GULF & SOUTH ATLANTIC REGIONAL PANEL
ON AQUATIC INVASIVE SPECIES
MINUTES
Tuesday, October 4 & Wednesday, October 5, 2011
Austin, Texas

On Tuesday, October 4, 2011, Chairman **Ron Lukens** called the meeting to order at 8:30 a.m. The meeting began with introductions of the members and guests. The following were in attendance:

Members & Proxies
James Ballard, GSMFC, Ocean Springs, MS
David Britton, USFWS, Arlington, TX
Rick Burris, MDMR, Biloxi, MS
Paul Carangelo, Port of Corpus Christi Authority, Corpus Christi, TX
Earl Chilton, TPWD, Austin, TX
Pam Fuller, USGS, Gainesville, FL
Chris Furqueron, National Park Service, Atlanta, GA
Lisa Gonzalez, HARC, The Woodlands, TX
Scott Hardin, FL Fish and Wildlife Conservation Commission, Tallahassee, FL
Leslie Hartman, TPWD, Palacios, TX
Jeffrey Herod, USFWS, Atlanta, GA
Rebecca Hillebrant, LA Dept. of Wildlife & Fisheries, Baton Rouge, LA
Chuck Jacoby, Indian River Lagoon National Estuary Program, Palatka, FL
Peter Kingsley-Smith, SCDNR, Charleston, SC
David Knott, At-Large Member, Charleston, SC
Ron Lukens, At-Large Member, High Springs, FL
Craig Newton, AMRD, Dauphin Island, AL
Chris Page, SC Department of Natural Resources, West Columbia, SC
Dennis Riecke, MDWFP, Jackson, MS
Don Schmitz, FWC, Tallahassee, FL

Staff
Alyce Catchot, GSMFC, Ocean Springs, MS

Others
Matt Cannister, USGS, Gainesville, FL
Mary Gilroy, Austin, TX
Luci Cook-Hildreth, TPWD, Austin, TX
Rebecca Haynie, UGA, Athens, GA
Jim Lester, HARC, The Woodlands, TX
Susan Mangin, FWS, Arlington, VA
Susan McCarthy, FDA, Dauphin Island, AL
Priscilla Weeks, HARC, The Woodlands, TX

Public Comment

Chairman **Lukens** provided the opportunity for public comment. No public comments were received.

Adoption of Agenda

Lukens reported that the Updates on GSARP Funded Projects scheduled for Wednesday, October 5, 2011 would not be presented, due to the absence of the panel members who were to present the updates. However, written reports were provided in each member's folder.

A motion to adopt the amended agenda was made, and passed unanimously.

Approval of Minutes

The minutes of the meeting of the April 12-13, 2011 meeting in Charleston, SC were presented for approval.

There being no changes to the minutes, a motion was made to approve the minutes. L. Hartman seconded the motion, and the motion passed.

Aquatic Invasive Species Activities around Austin

M. Gilroy gave a PowerPoint presentation entitled "Aquatic Invasive Species Control Efforts in Austin, Texas". **Gilroy** reported on two 'Run of the River' reservoirs: Lake Austin and Lady Bird Lake. They are the last two in a chain of 7 'Highland Lakes'. They both provide flood and irrigation water conveyance and are high-use recreational areas. Lake Austin covers 1,600 acres, is 21 miles long, and contains clear, cold, low-nutrient water. It is a fairly shallow reservoir overall; less than 7 meters deep. It is a potable water supply with a privately-owned shoreline and is a popular recreational area for boating, fishing, skiing, and sport fishing.

In Lake Austin, eurasian watermilfoil (*Myriophyllum spicatum*) is dominant, but is controlled by biennial winter drawdowns of the lake being dropped to less than 12 feet for approximately 6 weeks. In July 1999, there were 23 acres (10% of total vegetation) of hydrilla (*Hydrilla verticillata*). Hydrilla was first found at boat ramps, which is believed to be where it was introduced into the water by a boat. In July 2000, the hydrilla encompassed 200 acres (40% of total vegetation) in water depths up to 20 feet deep. In July 2002, hydrilla covered 320 acres, bank to bank. Observations over the last few years have revealed that hydrilla has moved steadily upstream due to the water in that area becoming warmer. Typically, that area has contained colder water and has been dominated by Milfoil, which prefers colder water. Many possible control methods were discussed that all stakeholders would agree on, and this led to the development of the Lake Austin Hydrilla Management Plan. In partnership with COA, TPWD, LCRA, and Friends of Lake Austin (FOLA), the plan's objectives are to get the lake back to a pre-hydrilla condition, and to maintain the lake's ecosystem. Integrated efforts include implementing winter drawdowns, harvesting/herbicides on primarily public area mats, incremental grass carp stocking, and stocking based on vegetation surveys supplied by TPWD.

The Hydrilla Management Plan included stocking Lake Austin with 8,125 grass carp between February 2003 and November 2004. Approximately 4 – 4.5 grass carp per lake acre is believed to provide adequate control of the hydrilla. Winter drawdowns were done in February 2003, 2004, and 2005. The implementation of these control methods resulted in a significant reduction in the spread of hydrilla to less than 100 lake acres. Between October 2006 and July 2011, over 15,000 more grass carp were stocked in Lake Austin. However, by September 2011, there were over 500 lake acres covered by hydrilla, despite the presence of 5+ grass carp per acre of lake. **Gilroy** stated that they are unable to explain why this is happening and that there seems to be no way of stopping the spread. **Gilroy** and **E. Chilton** have discussed that perhaps instead of targeting the stocking rate as fish per acre of lake, they should instead look at how to get the stocking rate as 50-60 fish per acre of hydrilla. Several factors have likely enabled the increased spread of hydrilla. Drought means warmer water, which results in more nutrients for the plants. The last scouring flood was in 2007. Fish migration to other nearby water bodies means less fish to feed on the hydrilla. Although over 23,000 grass carp have been stocked in the lake, fish mortality has resulted in approximately 10,000 currently alive.

Gilroy explained that they have ascertained that grass carp do play a critical role in hydrilla control. Other factors in helping with hydrilla control include floods and drawdowns, and non-palatable vegetation which cause the grass carp to feed mainly on the hydrilla. So far, grass carp have not been observed significantly feeding on milfoil in the lake. Milfoil is not the public safety or infrastructure hazard that hydrilla is. **Carangelo** inquired as to how much has been spent on the management plan. **Gilroy** surmised that approximately $500,000 has been spent thus far. **Riecke** asked about using herbicides for hydrilla control. **Gilroy** explained that due to the lake being used as both a public and a private drinking water supply, there is a significant amount of opposition to that practice. Also, the herbicide would kill the plant on the surface, but not the roots and tubers, and therefore would not be feasible cost-wise or effort-wise.

Gilroy next reported on Lady Bird Lake. The lake is 6 miles long, approximately 500 acres, with 7 urban tributaries and a highly-used public shoreline. It is an urban refuge for wildlife. There is increased turbidity, temperature, and nutrients. At least 7 invasive species are found on the lake, but very few of them are aquatic vegetation. Only about 10 lake acres are affected by invasive aquatic vegetation. It is believed that this is due to the fact that most of the lake's shoreline is a national shoreline, whereas Lake Austin is privately owned and is over 50% bulk-headed. This means that there is less of a connection between the land and the water. The Lady Bird Lake Riparian Restoration project was created to improve habitat and water quality, and to remove invasive vegetation and plant native species. This project will be a used as a model for a city-wide effort. The city is also working on a city-wide Invasive Species Management Plan.

Gilroy spoke on Giant cane (*Arundo donax*) which has spread along the entire 5-mile lake shoreline and totals 3.4 acres. Typically found on steep slopes, the cane grows 20 feet tall and spreads by fragments and rhizomes. Though a monoculture, it is also found in mixed stands of hardwoods. It pushes out native species and uses three times the water as native plants. There is little public benefit from the cane, and it provides limited wildlife habitat. It does, however provide hiding places for transients and trash, and increases fire danger. Year-long control efforts include cutting the plants down in mid-summer to decrease biomass, and composting the material at the city facility. In early fall, herbicides (Imazamox, MSO, and Glyphosate) are

applied when re-growth reaches four feet high. This limits the amount of herbicides that would be required if the plants were taller, since the area is used as a hike and bike trail. Next spring, the cane will be re-treated as needed.

Gilroy reported on Elephant ear, wild taro (*Colocasia esculenta*). This invasive species covers at least 50% of the lake's shoreline and shades out native grasses. It has little to no wildlife or public benefit and traps trash and debris. However, since it covers so much of the shoreline, it does provide some erosion control.

A pilot project is underway that involves using three replicates of each control treatment. Two herbicides are being used; Imazamox (Clearcast) with MSO, and Glyphosate (Refuge) with NIS. Three application techniques are being used; cut and paint (100% Glyphosate/100% Imazamox), wicking (50% Glyphosate + 0.25% NIS/50% wick imazamox + 0.5% MSO) or glove-in-glove (cotton on top neoprene), and foliar spray (1.6% Glyphosate + 0.25% NIS/5% Imazamox + 0.5% MSO). The areas being treated are $1m^2$ plots, with a .5m buffer zone. Treatments are done in mid-August and are evaluated four weeks after treatment, and eight weeks after treatment. (Very) Preliminary results have shown that at four weeks after treatment, there was slightly better control (visually) in the wicked plots than the foliar plots. For both the wicked and foliar plots, Glyphosate appeared to provide better control. Cut-and-paint plots showed signs of new growth. Mid-October evaluation may show more control for Imazamox due to the fact that it is slower acting. **D. Riecke** asked how long the Arundo and Elephant ears have been on the lake. **Gilroy** answered that since there are no historical records, it is not known how long they have been there or how much they have spread. They are in the process of studying GIS aerial photographs to find out.

Gilroy discussed the Austin Lakes Aquatic Plant Restoration Project that the city of Austin and the Lewisville Aquatic Ecosystem Research Facility (LAERF) are working on. The goal of the project is to increase native plant diversity and cover on both lakes, but the project is limited by funding issues, the size of the lakes, and the large amount of private property. The project would provide habitat and water quality benefits without invasives, reduce niches for hydrilla, and reduce impacts from grass carp by using a "founder colony" approach to provide propagules and enable the spread of natural species in the lakes. The project design consists of twenty sites on the lakes using seven species that were emergent and submersed in 1-2 ft. depths, with two growth habits. The herbivore exclosures are trays and ring cages built on-site with PVC-coated wire. The benchmarks of success are the survival and spread of the plants inside the protective cages, the spread of plants outside the cages, and the spread beyond and between the various sites. Challenges to the success of the project include two major floods, and a drawdown in Lake Austin in 2005 to control hydrilla that isolated the native plants and caused them to dry out. Other problems were hydrilla floating onto the top of the cages and smothering the vegetation underneath, stranded turtles inside the cages trampling the vegetation, and construction debris being thrown into the cages. In Lake Austin, hydrilla and milfoil limit the spread of the native vegetation.

