



GEORGIA AQUARIUM

## RESEARCH AND CONSERVATION AT GEORGIA AQUARIUM

Georgia Aquarium's deep commitment to marine life is manifested in its impactful research and conservation program. As a leading facility for aquatic animal conservation and research, Georgia Aquarium is uniquely positioned to be a global resource for scientific research and education that explores the vital connection between ocean and human health.

### A Growing Leader in Aquatic Conservation and Research

Georgia Aquarium contributes to the advancement of scientific knowledge of aquatic species and habitats by combining the study of animals in the Aquarium collection with field research.

Approximately 90% of current research and conservation funding is directed toward research projects for which an Aquarium staff member is the principal investigator. Since opening, members of the Aquarium's research team have served as authors on more than 100 peer-reviewed publications, an impressive amount for a research department of this size.



Georgia Aquarium strategically focuses on research activities, ensuring synergy between various projects. Research and conservation activities are built around the galleries: Georgia-Pacific Cold Water Quest, SunTrust Georgia Explorer, Ocean Voyager Built by Home Depot, Southern Company River Scout and Tropical Diver Presented by Southwest Airlines. This arrangement provides a natural way to organize and prioritize the scope of research and conservation activities so they remain relevant to Georgia Aquarium's collection.

Highlights of Georgia Aquarium's existing research and conservation activities include:

- **Georgia Aquarium Research Projects** Since 2004, the Aquarium has



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led 65 funded research projects, including a flagship research or conservation project for each gallery. Ongoing research projects involve collaboration with colleges throughout the United States and Latin America. Georgia Aquarium conducts research to improve husbandry methods, develop innovative new exhibits, contribute to the understanding of the underwater world and apply new discoveries to the conservation of aquatic life. Every day, researchers in the Aquarium's exhibits and labs learn more about marine life in order to develop new methods of animal care and veterinary medicine.

- **The Correll Center for Aquatic Health** The Correll Center for Aquatic Health is a state-of-the-art animal health facility designed by world-class veterinary professionals. Georgia Aquarium is the only



aquarium facility that has opened with an integrated veterinarian teaching hospital that specializes in wildlife medicine and veterinary pathology. The Center is a partnership with the University of Georgia Veterinary Teaching Hospital that allows the Aquarium to operate a unique

aquatic animal pathology and clinical medicine residency program while also training veterinary interns and students.

- **Georgia Aquarium Conservation Field Station** Located in Marineland, Florida, Georgia Aquarium Conservation Field Station (GACFS) was established as part of our 4R program: Rescue, Research, Rehabilitation and Responsibility. GACFS is dedicated to the research and rescue of dolphins and small whales in Northeast Florida. Research programs led at GACFS





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document the cause of marine mammal stranding and the identification of emerging diseases in these species. This research provides critical information not only about the health of marine mammals but the ecosystems they inhabit and, in many instances, human health. The GACFS is also active in stranding awareness programs which educate the public on what to do in the event of a marine mammal stranding.

## **CURRENT RESEARCH AND CONSERVATION EFFORTS:**

### **Whale Shark**

The management of a collection of whale sharks in an Aquarium setting has presented truly unique and exciting in-house research opportunities that



are quite different than those underway in field populations. To date, studies of these animals in human care have focused on basic biology – including one of the first whale shark blood draws – behavior, functional anatomy, internal physiology and homeostasis.

Georgia Aquarium scientists have an established whale shark field program at the northeastern tip of Mexico's Yucatan Peninsula, near Cancun. Scientists have been actively involved at this site since 2003, with research focused on nutritional studies, photographic identification and a satellite telemetry program. Georgia Aquarium Research and Conservation staff is partnering with a non-governmental organization called Blue Realm, with an ultimate goal to have this area declared a UNESCO World Heritage Site. To do so the research will expand to cover manta rays, dolphins, small whales, sea turtles, coral reefs and fishes.

### **Dolphin**

The Bottlenose Dolphin Health and Environmental Risk Assessment (HERA) project was initiated as a multidisciplinary, integrated, collaborative effort in 2003 to assess individual and population health in two southeast coastal



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regions of the USA: Charleston, S.C. and the Indian River Lagoon, FL. In part, the goals of the project are to develop standardized tools for health and risk assessment and to explore associations between health status and environmental stressors.

As an apex predator, bottlenose dolphins serve as a sentinel species for monitoring the health of the environment and may provide valuable information for evaluating the relationship between exposure to biological and chemical agents and adverse health effects. Since dolphins live in a coastal environment with humans and consume the same food, they also serve as effective sentinels for public health problems. HERA has documented zoonotic diseases, contaminant issues and other factors such as antibiotic resistant bacteria that have important human health implications.



Research is conducted at Georgia Aquarium as part of a health maintenance program for the dolphins in its care. Daily research includes studies regarding growth, behavior, health and genetics. Additionally, blood samples collected from field research programs on dolphins are brought to Georgia Aquarium and its partner facilities for extensive analysis and study. Studies with dolphins are underway in conjunction with research partners Georgia Institute of Technology, University of Georgia, University of Miami, Cornell and University of California, Davis, to learn about their biochemistry and physiology by studying their blood profiles.

### **Beluga Whale**

Ongoing studies at Georgia Aquarium regarding beluga whales' biology, physiology and diseases ultimately benefit the species in its natural environment. Using safe handling techniques developed during health assessments in an aquarium setting, researchers are now better equipped to assess the health of belugas in their natural habitats. At the request of a





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NOAA/NMFS principal investigator, Georgia Aquarium is an active participant in beluga whale health assessments in Alaska. In 2008, 2011 and 2013, field work in Alaska was focused on understanding nutrition of belugas in Bristol Bay relative to the population in Cook Inlet, which was recently listed as endangered.



Research staffed and sponsored by Georgia Aquarium focused on what belugas eat based on blood samples, in addition testing for exposure to pollutants which could have long term effects on the beluga population. There were also studies on hearing and spatial usage via satellite telemetry.

### **Loggerhead Sea Turtle**

Georgia Aquarium is committed to the rescue and rehabilitation of stranded loggerhead sea turtles off the coast of Georgia. By working with groups like the Georgia Department of Fish and Wildlife and the Jekyll Island Sea Turtle Center, Georgia Aquarium has been able to aid in the rescue of loggerhead sea turtles, rehabilitating them in the SunTrust Georgia Explorer gallery and releasing them to their natural habitat.



### **Antillean Manatee**

The Antillean manatee disease studies with Puerto Rico Manatee Conservation Center staff at the Inter American University of Puerto Rico uses the sentinel concept for environmental and human health. The project identifies the pathologic findings in stranded endangered Antillean manatees from Puerto Rico. Understanding the pathologic features associated with mortality of manatees identifies a disease trend in this unique environment that has environmental and human health implications.



### **Coastal Georgia Manatee**

Florida manatees (*Trichechus manatus latirostris*) have been documented in Cumberland Sound, GA for decades and now Georgia Aquarium is teaming up with Sea to Shore Alliance and Georgia Department of Natural Resources (GDNR) to conduct the first ever health and population assessment of Georgia's manatees. Listed as "Endangered" (IUCN) since 1967, recent estimates suggest less than 5,000 individuals remain in North America. In recent years, record levels of mortalities have been reported due to cold weather, red tide and other factors such as human activities. Georgia Aquarium and its partners are collaborating to conduct aerial surveys that document location and numbers of manatees, to place satellite telemetry tags on animals that record movement and to perform health assessments on a small subset of individuals collected for satellite tagging.

### **Sea Turtle Conservation in Dominica**

Along the sandy beaches of Dominica's northeast coast, the "Critically Endangered" (IUCN) female leatherback sea turtle comes ashore every summer to lay eggs in massive nests. The leatherback is the largest of the seven species of sea turtles and can grow to almost 6 feet in length and weigh as much as 2,000 pounds. The numbers of all sea turtle species have drastically dropped over that last century and it's more important than ever to learn about their natural lives in order to save them.

Georgia Aquarium has become involved in a conservation program in Dominica through former Conservation Biologist Jake Levenson. Since 2011, Levenson and a group of dedicated volunteers (both local and from the United States) have studied leatherbacks as well as hawksbill sea turtles. Along with educating the people of Dominica about the plight of sea turtles, Jake and his partners have used tracking tags to learn about the pelagic movements of these animals.

During this year's field season, two separate trips occurred; one at the beginning of the season (early June) and one at the end of the season (late June). Altogether, nine volunteers worked on setting two satellite tags on leatherback turtles as well as 2 kinematic (motion) tags on hawksbill turtles.