Between 2004 and 2008, five species survived and spread: *Pontederia*, *Sagittaria*, *Justicia*, *Vallisneria*, and *Heteranthera*. Some of the cages were damaged by flooding and vandalism and there was pressure from herbivores. Overcoming herbivory varies by species. In 2009, larger

pens were constructed, which increased growth and propagule production. They are the key to overcoming the herbivore pressure. In Lake Austin, *Sagittaria* spread 20m beyond the cages. In Lady Bird Lake, the plants had spread outside of the cages, and increased diversity and cover occurred. The current status of the project is that there are well-established founder colonies, a mix of twelve diverse plant species, a significant spread outside of the exclosures, and spread well beyond and between the sites. 'Free' colonies on Lady Bird Lake include $26m^2$ of *Sagittaria*, $37m^2$ of *Vallisneria*, and *Pontederia* seedlings. There is no single "end-point" for the project. In 2011, new cages and techniques were created for the project. **Riecke** asked if Bullrush had been planted. **Gilroy** stated that it had, and it has been successful.

Why People Release Their Pets - A Socioeconomic Study

P. Weeks gave a PowerPoint presentation entitled "Freshwater Aquarium Hobbyists and Invasive Species in the Houston-Galveston Region". **Weeks** reported that they have been working on a project to better determine what drives the decision for people to purchase, and later to release, ornamental fish. Additionally, it aims to better understand how knowledge and values influence the decision-making process. The long-term goal is to develop an Invasive Potential Scorecard that integrates ecological and human dimensions. The current project seeks to discover the availability potential by identifying social and market networks through which aquarium species are exchanged; the release potential by identifying factors that drive the release of non-native invasive species by pet owners; the survival/reproduction potential to develop methodology to determine the potential of invasion for a species released into the environment; participatory research to identify and evaluate potential strategies to discourage release. Future steps to reach the long-term goal are to use results from the current project to create the Invasive Potential Scorecard, and to identify and evaluate candidate management strategies using the Invasive Potential Scorecard. **Weeks** explained that they employed population survey questionnaires, interviews, and statistical analysis to reach their conclusions.

The availability potential was determined by conducting surveys of sources for live aquarium fish. Those sources included local breeders, local fish stores (4 independent and 9 chain), discount stores (9), internet sales by individuals, aquarium society auctions, and international import data (Dallas, Houston, Del Rio, El Paso, Laredo).

The release potential was determined by conducting in-depth interviews and in-person surveys, web-based surveys, and by using a decision model. A multi-stage cluster approach was used to identify aquarists. A general population list of 201 people who have aquariums or are thinking of getting one was drawn from 62 zip codes in the Houston region. Using a stratified random sampling of 30 people that was based on venues, the research sample was selected for the second round. This allowed the research sample and the findings to better represent the various subgroups of neophytes and hobbyists. The survey/interview questionnaire consisted of 31 questions (18 on release) and was conducted in two rounds with each interviewee. The in-depth interviews lasted 1-2 hours.

The in-person survey summary findings revealed that when someone decides to dispose of their aquarium fish, trade/selling is the preferred option, but release is a close second. The respondents believed that release means giving a fish a fighting chance and if the fish dies, it is

because of survival of the fittest. They believed that releasing the fish benefits nature because it adds to diversity, nature is always changing, and it helps prevent extinction. People will drive long distances to release a fish in an appropriate body of water. Virtually no one was worried about legal consequences of release because they knew they would not get caught.

The model summary findings revealed that the well-being of the fish is the primary value considered in making a relinquishment decision. The environmental impact of release is a significant, but secondary, value. Stressing the legal consequences of release is not likely to effect the release decision. Respondents were less likely to release the fish if they perceived that the fish would not thrive; that releasing the fish would likely have a negative impact on the environment; if they had increased connections to the aquarium community.

The web-based survey was designed to capture a few dimensions of five primary constructs and determine what relationship these had to each other. Those five constructs were aquarist identification, Darwinist/survivalist values, environmentalist values, trust in science, and release potential. Ninety-four percent of the aquarists were identified as aquarium owners, with an average age of 32. Sixty percent were men and 40% were women. Nearly 35% of respondents admitted that they would release their fish if they couldn't find someone to give the fish to, and 30% would go so far as to seek out a body of water that seemed appropriate for the fish. Interestingly, although 80% of the respondents were overwhelmingly opposed to release, only 60% said they were unlikely to release. Factors that raised a person's release potential were Darwinist/survivalist values (strong species have a right to survive); their emotional attachment to the fish; if the fish were purchased from big box stores; if information was obtained from big box stores; if they were not connected into the aquarium community. Factors that lowered a person's release potential were their valuing of the stability of the ecosystem; their viewing the environment as a public resource; if they were a serious aquarist; if they used local fish stores and the web for information.

The methodology for determining the survival and reproduction potential of aquarium fish released in Houston's bayous include: determining the species' ability to become established in Texas waterways, and developing a Survival Potential methodology that combines with the Availability Potential and Release Potential aspects of the project; is used as an assessment tool for multiple species and areas; informs education and outreach efforts; supports prevention strategies. Seven species were chosen based on their invasion status. Species attributes were collected through literature review and compiled into species attribute charts. Local habitat was characterized by stream water quality data collection and analysis. Environmental optima charts were developed to compare species attributes to local habitat characterization (e.g. minimum winter water temperature compared to species requirements). Species survival and reproduction potential was combined with availability and release potential. Survival and reproduction potential conclusions were that the methodology shows promise. It should not be unequivocally stated whether a species can or will invade but rather, to predict which species is likeliest to invade and which habitat is the likeliest to be invaded.

The future goal is to create an Invasive Potential Scorecard that is pathway-specific and involves aquarium fishes only. It would differ from risk assessments in that it would not seek to assess quantitative or qualitative risk related to a threat. It would also not assess impacts to ecological,

social, or economic systems. Instead, the potential of invasion would be based on availability potential, release potential, and survival/reproduction potential.

Participatory research included conducting a workshop in April 2011 for aquarists, public educators, resource managers, and the aquarium industry. An exploratory stakeholder workshop was held in August 2007. Project methodology was reviewed and potential strategies to discourage release were identified and evaluated. A framework will be constructed for ongoing collaboration. Long-term outreach oriented management strategies will involve working with big box stores on species lists, perhaps through a large NGO with a track record of working with large corporations, and to create a large ad campaign on the order of "Don't Mess With Texas". Short-term strategies will be to design ad campaigns and materials that target the knowledge and values of people who release aquarium fish.

Overview of Avian Vacuolar Myelinopathy (AVM), and the Relationship Between the Disease and Invasive Aquatic Vegetation

R. Haynie gave a PowerPoint presentation entitled "Avian Vacuolar Myelinopathy (AVM) Research Update". Avian Vacuolar Myelinopathy (AVM) is a neurolgic disease that affects waterbirds and their avian predators. The disease was first documented in 1994/95 at DeGray Lake in Arkansas. Twenty-nine bald eagles were found dead or dying. The next outbreak was documented in 1996/97 at Ouachita Lake and Hamilton Lakes in Arkansas when 26 more dead or dying bald eagles were found. In 1998, the National Wildlife Health Center characterized and named the disease. AVM was also confirmed in birds from reservoirs in Arkansas, Texas, Georgia, South Carolina, and North Carolina. The body count consisted of Mallards, Ring-necked Ducks, Buffleheads, American Wigeon, Canada Geese, Great Horned Owls, and Killdeer. Clinical symptoms include a staggering gait, ascending paralysis, loss of righting reflex, and general in-coordination.

Pathology reports identified a unique lesion, called an intramyelinic edema, in the white matter of the central nervous system, which was the only consistent finding. The culprit was not easily identified. Anthropogenic compounds that elicit this type of myelinopathy are hexachorophene, triethyltin, and bromethalin. These compounds were quickly ruled out and the next possible source of the toxin investigated was the environment. Field and laboratory investigations revealed that the disease has a rapid onset of less than 5 days, is site-specific, and seasonal (late fall-winter). The transmission is dietary; the primary intoxication is from an etiologic agent associated with plant material. The secondary intoxication is from an agent retained in the digestive tract. Waterfowl feed primarily on aquatic plants and algae, and thus contract AVM by ingesting cyanobacteria. Bald eagles, in turn, contract AVM by preying on the diseased waterfowl. In spring 2001 at the S. Wilde Laboratory, reservoir surveys were done of water quality, water temperature, DO, and pH. From whole water, nutrient chemistry and algal identification was done. From sediment, algal identification was done. From aquatic plants, primarily submerged aquatic vegetation (SAV), epiphytic alga was found to be very abundant, primarily on *Hydrilla verticillata* that was analyzed from reservoirs and lakes in Arkansas, Texas, SC, Georgia, and North Carolina. Brazilian waterweed (*Egeria densa*) was analyzed from lakes in Arkansas and Georgia. Eurasian watermilfoil (*Myriophyllum spicatum*) was analyzed from water bodies in Arkansas, South Carolina, and Georgia. Results from the surveys

found that these non-indigenous, invasive SAV dominate the AVM sites. A previously un-described plant-associated cyanobacterium, of the order Stigonematales ("Stig"), is suspected of producing the AVM neurotoxin that causes the disease. The epiphyte covered 20-90% of the leaf and stem surface of the aquatic plants (primarily hydrilla) in the disease sites, but was rare or absent on SAV from unaffected reservoirs. A website, http://www.forestry.uga.edu/swilde/locations.php, has been created by UGA that shows confirmed AVM sites and relative Stig densities in the United States. PCR analysis was done and confirmed the morphologic identification. In laboratory tests, methanol extract derived from Stig-SAV complex caused AVM in mallards. The toxin is a stable, polar compound.

Current research being done at the UGA Wilde Laboratory include identifying parameters conducive to Stigonematales growth; invertebrate bioassay development; cell-line assay refinement; distribution and impacts in GA, and Maxent model predict potential range. Also being researched is an alternative toxin transfer pathway through the invertebrate vector (invasive island apple snails), and threats to endangered raptors such as the Snail kite. Idiopathic neurodegenerative diseases are being studied to determine if the disease is a genetic predisposition, or triggered by the environment. Recently, UGA was awarded a grant through the USFWS Avian Health Initiative and will be able to evaluate the management of invasive SAV as to mitigate the impacts of AVM, and also to evaluate paired "AVM" reservoirs with and without SAV management using grass carp stocking. Brian Popko, Director at the University of Chicago's Center for Peripheral Neuropathy, is investigating mammalian susceptibility. R. Bidigare and S. Christensen at the University of Hawaii's Center for Marine Microbial Ecology and Diversity are investigating the involvement of known human neurotoxins.

A recent study demonstrated that BMAA (β-N-methylamino-L-alanine) is a neurotoxic amino acid that falls into a group of toxins called excitotoxins. The source of these compounds are marine and freshwater alga. It is produced by cyanobacterium that has been linked to AVM. Glutamate-related excitotoxicity is among the most prominent factors. The ultimate toxicity is neurodegeneration. BMAA first received attention in the 1950's when the Chamorro people, the indigenous peoples who inhabit the Mariana Islands (Guam), were found to be suffering from Amyotrophic Lateral Sclerosis/Parkinson-Demetia complex (ALS-PDC). The occurrence of ALS-PDC in the Chamorro people was 50-100 times more common than any other known population. Researchers found that a high incidence of ALS-PDC in the native Chamorro people may be linked to their feasting on flying foxes. The flying foxes forage on seeds from cycad trees, which contain cyanobacteria in their roots that produce BMAA. The Chamorro people drop an entire flying fox into a pot of boiling coconut milk. Once the animal is cooked through, it is eaten entirely - fur, wings, bones and all internal organs, where high levels of the toxin accumulate. In Canada, free BMAA was found in the brains of Canadian Alzheimer's patients.

Cyanobacterial strains that produce BMAA represent all 5 morphological sections. Is the biomagnifications of this cyanotoxin unique to the Guam case study, or can it occur elsewhere? Could BMAA be the mysterious AVM toxin? Toxin similarities were studied beginning with its origin, the cyanobacteria-vegetation complex, followed by the secondary predator, then the tertiary predator. In birds, similar clinical symptoms of ascending paralysis, head retraction, staggering gait, and loss of righting reflex were all observed. In mammals, no AVM was observed; however, BMAA was found in laboratory mice and rats. The rodents experienced

weakness and convulsions, dragging, unsteady gait, ataxia, and the inability to stand. BMAA damage to the hippocampal neurons in young mice occurred in mammals. In young rats, AVM was suspected as the cause of damage to their hippocampal neurons. To determine if BMA could be the mysterious AVM toxin, cyano-SAV and birds need to be collected in the field and screened in the laboratory for the presence of BMAA.

In 2009, cultures from Stigonematales (BG-11), Stigonematales (BG-11 – nitrate), hydrilla plus Stigonematales, and hydrillae were sent to the University of Hawaii's Center for Marine Microbial Ecology and Diversity for analysis. In November 2010, coots with clinical symptoms were collected at J. Strom Thurmond Lake after an AVM outbreak was detected. Tissue from muscle, liver, kidney, brain, and crop/GI tract was extracted from the coots so that it could be analyzed for BMAA. Brains from seven of the birds were reserved for AVM analysis. From September to December, hydrilla samples were taken from each bird collection site. The cultures were analyzed using high performance liquid chromatography/fluorescence detection by HPLC/FL. The identification of BMAA in the samples was confirmed by liquid chromatography/mass spectrometry (LC/MS). BMAA was detected in the Stigonematales BG-11 culture (23 µg/g DW); the Stigonematales BG-11 – nitrate culture (30 µg/g DW); and highest in the hydrilla plus the Stigonematales culture (59 µg/g DW). BMAA was below the limit of detection in the Hydrilla culture. **Haynie** noted that a paper was released in 2011 that showed that cyanobacteria produce more BMAA in nitrogen-starved environments. AVM was confirmed in all seven of the coot tissue samples. BMAA was below the detection limit in all of the coot tissue samples. Results are still pending for the hydrilla/stig samples.

BMAA may not be the AVM toxin. Anecdotal evidence shows that organisms that routinely feed on BMAA-tainted food sources may possess the ability to metabolize and/or depurate the toxin. To strengthen these conclusions, BMAA detection will need to be confirmed in the hydrilla samples that were collected with the coots. Findings from screenings of samples of cyanobacteria species/strains from various habitats and origins confirmed free BMAA in the samples. However, the concentration amount for human health concern is 7000 µg/g, and the findings from the sample screenings ranged from concentrations of 4 µg/g to 758 µg/g. The concentration amount for damage to mammalian neurons is 10-30 nMol. The plant-cyano symbiosis had a BMAA concentration of 0.3 µg/g DW in the Nostoc culture alone. In the C. Micronesia + Nostoc culture, the concentration was 37 µg/g DW. Were the clinical symptoms in mammals an "environmentally relevant" dose? The general consensus is that because BMAA is a non-protein amino acid, it can be incorporated into protein that produces a reservoir of toxins that, over a lifetime, acts as a "slow toxin" as the proteins break down. This could account for the latency period of symptoms in people who are not diagnosed with ALS, Alzheimer's, etc., until later in life. There was a 30+ latency period in the Chamorro people. The implications from BMAA in wildlife are dire. The death toll of bald eagles alone has been immense. In human health, it is unclear at this time. The prevalence and severity of cyanoblooms are increasing. It is imperative that increased awareness and improved management practices of invasive aquatic vegetation be implemented to prevent and reduce cyanoblooms.

Overview of TexRAT

L. Hartman gave a PowerPoint presentation entitled "TexRAT - Galveston. The Hunt for Invasive Species". The Texas Rapid Assessment Team (TexRAT) conducted a week-long rapid assessment survey of native and non-native aquatic species in Galveston Bay and its tributaries June 19-24, 2011. The survey provided a snapshot in time of short-term distribution and abundance patterns of native and non-native species. It increased public awareness of invasive species issues, and established cross-agency relationships. Galveston Bay was chosen for the study because it is a research-rich area with a history of exotic species. Its multiple pathways provide an open door to new invasives. It is geographically accessible and has many vested organizations already there.

TexRAT funding is provided by TPWD funds consisting of $20,000 in restitution funds and $20,000 in SWG funds. TexRAT'S partners include TPWD, Texas A&M Galveston, University of Houston Clear Lake, Houston Advanced Research Center, and Sea Grant. In-kind/personnel donations are also received.

A map of "Hot Spots" in Galveston Bay was created to show which locations were most likely to have invasive species. TPWD will set up sampling sites around these hot spots.

A Galveston TexRAT management group/structure was created which consists of program management, lab management, outreach, a field manager, a weather manager, a safety manager, a media team, data shepherding, data entry, SOP development, photographers, and data storage. Data will be posted on GSMFC's website. HARC has also expressed interest in the data. A museum accessioning of samples was done by UHCL and Texas A&M. Media coverage included *The Houston Chronicle* and the *The Daily News - Galveston County*. A map was created that shows high and medium exotic plant and animal risks and what gear types were used to collect the samples. Invasive animal species identified and/or collected included Cichlids, Nile tilapia, corbicula, grass carp, pleco, and apple snails. Invasive plant species identified and/or collected included alligator weed, giant reed, elephant ear, water hyacinth, hydrilla, salvinia, Brazilian peppertree, saltcedar, and Chinese tallow tree.

Issues faced by TexRAT during the week-long survey included bad weather, personnel scheduling conflicts, and the need for a complete team for field and lab, a centralized location, and improved public outreach. Even with those issues, participants expressed enthusiasm and interest in attending the next rapid assessment survey.

Lukens inquired about developing a "how-to" written manual for conducting the surveys and **Hartman** stated that it had been discussed and they will be developing a manual in the future.

Risk Analysis of Wild-Caught Tilapia in Aquaculture in Florida

S. Hardin gave a PowerPoint presentation entitled "Tilapia Risk Analysis". In 1961, blue tilapia were brought to Florida by the Florida Game and Freshwater Fish Commission. The Commission was considering them as a potential sport fish. From 1961-62, their growth and sportfish attributes were studied. In 1964, it was determined that stocking the tilapia was not a good idea, and it was recommended that they no longer be stocked. By 1968, it was illegal to stock the fish

in public waters. In the late 1960s, another tilapia species, Mozambique, found its way into the canals of Southeast Florida. By 1977, blue tilapia had invaded 21 counties and eight major river basins. In the 1980s, blue/Mozambique hybrids were appearing. In 1989 nile tilapia, a popular aquaculture species, was classified as a "conditional species" to avoid having another invasive species become established. However, in 2006 nile tilapia were found in three Florida counties. From 2007-2011, they have been found in over five more counties.

The control of aquatic vegetation by blue tilapia has had varying results. Blue tilapia have been used to control filamentous algae and other aquatic vegetation in lakes and experimental ponds.

Potential impacts from blue tilapia include spawning site competition; disruption of spawning activities; food competition between gizzard shad, largemouth bass, and sunfish. In Lake Lena from 1978 – 1984, there was a negative correlation with bass, bluegill, and shad. In the experimental ponds containing no tilapia, there were more young-of-year largemouth bass. However, the three top bass lakes, crappie lakes, and bream lakes have all had blue tilapia for over thirty years with no apparent negative impacts. Biomass estimates (kg/ha) of blue tilapia from the Boynton Canal from 1998-2008 showed no significant negative correlations between blue tilapia and any individual or group of native fish species. The consensus among the fisheries biologists is that they wish the blue tilapia weren't there, but no consistent negative impacts on native species has been observed. FWS has a rule that there are four conditional species of tilapia (blue tilapia; nile tilapia; Mozambique tilapia; wami/Rufigi tilapia) that are allowed only for commercial use in aquaculture. All other oreochromis and sarotherodon tilapia are prohibited. The introduction of all non-native species to Florida waters is prohibited. The FWC rule for conditional tilapia is that permits are only issued for certified aquaculture, exhibition, and research. There must also be bio-security measures in place, such as pond levees that are 1' above the 100-yr flood plain, and no discharge into public waters. The exception to this rule is that a permit is not required to possess, culture, and transport *Oreochromis aureus* in areas where it is established. However, the fish cannot be stocked in Florida waters or be discharged into Florida waters. There is public interest in stocking blue tilapia to control filamentous algae in homeowner association ponds. However, these ponds are typically connected to state waters via overflow structures, making stocking illegal. Florida fish farmers want to culture wild-caught tilapia without a permit, but due to hybrids, DACS requires proof of species.

The U.S. Fish and Wildlife Service funded a tilapia risk analysis study to determine risk prevention or mitigation options, and the statewide and regional ecological, economic, or human health risks. These are above the existing risks if proposed uses are allowed. **Hardin** stated that they used The Generic Nonindigenous Aquatic Organisms Risk Analysis Review Process that was published by the Aquatic Nuisance Species Task Force in 1996. This Review Process is "…a standardized process for evaluating the risk of introducing nonindigenous organisms into a new environment and if, needed, determining the correct risk management steps needed to mitigate risk". There are three element (risk/consequence) ratings that are used. A "Low" rating means that the risk is acceptable and there is too small of a concern to justify mitigation. A "Medium" rating means that the risk is unacceptable and there is a moderate concern that would justify mitigation. A "High" rating means that the risk is unacceptable and there is a major concern that would justify mitigation. Using the Generic Analysis matrix, the organism risk

potential is determined. The Probability of Establishment and the Consequences of Establishment are combined to identify the Overall Risk Potential. Generic analysis involves developing a risk assessment by stakeholders who analyze information; qualify or quantity risk; uncertainties, and make recommendations. Risk management deals with policies, regulations, and/or operational measures to reduce the risk. The Probability of Establishment and Consequences of Establishment for Blue tilapia are combined to identify additional consequences of aquaculture/weed control. The Expert Panel is made up of personnel from government, state, and federal agencies; academic representatives well-schooled in fish and invasive biology; people from the private sector.