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Satellite tags will track the distance and depth travelled while kinematic tags will record *how* the turtles travel by reading their movement through the water.

### **African Penguin**

Georgia Aquarium is a participating member of the African penguin Species Survival Plan (SSP), which provides breeding pair recommendations for participating institutions affiliated by the Association of Zoos and Aquariums (AZA). Many of Georgia Aquarium's penguins are genetically valuable to the collection of African penguins in AZA institutions because they are not offspring of birds in the current population, and have yet to produce offspring of their own. Due to Georgia Aquarium's dedication to maintaining a sustainable population in human care, the African penguin habitat was redesigned to create an environment that closely mimics their



natural environment, including seasonal variations in light duration and intensity, which helps to promote natural breeding cycles within the colony. A new penguin nursery allows animal care and training team members to tend to and incubate the penguin eggs in a climate-controlled and protected

environment. As a result, Georgia Aquarium is now seeing repeated successful breeding with increased numbers of African penguin chicks. In addition, Georgia Aquarium is a proud supporter of SANCCOB and the work they do with African penguins in South Africa.

### **Flukebook**

The flukebook project is an extension of our marine mammal exhibits in that they aim to conserve dolphins and whales in the ocean by enabling international collaborations on whale photo-identification. Through photo ID we can learn about individual animal health by analyzing how features such as scars from entanglements appear over the course of an animal's life. This catalog of information will be created for animals along the East Coast and will be compared with other known animals from other



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areas. Information such as habitat usage, home ranges and estimated population size can all be gained through photo ID while expanding GAI's reach and potential visitors as citizen scientists.

### **Sting Ray**

Stingray City is a series of shallow sandbars founding in the North Sound of Grand Cayman, Cayman Islands and is a well-known tourist attraction where southern stingrays are known to congregate and visitors can feed and interact with the animals. There is concern that the human interaction activity may be directly and indirectly facilitating the decline in the population of rays. The goal of this project is to measure indices of health, stress, and nutritional status from southern stingrays at Stingray City with a focus in 2014 on monitoring the reproductive capacity of the female rays. This goal will be accomplished by performing ultrasounds on all females to detect pregnancy or ovarian activity, which will in turn be correlated with blood hormone levels.

### **PAST RESEARCH AND CONSERVATION EFFORTS:**

#### **Coral**

Since 2010, members of Georgia Aquarium's scientific dive team have re-planted critically endangered staghorn and elkhorn corals on Molasses Reef in the Florida Keys National Marine Sanctuary. This work helps to re-populate a degraded reef with genetically diverse coral fragments that will enhance the resilience of the animals and ensure they are less susceptible to disturbances within their environment.

**African Penguin** Georgia Aquarium has partnered with non-profit wildlife rehabilitation group SANCCOB to study, for the first time anywhere, the health of free-ranging African penguins, like those in the Georgia-Pacific Cold Water Quest gallery. Georgia Aquarium veterinary and zoological staff have travelled to South Africa for animal care and sampling research. Sampling has taken place off the coast of Namibia on the







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western side of South Africa. SANCCOB is a leading seabird rehabilitation non-profit situated in Cape Town (South Africa) and has treated over 90,000 injured, oiled, ill and abandoned seabirds since its establishment in 1968. Currently there is very little knowledge of the diseases that affect African penguins. For the first time anywhere, the health of free-ranging African penguins, like those in our Cold Water Quest gallery, is being closely examined.

### **Coral**

Georgia Aquarium has partnered with SECORE, one of the leading coral conservation initiatives of scientists and aquarium professionals from around the world, to restore reefs off the coast of Curaçao and educate biologists. The restoration project and the workshop both aim to better understand sexual reproduction of corals and develop new restoration strategies to help save endangered corals, such as the elkhorn coral.

### **Tiger Sharks**

Sand tiger shark populations along the Atlantic Coast of the United States have declined significantly in the past few decades. The goal of this project is to measure indices of health, stress, and nutritional status from free-ranging juvenile and adult sand tiger sharks in Delaware Bay. This information is valuable not only for federal and state management authorities in developing a conservation plan for this species but also to aquarium husbandry staff caring for sand tiger sharks within their collection.

### **Sea Otter**

Georgia Aquarium is committed to the rescue and rehabilitation of stranded southern sea otter pups off the coast of California and Alaska. Only 25% of pups survive the first year, and when pups are separated from their mothers, the odds of survival drastically change. By working with groups like The Alaska





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SeaLife Center and Monterey Bay Aquarium's Sea Otter and Research and Conservation programs, Georgia Aquarium has been able to aid in the rescue of sea otter pups and rehabilitate them in the southern sea otter exhibit in Georgia-Pacific Cold Water Quest.

## **Manta Ray**



The manta ray is an iconic species that is listed as “Vulnerable” by the IUCN. The animals that annually migrate through Florida’s Atlantic waters are two species; the true giant manta ray and an undescribed species conventionally referred to as the Caribbean or Atlantic manta. Georgia Aquarium has conducted field research on these specific populations and has developed successful strategies for locating the mantas, attaching satellite tags and tracking their migratory routes. The Aquarium would like to expand this project by tagging additional animals, retrieving sloughed skin samples and conducting nutritional analyses of their diet.

The data obtained will determine if the two manta species have distinct biology or migratory routes throughout the region and can be used to inform management and conservation decisions in the relevant areas.

## **Green Sea Turtles**

The goal of this project is to monitor the nutritional status of stranded green sea turtles throughout the rehabilitation process and develop a nutritionally complete diet that can be used for the long-term care of green turtles in a human care environment. The researchers compare plasma biomarkers in rehabilitated animals to those in healthy free-ranging green turtles in order to make dietary modifications and develop new gel-based diets that will enhance the recovery process of green turtles managed under human care.

## **Loggerhead Sea Turtle**



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Many people are unaware that the “Endangered” (IUCN) loggerhead turtle nests in several wildlife refuges right on the Georgia Coast. Georgia Aquarium has partnered with the Fish and Wildlife Service and the Caretta Research Project to survey these turtle nesting areas in Georgia to better understand the needs of both adults and offspring, and how to protect them.

### **Spotted Eagle Ray**

Spotted eagle rays are a popular exhibit species in zoo and aquaria and are typically managed with a diet largely consisting of bivalves. In the ocean however, spotted eagle rays may consume a diverse diet that in addition to bivalves can include shrimp, crabs, whelks, hermit crabs, octopus and small fish. Proper nutrition is the cornerstone of health and the nutritional requirements of spotted eagle rays and other elasmobranch species are largely unknown. The goal of this project is to serially blood sample wild-caught spotted eagle rays and monitor changes in plasma vitamin, trace mineral, and fatty acid levels as they transition from an oceanic diet to the typical bivalve. This information will be used as a benchmark for adjusting the vitamin and mineral composition of the human care diet in order to better reflect plasma values in spotted eagle rays foraging on an oceanic diet.

### **Right Whale**

Did you know that the right whale is Georgia’s state mammal? These large baleen whales breed every year in the warm waters of the South Atlantic Bight, which includes the Georgia coast. Georgia Aquarium has partnered with scientists from Woods Hole to monitor right whale populations in local Georgia waters. The Aquarium has also participated in right whale studies off the coast of Marineland, Florida in conjunction with the National Oceanic and Atmospheric Administration (NOAA).

### **WATER CONSERVATION**

Water conservation is a concern of Georgia Aquarium, and necessary measures are taken to ensure water supply is plentiful. All Georgia Aquarium exhibits are closed systems in which the water is filtered, treated



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as required and returned to the exhibit. The Aquarium recycles and reuses as much water as possible within the limits of providing animals living at the Aquarium with the most exceptional care. A few of the many water conservation measures include:

- Adding waterless urinals that save approximately one million gallons of water per year.
- Recapturing condensation from our cooling units, saving 1.5 million gallons of water per year.
- Life Support operational changes that save approximately 4.5 million gallons of water per year.
- Observing the outdoor watering ban on all our landscaping.
- Shutting off all non-essential water features, such as the waterfall, atrium lake and shrimp boat moat.
- Educating the public at the Aquarium through our staff and Volunteers on the floor, signage/displays and website about ways individuals can conserve water.

## **EDUCATION RESEARCH**

Georgia Aquarium provides a remarkable platform for educating people of all ages about the ocean and the ways it is impacted by human activities.

Since opening, the Aquarium has attracted more than 20 million visitors from around the world. Nearly 130,000 students participate in educational programs at the Aquarium each year, as well as hundreds of teachers who receive training on how to incorporate science into daily classroom lessons.