Hardin stated that the panel was asked to consider possible wild tilapia scenarios. It is feasible that Nile or Mozambique tilapia could be collected, and their release/escape might increase the Florida range of these species; blue tilapia and nile/Mozambique/B-M hybrids could be collected from the wild and might lead to a "new" hybrid creation with different cold/salinity tolerance; wild tilapia could be mixed and matched with existing stock of uncertain genetic parentage that might be released/escape; wild fish with parasites and pathogens could be collected and transferred with shipments of live fish. Blue tilapia for weed control scenarios were also discussed. Since it is difficult to identify tilapia, mistakenly stocking nile tilapia or hybrids of unknown parentage for weed control instead of blue tilapia could occur; fish of unknown origin could introduce parasites and pathogens; tilapia and other species could be introduced by unknowing or unscrupulous contractors. "Other" scenarios include the increased use of tilapia as bait; citizen fishery management (i.e., stocking novel waters); citizen or farm interest in the other conditional or prohibited tilapia species in Florida (*T. buttikoferi, T. mariae, T. sparrmani, T. zillii*). Possible environmental consequences are: impacts on native fish such as spawning site competition, behavioral spawning impacts, and parasite/pathogen spread; impacts on trophic structure (e.g., selective grazing) such as community structure changes, fish population size/age structure, predator/prey relationship; impacts on aquatic habitat, water quality (through increased benthic sifting, filter feeding). Possible economic consequences are: the loss of sport fishing; increased commercial fishing; bait production/distribution. Social/political consequences are: the adverse reaction to the establishment of new exotic species; the adverse reaction to relaxing rules for non-native species; the positive reaction to additional algae control options (alternative to chemicals); the positive reaction to increased aquaculture opportunities. The majority of the panel felt that there was no high risk of environmental consequences for tilapia aquaculture. However, some panel members were adamant that there was at least a medium risk because of the presence of nile tilapia in certain locations. The panel felt that the economic consequences were low. On the other hand, the panel felt that the social/political consequences were a medium/high risk. Environmental consequences for filamentous algae control were felt to be a low risk, with the exception of a medium risk being associated with the native fish/trophic structure in central Florida and lower St. Johns South Florida. Social/political consequences were ranked as a medium/high risk for filamentous algae control.

The panel felt that there were risk management issues that need to be determined: the hybrid tilapia environmental tolerance (temperature, salinity); the status of hybrid tilapia on farms in Florida waters; a better definition of nile tilapia distribution. **Hardin** reported that in January 2012, they will work to discover a lower lethal temperature for nile tilapia, which are not as cold-tolerant as blue tilapia. Also, genetic analysis will be done to identify hybrid tilapia. Tilapia will

be collected during fall fish monitoring to determine nile tilapia distribution. The panel's recommendations are to educate the public on regulations, and to provide them with photo identification of the difference between nile tilapia and blue tilapia. Fish farmers need to be informed where to collect blue tilapia. To determine if tilapia actually control filamentous algae, the panel recommended conducting a study of the tilapia's consumption rates, the algae species preferences, and the optimal size of the fish. Aquarium studies at the non-native fish laboratory will be undertaken in late 2011/2012. **Hardin** ended his discussion with a post-script. Nile tilapia were collected and analyzed by **J. Teem**. Some of the samples were sent to Canada for identification. All of the samples were identified as being nile tilapia.

Status Update on the Zebra Mussel Situation in Northern Texas

D. Britton gave a PowerPoint presentation entitled "Zebra Mussels in North Texas". In April 2009, the first zebra mussel was found in Lake Texoma. Due to the discovery of the zebra mussels, in July 2009 the North Texas Municipal Water District stopped pumping water from the Red River Basin (Lake Texoma) through an interbasin pipeline that empties into the Red River Basin (Lake Lavon via Sister Grove Creek). Despite these efforts, two zebra mussels were found in Sister Grove Creek in August 2009. From May – August 2010, additional zebra mussels were found in Sister Grove Creek. In October 2010 TPWD treated Sister Grove Creek with Potassium Chloride. Even after the treatment, some zebra mussels were found alive.

In February 2011 the US Army Corps of Engineers, Tulsa District, suspended the DA permit to transfer water from Lake Texoma into the Trinity River Basin. The Trinity River system supplies drinking water to the Dallas Fort Worth Metroplex and the Houston Metro Area. Both combined total over 12 million people. In August 2011 NTMWD submitted a proposal to USACE to resume pumping water into the Trinity River Basin. The pipeline would first be cleaned, and pumping would only occur when larvae are least likely to be present. As of October 2011 the pipeline remains closed, awaiting USACE authorization. One of the factors considered to be instrumental in the USACE's decision to keep the pipeline closed is Executive Order 13112, which states, in effect, that no federal agency shall knowingly authorize or carry out any actions that would promote the introduction or spread of invasive species in the U.S. or elsewhere unless a thorough study has been done that show that the benefits of these actions outweigh the potential harm caused by the invasive species. **Britton** brought an issue to the attention of the panel members involving the Texoma Area Boundary Agreement that was passed on July 28, 2000. The Agreement delineates the state line between Texas and Oklahoma. However, the NTMWD pump house is located primarily in Oklahoma. Any water pumped through the pipelines starts in Oklahoma and empties into Texas. This means that for the first time, an interbasin transfer of zebra mussels would occur across state lines. For that reason, the Injurious Wildlife Provisions of the Lacey Act may come into play. The Act states, in effect, that importation onto or the transportation of live wildlife or eggs thereof from one state to another state by any means whatsoever is prohibited, except for certain purposes and conditions.

D. Schmitz inquired if there had been any discussion about building a water treatment facility that the pipeline water could run through to be treated and sterilized before being released as drinking water. **Britton** replied that it has been discussed, and two proposals were presented that seemed promising. The first proposal's objective was to develop a filter system, which would

cost approximately 30 million dollars. The second proposal's objective was to reroute the pipeline through a water treatment facility that already exists, which would take two years and cost 160 million dollars. That proposal was rejected, as the costs were deemed unreasonable.

Commerce/E-commerce As It Relates to AIS

E. Chilton gave a PowerPoint Presentation entitled "AIS Commerce in Texas". **Chilton** reported that last July, an email was received at the TPWD that Purple loosestrife was being sold at a New Orleans area Home Depot and the source of the loosestrife was believed to be in Texas. **Chilton** located the distribution center in Texas and TPWD's law enforcement department was sent to investigate. Approximately 3,000 plants were discovered that were to be sold and shipped to Home Depot locations in Texas and Louisiana. The plants were all placed in bags and disposed of. To deal with this scenario happening again in the future, TPWD quickly developed an Aquatic and Riparian Plant Emergency Response Protocol. Once an occurrence of a prohibited plant species has been reported, a physical sample of the plant should be obtained, accompanied by high resolution photographs. Positive identification of the plant in question should be conducted by a trustworthy authority with written documentation of the findings. The affected area should be contained to avoid possible spread. Specific location, time, date, GPS coordinates, water body name, controlling authority, address, and property owner should all be recorded for future reference. Appropriate authorities should be notified as soon as possible after confirmation (TPWD Law Enforcement, District Fisheries Management office, Regional Fisheries office, Aquatic Habitat Enhancement (AHE) office, and the local Controlling Authority. A brief survey of the immediate area should be conducted by Inland Fisheries personnel to assess the extent and circumstances of the infestation. If located near a stream or waterway, thorough surveys should be conducted downstream from the affected area to determine if dispersal has occurred and identify additional infestations if present. Once surveys are complete, an emergency action plan should be submitted to the governing authority, property owner, or business responsible for the area where the plant was found, outlining the steps to be taken, those responsible for their execution, and deadlines for completion. Hydrilla is easily obtainable for sale from various sources and most likely became invasive through its initial introduction as an aquarium plant. Salvinia is also easily obtainable and is considered a good nutrient sump that keeps algae down and is great for the production of fish such as bettas. Similarly, water hyacinth and water lettuce are also popular aquatic plants for sale. Commercial nurseries that are selling aquatic invasive plant species have been discovered. At one nursery alone, four invasive plant species were being offered for sale.

Other invasive species introduced through commerce include apple snails (*Pomacea insularum*), northern snakehead (*Channa argus*), lionfish (*Pterois volitans*), and suckermouth catfish (family *Loricariidae*). When the White List was being developed, over 50 species were identified as potential threats but are still currently legal to purchase. **Chilton** stressed that the sale of these species should be discontinued before they become invasive. **Schmitz** recommended that the panel develop a regional "watch list" of potential invasive plant and animal species that have a medium to high potential risk of becoming established and possibly producing harmful impacts. These species could then be assessed for their risk potential. **Lukens** agreed and suggested that a risk assessment of a particular species be done on an annual basis until a library is compiled of all potential risk species that are still in commerce. **Chilton** stated that they will be assessing the

25 most egregious plant species from the White List through a second and separate risk analysis that was developed specifically for aquatics. If both lists are in agreement, there would be strong evidence that those species are harmful and should be regulated. **Ballard** reminded the panel that at the last meeting, it was discussed that an "assessment clearing house" should be created. **Schmitz** pointed out that the creation of a watch list should be considered a high priority in the next few years. **Hartman** asked which panel members would be willing to participate in a work group to create the watch list.

Ballard moved that a work group be formed and a watch list created and incorporated into the Rapid Response Plan. He made a recommendation that the work group be headed by Hartman. Schmitz seconded.

J. Herod, D. Schmitz, and C. Jacoby volunteered to serve on the work group. Lukens asked the panel members if they were ready to proceed with the project, and if anyone had any objections. There were no objections, and Lukens announced that the panel will proceed with the project.

FY 2011 USFWS R4 AIS Program: Collaboration, Coordination, and Cooperation on AIS Issues

J. Herod gave a PowerPoint presentation entitled "FY 2011 USFWS R4 AIS Program: Collaboration, Coordination, and Cooperation on AIS Issues**".** **Herod** reported that state ANS plans approved by ANSTF are Kentucky, Tennessee, Louisiana, South Carolina, Georgia, Oklahoma, and Missouri. Those states with plans drafted and/or under revision are Alabama, Florida, Mississippi, Arkansas, Texas, and North Carolina.

Herod reported on USFWS partnerships/projects:

Lionfish and Other Marine Fishes

The USFWS partnered with NOAA and the USVI Division of Fish and Wildlife on a ciguatera survey for invasive lionfish in the USVI. USFWS is partnering with and providing funding to REEF for a project to study lionfish impacts on the Florida Keys commercial lobster fishery; Lionfish Public Outreach; Control Programs for Florida. USFWS, NOAA, NPS, USGS, REEF, and GSMFC have partnered to form the Invasive Lionfish Control Ad-hoc Committee. USFWS is partnering with USGS on a project to study the small-scale rapid response to non-native marine fishes that are an emerging threat in the Southeastern US.

Early Detection and Planning

The USFWS worked with Pam Fuller at USGS to update the Summary Report of Nonindigenous Aquatic Species Report for USFWS Region 4. The USFWS, USGS, and Auburn University partnered to do an assessment of the invasion risk of zebra mussels (*Dreissena polymorpha*) into the Mobile River Basin, and the veliger production and drift in the Tenn-Tom Waterway. The Florida Tropical Fish Farms Association, University of Florida, Tropical Aquaculture Laboratory, Division of Aquaculture, and the Florida Department of Agriculture and Consumer Services are partnering in the "Ornamental Nonnative Species Regulation, Production and Distribution Workshop".

Education and Outreach

The Louisiana Department of Wildlife and Fisheries received USFWS funding for the Louisiana AIS Public Awareness Campaign launched last year. The Florida Everglades Cooperative Invasive Species Management Area (ECISMA) Outreach Committee and the USFWS are partnering on a project to create Florida Non-Native Animal Species Identification Cards. The USFWS received a request from the USDA Forest Service in Arkansas to erect signage on Lake Wedington for Floating Yellow Heart.

Control and Research

The USFWS provided funding to UFFWS and the Alabama Department of Conservation and Natural Resources (ADCNR) Wildlife and Freshwater Fisheries Division for a project to control the Invasive Exotic Island Apple Snail (*Pomacea insulartum*) in Southwest Alabama. This is the third year that USFWS has provided funding for the project. The USFWS is in its third year of working with the Florida Department of Agriculture and Consumer Services on a project to sterilize channeled apple snails for biocontrol. The USFWS is working with the USGS on a project on everglades invaders and the biology and ecology of non-native aquatic species in south Florida.

Early Detection and Surveys

All of the USFWS regions and headquarters are partnering on eDNA projects. Environmental DNA (eDNA) refers to DNA fragments that a species leaves behind in the environment. The eDNA can then be extracted from the filter and species-specific eDAN can be detected via the polymerase chain reaction (PCR) with the aid of molecular markers specific to each species used to target known segments of the genome.On one project, a list will be compiled of known invasive species, projects being developed, and which species to target for eDNA. The USFWS' Warm Springs FTC was able to fund a project to develop eDNA Chytrid fungus. USFWS NWR funds (not AIS funds) were used for the LOX NWR Project which will develop primers for eDNA for Bullseye snakehead (*Channa marulius*), African jewelfish (*Hemichromis letourneuxi*), Mayan cichlid (*Cichlasoma urophthalmus*). The concept of the project is to develop biometric and environmental DNA standardized protocols for the early detection and population assessment of aquatic invasive species for Loxahatchee National Wildlife Refuge. It will be calibrating e-fishing (the classic fisheries detection tool) and survey methods, and match it with eDNA. Sampling will be quarterly and will begin in October 2011 and continue until October 2012.

HACCP (Hazard Analysis and Critical Control Point) is a valuable tool that can help reduce the risk of moving invasive species unintentionally. It is a process that can be useful for many activities such as field sampling, site visits, and road/trail maintenance. Free training and workshops are provided by USFWS.

As an action item, Herod will send his report to Ballard, who will distribute it via email to the panel members.

Update on Lionfish

National Park Service Activities - C. Furqueron

Furqueron reported that in January, they began having conference calls with parks in the southeast region that are marine-based. From those calls, it was determined that a general response plan for the southeast region should be developed. A workshop was held on September 13-16, 2011 and a draft for a general response plan was developed. The final response plan should be finalized by October 21, 2011. The focus of the plan is to describe the current lionfish situation and to outline the steps that park managers and staff would take to prevent or mitigate resource impacts.

The NPS will be looking at how to identify and target high-priority areas for lionfish management. Control techniques will be selected that are appropriate for each area, as not all parks allow the taking of lionfish. Also, the NPS will work on determining how to monitor lionfish in native ecosystems. Their lionfish management program will be evaluated periodically to improve management actions. **Lukens** asked if any of the parks would be open to hosting a lionfish derby. **Furqueron** replied that it had been discussed and several parks are interested in it. **Riecke** asked if the decision to harvest lionfish in national parks and marine sanctuaries could be made on a regional level or if it must go to Washington. **Furqueron** replied that the decision would most likely be made on a park level.

New Invasive Lionfish Control Ad-hoc Committee – J. Ballard

Ballard updated the panel on the recommendation that was made at the previous GSARP meeting regarding the ANSTF forming a lionfish Control Working Group (CWG). The purpose of the group is to scope the issues related to the prevention, control, and management of lionfish. If the formation of a lionfish CWG is approved by the ANSTF, it was recommended that the CWG provide a final report by the next ANSTF meeting in November 2011. The report would contain supporting information for a recommendation on whether or not a National Invasive Lionfish Control Plan is needed. The ANSTF accepted the recommendation at their spring meeting, and a new ad-hoc committee was formed. The new "Invasive Lionfish Control Ad-hoc Committee", coordinated by **Ballard**, is made up of **J. Herod**, **C. Furqueron**, A. Toline, P. Schofield, J. Morris, and **L. Akins**. The committee has been holding monthly conference calls, and finished their report by the deadline. The report will be sent to the ANSTF for review.

Little Cayman Island Lionfish Culling Experiment – C. Jacoby

Jacoby reported that lionfish are definitely established. A lionfish was first spotted in the Cayman Islands in February 2008. They have virtually no natural predators in the Caribbean. They also have a voracious appetite. Within five weeks, they can consume most of the juvenile and small fish on a reef. On reefs where lionfish are present, there is 70-80% less small reef fishes of various types. Lionfish are also responsible for great reductions in fish numbers on reefs where they become established. They prey on herbivorous fishes that consume macroalgae and help protect corals from algal overgrowth.

Due to their extensive geographical range and diversity of habitats, it is unlikely that the lionfish invasion can be reversed. Control is now the only option left. In order to control and manage the lionfish invasion, culling programs have been introduced in the Cayman Islands. The Cayman Islands Government has begun licensing the local dive master population in an effort to cull the

lionfish population. The Department of Environment (DoE) also hosts lionfish culling courses to locals and tourists. Lionfish derbies are held to help eradicate the lionfish. An "Eat Lionfish" campaign is also being promoted.

Lionfish are being harvested to analyze stomach contents and reproductive maturity. Otolith analyses are being performed for age and growth data of the lionfish. Data of this type is needed to build accurate models and plan for the future of lionfish population management.

Non-native Marine Fishes: Lionfish and More…

Ballard gave a brief summary of a PowerPoint presentation entitled "Non-native Marine Fishes: Lionfish and more…" that was done by **P. Schofield**, who was unable to attend the meeting. **Ballard** reported that tracking distributions of non-native marine fishes by USGS is part of a large, joint research program in partnership with NOAA and REEF that focuses on lionfish biology and ecology; control techniques and assessment; assessment of impacts; outreach and education. Panther grouper (*Chromileptes altivelis*), which had not been seen in Florida since 2007, was spotted in West Palm County. There have been two recent sightings of yellow tang (*Zebrasoma flavescens*) off the southwest coast of Florida. They were last seen in Florida in 2005. Their native range is in the northwest and Central Pacific, including Hawaii. In July 2011, a spotted scat (*Scatophagus argus*) was captured just inside the St. Lucie inlet near Stuart, Florida in a mangrove/mud habitat. It was transferred to the Florida Museum of Natural History. Spotted scats were last seen in Florida in 1992. Their native range is the Indo-Pacific (India, Sri Lanka, Japan, Philippines, Indonesia, SE Asian coast). Their diet consists of detritus, vegetation, algae, and phytoplankton. An important note is that spotted scats are reported to have venomous spines. This is the first time this species has been documented from the Atlantic Ocean, and the second record of the species in the continental USA. The only other specimen on record was collected in 1992 in the Gulf of Mexico off Cedar Key, Florida.

Public Comment

R. Lukens provided the opportunity for public comment. No comments were received.

The meeting recessed at 5:00 p.m.

Wednesday, October 5, 2011

The meeting reconvened at 8:30 a.m. The Chairman again provided the opportunity for public comment. No comments were received.

AFS Southern Division Resolution on AIS State Plan and Panel Funding

D. Riecke provided panel members with a copy of the *AFS Southern Division Resolution on the Federal Funding for Programs to Prevent, Control, and Manage Aquatic Invasive Species*. The resolution calls for increased federal funding (59 million dollars annually) for programs for aquatic invasive species. As required, the resolution was published in the AFS newsletter in the summer, and was put on the website for public comment. It will now go to the AFS Governing Board for approval. It will then go the Southern Division membership when they meet in

January 2012 in Biloxi, MS. If the board passes the resolution, the next step would be for the board to ask at the January meeting if it should go to the parent American Fisheries Society. If yes, it would then go to the resolution committee's national/international level, where electronic voting will be done. **Riecke** stated that he will keep the panel informed as the resolution makes its way through the consideration/adoption process.

Update on New Introductions

M. Cannister gave a PowerPoint presentation entitled "GSARP Species Updates". On April 21, 2011 a bighead carp (*Hypophthalmichthys nobilis*) was captured in Chowan drainage in North Carolina. It is unclear how the carp got there. On July 19, 2011 a bighead carp was captured in Plaquemines Parish, Louisiana. On June 15, 2011 a silver carp (*Hypophthalmichthys molitrix*) was captured in Lake Pontchartrain drainage. On July 22, 2011 silver carp were captured in St. Martin Parish, Louisiana, and Morehouse Parish, Louisiana. On May 16, 2011 a red-bellied pacu (*Piaractus brachypomus*) was captured in Spring drainage in Montgomery County, Texas. On June 1, 2011 a red-bellied pacu was captured in Withlacoochee drainage in Lowndes County, Georgia. On May 23, 2011 a nile tilapia (*Oreochromis niloticus*) was captured in Sarasota Bay drainage in Sarasota County in Florida. On September 14, 2011 an Oscar (*Astronotus ocellatus*) was captured in Haw drainage in Chatham County, North Carolina. On May 9, 2011 zebra mussels (*Dreissena polymorpha*) were removed from East Fork Trinity drainage in Rockwell County, Texas. On May 16, 2011 a flathead catfish was captured in Upper Catawba drainage in Gaston County, North Carolina. "Bonus" captures in Florida include a yellow tang (*Zebrasoma flavescens*) on September 7, 2011 and a sailfin tang (*Zebrasoma veliferum*) on June 1, 2011. An Australian spotted jellyfish was captured in 2011 in Galveston Bay, Texas. Asian tiger shrimp numbers have continued to increase. In 2009, less than 31 were captured. As of 2011, 87 have been captured. New to the U.S. is the pacific coast giant musk turtle (*Staurotypus salvinii*). On April 15, 2011 a female turtle was captured in Everglades drainage in Miami-Dade County, Florida. In November, a juvenile female turtle was captured in the same area. Additional information is available on the USGS website at http://nas.er.usgs.gov/. **P. Fuller** mentioned that they are beginning work on the *Peneuas monodon* issue by collecting samples for genetic analysis to determine where the shrimp originated from, if they are established, and how many sources and areas of introductions there may be.

P. Fuller finished presenting the PowerPoint presentation done by **P. Schofield** entitled "Non-native Marine Fishes: Lionfish and more…" There are new reports of lionfish in west Texas. A panther grouper was spotted in West Palm, Florida. **L. Akins** attempted to capture the fish, but was unsuccessful. There were two more sightings of yellow tang in Florida. Again, **Akins** attempted to capture the fish, but was unsuccessful. A spotted scat was captured inside the St. Lucie inlet near Stuart, Florida in July 2011. This fish is sold in the aquarium trade. **Fuller** reminded the panel members to be on the lookout for any of these new marine species and to report them to **Schofield**.

Aquatic Nuisance Species Task Force Update

S. Mangin reported that the ANSTF charter must be renewed every two years. The latest charter was signed in August 2011 and the language has been changed. All panel/committee agendas

must be submitted by the coordinators to **Mangin** for approval. There have been numerous FY2012/2013 budget write-ups, but **Mangin** is not sure what the outcome will be. If ANSTF receives one million dollars from the USFWS 2012 budget, a coordinator would be hired for the Quagga zebra mussel program. Also, they want to use some of the funds for hands-on-training by USFWS personnel to law enforcement personnel on identifying and handling invasive species.

National Invasive Species Awareness Week will be February 26 – March 3, 2012 in Washington, D.C. It will be a week of activities, briefings, workshops and events focused on strategizing solutions to address invasive species prevention, detection, monitoring, control, and management issues at local, state, tribal, regional, national and international scales.

The next ANSTF meeting will be November 2-3, 2011in Washington, D.C. Topics to be discussed include updating the ANSTF Strategic Plan; climate change; the ANSTF/NISC Award Program; a working group to study how to manage invasive species; Lionfish Ad-hoc Committee Update; new state plans.

The USFWS was approached to explore federal support for the development of Asian carp fish processing facilities. Several states are considering some limited funding and facilitating of private processing facilities to meet market demands. This issue will be a topic at the ANSTF meeting in November. The current status of Asian carp in the Mississippi and Ohio River basins and issues related to processing these fish for markets will be discussed.

Invasive Species Advisory Committee Update

E. Chilton gave a PowerPoint presentation entitled "ISAC Report". To enhance the effectiveness of biological control programs, the ISAC Control and Management Subcommittee recommends that NISC agencies working on biological control of invasive organisms plan, conduct, and evaluate their programs at the inception of the program in the context of an Integrated Pest Management (IPM) approach. This requires integrating biological control with other management options (i.e., physical, cultural, and chemical) to achieve maximum effectiveness.

To further enhance the effectiveness of biological control programs, the ISAC Control and Management Subcommittee recommends that NISC departments and agencies that oversee and conduct control operations utilizing biological control agents become more fully engaged in adaptive management by collecting and sharing post-release monitoring data. This IPM approach should emphasize partnerships with local controlling authorities, post-release monitoring and collaborative programs with other stakeholders in other pest management disciplines.

The ISAC Communication, Education and Outreach Subcommittee recommends that NISC support the website, www.invasivespecies.gov, as the primary website coordinating critical and unique information on national invasive species and serving to provide a linkage for accessing all federal invasive species programs.

ISAC Action items:

- ISAC requests a presentation on the Lacey Act revision activities at its 2011 Fall meeting and welcomes as explicit invitation to participate in any associated public review and comment process
- Ask L. Williams to speak with Secretary Salazar regarding his possible assistance with enhancing the visibility of NISC and ISAC
- ISAC requests presentations on the differences on awareness campaigns vs. social marketing at a future meeting
- ISAC requests a presentation from DHS Customs & Border Protection to discuss their authority to conduct inspections for invasive species of privately owned boats and trailers at international borders
- ISAC proposes that they have a full day of the Fall 2011 ISAC meeting focused on ecommerce and invasive species. ISAC recommends that this be an additional day in addition to the normal 2-day meeting

D. Schmitz pointed out that it would be beneficial if NISC could create a comprehensive list of ongoing research projects being conducted around the country. Also, a list of what the USFWS is funding in terms of research.

Discussion of Panel Membership

C. Jacoby discussed the National Estuary Program (NEP) seat. **Jacoby** is the new Project Scientist for the Indian River Lagoon National Estuary Program. **Lukens** asked the panel members if anyone had an objection to **Jacoby** moving from his GSARP at-large seat into the NEP seat. There were no objections.

Lukens stated that there are two University seats open. Harriet Perry is giving up her seat. There is a recommendation for Linda Walters to fill the seat. Her CV was included in each panel member's folder. **Lukens** suggested that her nomination be considered, but asked if any members had anyone else to nominate, or if the matter should be postponed until more research has been done. After much deliberation between the panel, it was decided that **Ballard** will send follow-up emails to the members to request information on potential nominations for the University seats, within a one-month time frame. The information will be posted on the portal, and a deadline will be determined for receiving votes. **P. Fuller** suggested that the panel vote via email before the next meeting. **Ballard** suggested adding bios to the list of panel members on the GSARP website. **Lukens** asked if there were any objections. There were no objections, and it was decided that the panel members would email their bios to **Ballard**.

Lukens reported that there is an open seat on the Environmental User Group. It was decided that this seat nomination will be handled in the same time-frame as the University seat. **Lukens** also stated that this method of obtaining nominations will be used for all new seats, except standing seats which are offered by the agencies themselves.

Work Group Updates

Lukens reported that there were no work group updates to be given and reminded the panel that a lot of work has been done in the past through the work groups, and he would like to see that continue.

State Reports

Alabama

C. Newton reported on Alabama's marine invasive species. The Australian spotted jellyfish (*Phyllorhiza punctata*) continues to occur in the near-shore waters of the coast during early to mid-summer, but swarms are less frequent and overall abundance has decreased since their peak in 2000. An Asian green mussel (*Perna viridis*) was found on a dock in Perdido Bay in August 2011 by a group of Eastern oyster researchers. The specimen was later verified by a malacologist with Auburn University's Fisheries/Aquaculture Department. These invasive species do not appear to pose an imminent threat to resources or ecology.

The giant tiger prawn (*Penaeus monodon*) has been a species of concern since 2006 when it was first observed in Alabama's inshore waters of the Mississippi Sound. Captures of *P. monodon* have incrementally increased. From 2006 to 2009, the distribution of the tiger prawn was primarily restricted to Alabama's southern inshore waters. However, its distribution has shifted towards the northern portion of Mobile Bay and into Perdido and Wolf Bays. Numerous tiger prawns were caught by commercial shrimp trawlers in August and September during a single night of shrimping around Theodore Industrial Canal and north of Middle Bay Light in the Mobile Ship Channel. The increase of confirmed reports is indicative of the tiger prawn's presence in all of Alabama's primary estuary basins.

There are fewer confirmed reports of lionfish (*Pterois volitans* and *P. miles*) compared to reports of the giant tiger prawn, although the presence of lionfish is just as disturbing. The first report (non-validated) was from a 2009 observation made by a recreational SCUBA diver at an area of natural hard-bottom near Orange Beach in Trysler Grounds. The first confirmed report was documented in June 2011 by a spear fisherman who collected a lionfish from an oil/gas platform south of Dauphin Island. Numerous unconfirmed reports have been made to various government agencies that indicate lionfish are rather abundant on the Trysler Grounds. During a single dive in this area, SCUBA divers reported observing up to 30 lionfish. Reports are also being received from SCUBA divers that lionfish are inhabiting oil/gas platforms at low densities. There have also been reports of lionfish in inshore waters and within Alabama's territorial seas. In November 2010, an unconfirmed report was received that a lionfish was observed in Baldwin County.

Educating the public is paramount to obtaining quality information on invasive species reports, and the DCNR/MRD has increased efforts to enhance public awareness. A notification that describes the giant tiger prawn and provides information concerning proper reporting has been distributed to the shrimping community. Also, a page within the 2012 Alabama Marine Information Calendar is dedicated to educating the public about the giant tiger prawn and the lionfish. The calendar is distributed to bait and tackle shops, gas stations, fish houses, etc.

Newton reported that spaghetti bryozoan (*Zoobotryon verticillatum*) has been a problem. The biomass is so high in the Alabama waters of the Mississippi Sound that it is affecting the shrimpers. He was concerned about potential water quality issues that can be expected from this weed - especially when it dies off. Several members stated that it has been a problem in their states as well, but there isn't a lot of literature available on it. **Lukens** suggested following up on the matter.

Florida

D. Schmitz reported that despite aggressive control efforts, *Salvinia molesta* still persists in Florida. Giant salvinia still infests waterways in Pensacola, Collier County, near Tallahassee, and Ocala. Surveillance and aggressive treatment efforts of these infected systems are ongoing.

Crested floating heart (*Nymphoides cristata*) is becoming more widespread in Florida's waterways. This Asian species has increased in frequency in Florida's lakes, ponds, and canals but has still not significantly altered Florida's aquatic plant communities, although in canals it can produce a very dense canopy. It is being controlled when it is found in public waterways.

State funding for controlling invasive plant species in public conservation lands and waterways has decreased by 35% since 2008. These funding cuts have resulted in significant impacts to controlling new and existing invasive plant populations on Florida's conservation lands and in invasive plant management research. Research funding has been reduced from 2.8 million to 1.1 million.

FWC recently established an agency Position Statement and overall guidelines on how the agency will implement management of hydrilla in Florida's waterways. The purpose is to establish an agency position and guidance on how the nonindigenous invasive aquatic plant hydrilla (*Hydrilla verticillata*) should be managed and what process will be employed to determine how hydrilla will be managed in a specific waterbody. Prior to July 2, 2008, the invasive plant management program was under the direction of the Department of Environmental Protection (DEP). In July 2008, the legislature moved the program from DEP to the Fish and Wildlife Conservation Commission (FWC). FWC will determine the level of hydrilla management on each public waterbody using a risk-based analysis that considers human safety issues, economic concerns, budgetary constraints, fish and wildlife values, and recreational use, with input from management partners and local stakeholders. In waterbodies where hydrilla is well established, it will be managed at levels that are commensurate with the primary uses and functions of the waterbody and fish and wildlife. For additional information visit: http://myfwc.com/media/1386747/Hydrilla-Mgmt-Position-Background-Information.pdf.

S. Hardin reported that two *Penaeus monodon* were recently reported; one in Gulf Breeze and the other in St. Andrew Bay in Panama City.

Efforts are continuing in order to prevent zebra and quagga mussels that have infested freshwater bodies primarily in the Midwest in the Great Lakes area from being transported to Florida waters. Some boats are being thoroughly treated, but some are not. One idea **Hardin** would like considered is to supply boat owners with prevention handouts when boat registrations are done.

Schmitz and **Lukens** suggested collaboration between the Task Force, GSARP, etc., and holding a conference on combining efforts to deal with invasive species.

Georgia

K. Weaver was unable to attend, but provided a written report. For the 2011 sampling season (May-September), 3,134 flathead catfish were removed totaling 8,058 pounds. Since the implementation of the full-time flathead management program in 2007, 22,895 flathead catfish have been removed from the Satilla River. Size structure and age structure have both been reduced by removal efforts. Maintenance control of flathead catfish in the river is possible given the reported changes of biomass, size, and age-structure, but higher recruitment and earlier maturation was demonstrated. As a result, this will require intensive harvest to be maintained to prevent the flathead population from rebuilding within 2 to 5 years.

During sampling in 2011, the WRD removal crew documented the non-indigenous range expansion of blue catfish (*Ictalurus furcatus*) occurring in the Satilla River. A total of seven blue catfish were recovered this season. Along with the flathead catfish, this is the second large non-native riverine catfish to be found existing in the Satilla River Basin. Sampling has verified that non-native blue catfish are also present in the lower Altamaha River Basin.

Current funding is earmarked to fill temporary positions to enhance the sampling effort to remove flathead catfish in the Satilla River. Educational materials will be developed and distributed with the remaining funds.

Louisiana

R. Hillebrandt reported that in July and August, giant salvinia weevils were dispersed to Caddo, Saline, and Clear/Smithport Lakes, as well as to many areas of the Terrebonne and Barataria marshes including areas in Lafitte, Des Allemands, and the Barataria Preserve. Flood waters in the Atchafalaya Basin helped to flush large amounts of water hyacinth out, but enabled the Cuban sedge (*Oxycaryum cubense*) to take over in a way that has not been observed before. LDWF spray crews are working to clear some of those areas but the amount of sedge present is overwhelming. Regular use of aerial (helicopter and airplane) vegetation assessments has been employed to locate problem plants and to get accurate estimates of coverage.

The increased number of lionfish reports has created interest in the diving community and Louisiana universities. After contact with the LA Council of Underwater Dive Clubs, a lionfish category was added to their 2011 LCUDC shootout on September 16th and 17th. Samples collected were to be shared between two LA universities for gut content analysis, age and growth, and genetic data. Only two lionfish were brought in; one eaten by a triggerfish and the other cut in half by a cable. No samples were collected. Flyers have been distributed at dive shops across the Louisiana coast asking for reports.

There have been reports of drastic increases in tiger prawns. Within one two-week period, LDWF received reports of 40 specimens, which is twice the number of reports received in 2010. To date, nearly 100 specimens have been reported. Their distribution has also increased from Lake Pontchartrain to Calcasieu Lake. Tiger prawn posters have been distributed at shrimp docks throughout the coast asking for shrimpers and docks to report any catches.

Following the Mississippi River floods, Asian carp populations spread in northern Louisiana. As a result, more recreational boaters and fishermen were coming in contact with them. LDWF developed and distributed warning posters to boat launches throughout the state, alerting the public to the presence of Asian carp.

A report was received of a Rio Grande cichlid being found in a Baton Rouge subdivision pond.

Mississippi
D. Riecke reported that information in the Mississippi State Management Plan for Aquatic Invasive Species has been reviewed and updated.
In May, agency personnel attended the Mississippi River Basin Panel on ANS meeting in Little Rock, AR.

Riecke was appointed to represent MDWFP on the AFWA Invasive Species Committee.
Riecke worked to guide submission and consideration of an SDAFS *Resolution on the Federal Funding for Programs to Prevent, Control, and Manage Aquatic Invasive Species* by the SDAFS membership, of which he is the Southern Division AFS Resolutions Chairman. The resolution was published in the summer 2011 SDAFS newsletter and advertised for comment. No comments were received, and the SDAFS membership will vote on the resolution at their January 2012 annual business meeting.

Riecke coordinated the collection of silver carp from the Mississippi River Oxbow Lake fish kills in September. One carp from Tunica Lake was sent for disease diagnosis. The cause of death was a gram-positive bacterium, *Lactococcus garvieae*.

The *Mississippi State Management Plan for Aquatic Invasive Species* has undergone state review, and public comments were received. It was sent to the National ANS Task Force in January 2010 for their review, and extensive comments were received. The Mississippi Department of Environmental Quality hired a contractor to revise the plan for final submission to the National ANS Task Force in the fall of 2011.
Links to websites for the Mississippi River Basin Panel on Aquatic Nuisance Species and the Gulf and South Atlantic Panel on Aquatic Invasive Species, "Stop Aquatic Hitchhikers", and Habitattitude are on the department's website.

The Mississippi Museum of Natural Science has a permanent exhibit on exotic species.

Yellow plastic "Stop Aquatic Hitchhikers" signs that were obtained from the Atlanta USFWS office are being used by the MDWFP boat ramp construction crew for posting on boat ramp access signs.

Activities specified in the Mississippi State Management Plan for Aquatic Invasive Species will be implemented.

Freshwater fishing bait regulations will be composed to specify what bait can be legally sold, possessed, transported, and used in Mississippi.

A list of approved, restricted, and prohibited species will be adopted under the authority specified in MS Code 49-7-80, and as specified in the *Mississippi State Management Plan for Aquatic Invasive Species*.

The MDMR has secured Mississippi Coastal Impact Assistance Program funding authority to hire a Conservation Resource Biologist under a 4-year contract to form an Aquatic Nuisance Species Advisory Council.

An EDRR monitoring program comprised of state and federal personnel who sample aquatic species in Mississippi public waterways on a routine basis will be established.
All reports of nonnative species collected from field reports over the last several years will be sent to the USGS.

R. Burris reported that 54 field surveys totaling 798 miles were conducted for early detection of AIS. Giant salvinia (*Salvinia molesta*) was discovered north of Farrigut Lake in the Pascagoula River. Cogongrass (*Imperata cylindrical*) was discovered on Deer Island.

To aid in the early detection of AIS, three aerial photo surveys totaling 527 miles were done.

Nine sightings of invasive Asian tiger shrimp (*Panaeus monodon*) were reported to the NAS database from specimens given to DMR by local fishermen. An invasive species/tiger shrimp decal has been designed to distribute to local fishermen at various docks.

So far, there have been no reports of lionfish. An invasive species/lionfish decal will be distributed shortly.

Herbicide applications were performed in various areas to control invasive plants. In the Pascagoula River, 18 applications were applied to control giant salvinia. In Bogue Houma, Pearl River, Robinson Bayou, and the Pascagoula River, 15 applications were applied to control common salvinia (*salvinia minima*). On Deer Island, 13 applications were applied to control cogon grass (*Imperata cylindrical*). At Stennis Space Center and in the Pascagoula River, 8 applications were applied to control water hyacinth (*Eichhornia crassipies*). In a residential runoff collection pond that discharges directly into the Tchoutacabouffa River, 2 applications were applied to control Brazilian waterweed (*Egeria densa*).

Three public outreach tours to Deer Island were conducted. One of the trips was to deliver native plants for transplant to help populate newly constructed portions of the island and prevent the spread of invasive species.

An article was written about Asian tiger shrimp for the MDMR's quarterly newsletter *Coastal Markers*.

South Carolina
P. Kingsley-Smith gave a PowerPoint presentation entitled "Updates on the Status of Invasive and Non-indigenous Species in South Carolina". **Kingsley-Smith** reported on the infection of

the invasive swim bladder parasite *Anguillicoloides crassus* in South Carolina populations of the American eel (*Anguilla rostrata*). American eel populations in South Carolina estuaries have shown a decline since 2001. One potential reason for the decline is the nematode swimbladder parasite. *A. crassus* originated in East Asia where it is widespread in its native host, the Japanese eel (*Anguilla japonica*). The incidence of infections even in juvenile eels was also found to be high and preliminary findings suggest that this parasite may be capable of reducing the health of the eels. Preliminary results from studies done on 66 eels showed a 53% prevalence of infection overall. The percent infection is highest in summer (72%, n = 25), followed by spring (55%, n = 34) and winter (43%, n = 23). Results from studies done during the summer indicate that salinity plays a strong role in determining infection prevalence in the eels. American eels were collected from four South Carolina tributaries covering a wide range of salinities. Infections were most prevalent in eels from high salinity sites and lowest from freshwater sites.

Kingsley-Smith next reported on invasive monogeneans parasites of the American eel. Monogeneans are very small (<2 mm) parasitic flatworms within the Phylum Platyhelminthes that are largely ectoparasitic. They attach to the skin or gills of fish using specialized hooks. Two species of invasive monogeneans (*Pseudodactylogyrus bini* and *P. anguillae*) are under investigation in the American eel. It is assumed that these monogeneans should be present in all South Carolina estuaries due either to their initial invasion or to continual invasion. Differentiating between species of *Pseudodactylogyrus* on morphology alone is difficult, and future studies should incorporate DNA sequencing to confirm species identification.

The impacts of the Asian seaweed, *Gracilaria vermiculopylla* on estuarine community dynamics was discussed next. During the last decade, the Asian seaweed has rapidly proliferated along high-salinity mudflats in several South Carolina and Georgia estuaries. This seaweed invasion is particularly noteworthy because the mudflats in these estuaries were historically devoid of macrophyte-based primary production and structure. *Gracilaria vermiculopylla* therefore has few native analogues in these mudflat environments, and thus represents an important opportunity to examine the ecosystem consequences of an invasion within a historically-unexploited niche. Experiments done on interactions between the polychaete *Diopatra cuprea* and the two algal species *G. vermiculophylla* (invasive) and *Ulva lactuca* (native) within the intertidal zone revealed that tidal elevation did not significantly affect relative growth rate (RGR) of *G. vermiculophylla*; however, depth within the subtidal zone did significantly affect RGR, and RGR was significantly higher at subtidal compared to intertidal elevations. Laboratory experiments were also conducted to determine algal species preferences of *D. cuprea* both for decorating its tube and for direct consumption in both choice and no-choice experiments. In choice experiments, *D. cuprea* attached significantly more *Ulva lactuca* than *G. vermiculophylla* to its tubes. In no-choice experiments, there was no significant difference in the amount of each algal species attached to *D. cuprea*. In choice experiments, *D. cuprea* consumed significantly more *U. lactuca* than *G. vermiculophylla*, but in no-choice experiments, consumption rates did not differentiate between algal species.

Kingsley-Smith reported on the collection of live adult specimens of island apple snails (*Pomacea insularum*), and hatching of juveniles under laboratory conditions. A live apple snail and several egg masses were previously collected from a location in Mt. Pleasant, near Charleston, SC. A return visit in August yielded no evidence of fresh egg masses, although there

were scarce remnants of egg masses on the inside of two culverts. It cannot be determined definitely whether these egg masses were laid earlier in 2011 or in the 2010 breeding season. In recent visits no live snails were reported, however 17 empty shells were observed in shallow water.

The next topic discussed was the presence of Asian tiger shrimp (*Penaeus monodon*) in the southeast region. Ongoing annual monitoring of the tiger shrimp has revealed that a remarkable number of the species have been collected along the east coast from NC to LA this year. Several *P. monodon* have been collected from estuarine habitats this year. In previous years, reports from these habitats were rare. There is a concern that there may be a reproductive population in the southeast U.S. It is hoped that coordinated regional collecting and reporting efforts will help to address this. In South Carolina, efforts have recently been instigated that incorporate the use of standardized data collection cards that should facilitate the efficient collection of information from commercial fishermen and aid in the incorporation of this data in the USGS database. Tissue samples are being collected which will be used, along with archived samples from previous years, for genetic analyses to better understand the possible sources of these introductions and to determine whether or not this invasive species has become established along the U.S. coastline.

D. Knott reported further on Asian tiger shrimp. The average size of an adult male collected to date is 8" and adult females is 9". There seem to be more occurrences of reports after heavy weather, such as hurricanes. A major concern is that *P. monodon* is known to carry diseases such as white spot syndrome virus, which is a viral infection of penaeid shrimp. The disease is highly lethal and contagious, killing shrimps quickly. Outbreaks of this disease have wiped out within a few days the entire populations of many shrimp farms throughout the world. There is a fear that it might spread to native penaeid shrimp species.

C. Page reported that the ANSTF met in Charleston at the Marine Resources offices. Staff chaired the meeting and presented information concerning the revision and update of the SC Aquatic Invasive Species Plan.

A public service announcement campaign with the Freshwater Fisheries Section provided public service announcements, billboards, and literature for an ad campaign highlighting aquatic invasive species prevention in SC. The Aquatic Nuisance Species Program implemented several strategies both in-kind through staff time, and through the completion of several outreach materials. Campaign details include the following:

Awareness:

1. Ad campaign utilizing billboards and public service announcements
2. Website Update
    - Update the existing Aquatic Nuisance Species Program homepage to reflect messaging and overall look and feel of the materials produced during the campaign
3. E-blast
    - Distribute a minimum of two E-blast to be provided to all persons in the SCDNR email database

4. Earned Media
    - Work with media partners to get the word out through interviews and written articles
    - Complete taping of a one-minute interview for television
5. Press Releases
    - Include the information press release in the SCDNR news packet

ANS staff participated with the University of Georgia researchers in an island apple snail survey of the Savannah River as part of a research project concerning the transmission of AVM, using the apple snail as the medium for transport of the disease.
A cooperative effort with NRCS has been initiated to provide technical information and funding support to private landowners concerning the invasive species Chinese tallow. A workshop was initiated by SC Exotic Plant Pest Council to provide the public with a starting point for control efforts.

Oversight and supervision was given to the USFWS for invasive species helicopter control projects on the Savannah Wildlife Refuge and the ACE Basin.

In a pond in Trenton, SC, a joint research project with Clemson University, SePRO Corp., and Laymans Nursery was initiated to study pithophora algae and the associated diseases that are causing problems nationally.

Staff met with the US Army Corps of Engineers staff to discuss native plant habitat restoration projects on the Savannah River Lake system.

Staff met with Fisheries staff to discuss the viability of utilizing the Barnwell Fish Hatchery as a nursery for native submersed plants to be used in habitat restoration projects.

Field truthing and survey was accomplished with Santee Cooper staff on a habitat enhancement project in which native plants were transplanted around the Santee Cooper Lakes. This project will give valuable insight into certain planting techniques which, when utilized could provide a better chance for survival of the transplanted natives in water bodies around the state.

To help reduce alligatorweed in Georgetown, Charleston, Berkeley, Clarendon, and York Counties, 6,000 alligatorweed flea beetles were released.

Staff participated in and gave presentations at the South Carolina Aquatic Plant Management Society Annual Meeting in Clemson, SC and the South Carolina Exotic Plant Pest Council Board Meeting.

It appears as if the efficacy of the newer aquatic herbicides is having an impact, as the total acreage of control work is reduced over previous years.

Island apple snails seem to still be on the decline as acreage and total number of ponds has decreased so far this year. Massive egg production has not been seen in most areas, and in intense surveys live specimens have not been seen in a lot of areas.

Texas

E. Chilton reported that their Comprehensive Management Plan has been submitted to the Governor's office for review.

Bighead carp were discovered in the spillway below Lake O' the Pines.

Several habitat restoration projects have been initiated. A program is underway to eradicate giant river cane (*Arundo donax*) in the Nueces Basin and return it to a more historically natural state. This work is a huge collaboration of many private landowners and conservation partners led by the Nueces River Authority. The plants have been sprayed with herbicides, and landowners and volunteers assisted with pulling up plants by hand. Hand-pulling new arundo sprouts was an effective, if labor intensive, strategy on more than 30 miles of the Nueces River. Follow-up will be done in the spring. Other projects include work to maintain and protect the integrity of the headwaters of the Llano River through prescribed burns, construction of structures that slow overland flow, and a project to help maintain a native grassland prairie and remove exotic chinaberry and other invasive plants from a stretch of the Llano River.

A red-breasted piranha was caught in August in a community lake near Houston.

Funding has been cut from $1.6 million to $500,000.

L. Hartman reported that retired Navy vessels are being used for artificial reefs.

Lionfish were spotted at the Flower Garden Banks National Marine Sanctuary east of Galveston.

Lionfish posters are being distributed to commercial fishermen.

Members Forum

P. Carangelo requested that **Ballard** provide a link for the international ballast water standards from the regulatory congressional testimony.

D. Britton reported that a brown tree snake was reported near San Antonio, but efforts to capture it were unsuccessful. He will keep the panel posted on this. He also suggested holding a "Train the Trainer" course and to let him know if anyone was interested. A giant salvinia control team meeting was recently held. Their next meeting will be in January 2012.

Update on GSARP Funded Projects

The AIS "Traveling Trunk"

H. Kumpf was unable to attend the meeting, but provided a written update. The three sections of the "Trunk" are progressing as planned.

1. Talking Points Manual: Comments from most of the reviewers have been received and are being incorporated into the revised talking points. The draft manual has been submitted to the GSARP office. The rock python will be an additional species noted on the python fact sheet. Use clearance for illustrations is nearly complete.

2. Hands-on specimens are still being obtained. Three of the five plant species are either on hand or sources have been identified. There has been difficulty obtaining salvinia samples for pressing/laminating and Burmese python skins.
3. Graphics for both the manual and CD are being updated and revised.

Trojan Y-Chromosome Eradication of Invasive Fish

J. Teem was unable to attend the meeting, but provided a written Progress Report. Two tasks were accomplished during the first six months of the project. Two fish lines were identified for DNA work: Nile tilapia (*Oreochromis niloticus*), and African jewelfish (*Hemichromis bimaculatus*). Nile tilapia have an XY sex determination system that is suitable as a target species for the Trojan Y Chromosome eradication method. In aquaculture, YY Nile tilapia are used to produce all male populations of tilapia fingerlings for sale to commercial fish farms for grow out. Both male and female YY fish are viable and mate normally. It is thus an ideal fish to test the Trojan Y Chromosome eradication strategy. Since YY fish are not available for purchase from aquaculture suppliers, it is necessary to breed YY Nile tilapia anew for the purpose of testing the Trojan Y Chromosome eradication strategy. Sex-specific DNA makers will allow new YY Nile tilapia to be generated through the use of hormone-induced sex reversal and selective breeding techniques. In order to find sex-specific markers, however, it is first necessary to produce Nile tilapia DNA from pure lines of fish that have not undergone hybridization with other tilapia species.

The African jewelfish is an invasive fish in Everglades National Park in Florida. The sex-determination system of this fish is not yet known. African jewelfish are in the Cichlidae family and may therefore have either an XY or a ZW system of sex-determination. The Trojan Y Chromosome approach can be applied to a fish species with either an XY or ZW sex-determination system. In the case of an XY system, a YY female fish is developed as the Trojan fish. In the case of a ZW system, a WW male fish is used as the Trojan fish. Sex-specific markers will aid in the creation of either type of Trojan fish, so the identification of sex-specific markers will be a useful tool in the development of a Trojan African jewelfish regardless of the sex-determination system. Because the interest level for a Trojan Y Chromosome eradication of this invasive fish is high and already in motion, the African jewelfish was deemed an appropriate subject fish for the present study. The project is generating results as anticipated, and future efforts will be directed towards increasing the number of primers screened.

Reproductive Sterility as a tool for the Prevention/Control of AIS

J. Teem was unable to attend the meeting, but provided a written Progress Report. The project consists of three main goals. Goal 1 is to determine the dose of radiation required to produce a sterile adult apple snail for the aquarium trade. Studies to define sterility and viability of apple snails after irradiation at different doses are currently being conducted with *P. bridgesii*. Approximately 300 adult snails were obtained from Rawlins Tropical Fish Farm. Snails irradiated at each dose were placed in aquariums and are now being monitored for mortalities over time. Additional snails irradiated at these same doses were also used in pair-wise matings to assess fertility. If eggs are produced as a result of mating, the eggs are collected and hatched to determine whether viable progeny are produced. If no viable progeny are produced, the irradiated snail is deemed reproductively sterile. At this time, egg masses are being produced

only from the untreated controls, so there are no results to report as yet regarding fertility as a function of radiation.

Goal 2 is to define a method for producing sterility in snails that has practical utility for the sterilization of large numbers of snails. Research grade irradiators are generally limited in their capacity to hold samples. The research grade irradiator at the FAST facility at FDACS in Gainesville is limited to a sample container the size of a Pringle potato chip can. This capacity allows about 15020 adult snails to be irradiated in a single run. Irradiation of large numbers of snails is thus impractical in this type of machine. However, this size sample canister can accommodate about 30 apple snail egg masses (representing about 10,000 juvenile snails upon hatching). A research grade irradiator can thus be used to produce a large number of sterile snails if they can be irradiated as eggs rather than adults. Commercial grade irradiators at the FDACS FAST facility are designed to handle very large volumes of egg masses and can be used for apple snail irradiation. Adult snails pose a greater problem because they have a dense shell which limits the penetration of the electron beam into the gonads. They may require a greater radiation dose in order to penetrate the shell. Snails were irradiated using both the research grade and the commercial grade irradiators at the FAST facility. Snails at the same stage of development were irradiated at the same dose on each device and then assayed for fertility in pair-wise matings. These mating tests are currently in progress and have not yielded fertility results yet. Genetic approaches to produce sterile snails are to treat the snails with drugs that affect ploidy, and subsequent assays of progeny by flow cytometry for triploids or tetraploids. The gonads of snails were treated with colchicines, a drug known to induce polyploidy in plants. Colchicine-treated snails were mated and the egg masses produced were assayed by flow cytometry for tetraploid or triploid nuclei. Analysis of whole egg masses from the treated snails indicates that a small number of nuclei are present that fall into the range of triploids or tetraploids, but no individual triploid or tetraploid snails have been detected as yet. This drug treatment has therefore not been successful thus far for generating polyploidy snails. Treatments of the gonad with other drugs (such as cytochalsin B) will be tested in the future. Another approach is to identify putative chromosomal translocation resulting from irradiation. In some organisms, they can be detected microscopically by histological staining of cells that are blocked in metaphase. Giemsa staining is often used for this purpose and can allow translocations to be detected if the chromosomes are large enough to be distinguished using the microscope. Blood cells from snails were stained and examined in the microscope. Although chromosomes could be visualized by microscopy, they were too small to allow the detection of banding patterns on individual chromosome arms. It was therefore not possible to use this method to identify chromosomal translocations in irradiated snail cells. As an alternative to microscopy for identifying translocations, a genetic approach was also taken. Currently, one putative translocation heterozygote has been produced by snail irradiations. This snail was crossed to determine whether fertility was reduced as predicted. No egg masses have yet been produced from this cross, so the fertility associated with this translocation candidate is still pending.

Goal 3 is to perform mating tests on irradiated snails and determine whether they have been rendered sterile. To provide a means to conduct numerous mating assays, a multi-chamber flow-through apparatus was constructed to allow 18 mating tests to be conducted simultaneously. Eggs produced as a result of mating within the apparatus are deposited on the sides of the apparatus at the top.

Additional fertility studies are to be performed with *A. spixi* when a sufficient number of snails become available. Progress has been made toward the goals involving the production of sterile snails by radiation and the analysis of putative snail polyploids by flow cytometry. Alternative means of detecting chromosomal translocations will be further explored.

Election of Officers

Chairman
L. Hartman was nominated for Chairman. D. Knott seconded the motion. With no other nominations, Hartman was elected as Chairman.

Vice Chairman
Hartman nominated P. Fuller as Vice Chairman. D. Riecke seconded the motion. With no other nominations, Fuller was elected as Vice Chairman.

Next Meeting Time and Place

It was decided that Alabama would be the location of the next meeting.
The next meeting will take place the first week of April 2012.

Public Comment

Hartman provided the opportunity for public comment. There was none.

A motion was made to adjourn the meeting, and the motion was approved. There being no further business, the meeting adjourned at 4:00 p.m.