WRITTEN TESTIMONY OF
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HEARING ON
REAUTHORIZATION OF THE CORAL REEF CONSERVATION ACT OF 2000

BEFORE THE
COMMITTEE ON NATURAL RESOURCES
SUBCOMMITTEE ON INSULAR AFFAIRS, OCEANS, AND WILDLIFE
U.S. HOUSE OF REPRESENTATIVES

February 25, 2009

Madam Chairwoman and Members of the Committee, thank you for inviting me to appear before you today. I am Kacky Andrews, Manager of the Coral Reef Conservation Program (CRCP) at the National Oceanic and Atmospheric Administration (NOAA) in the Department of Commerce.

We are pleased to see many Committee members are committed to reauthorizing the Coral Reef Conservation Act (CRCA), as evidenced by the recent introduction of H.R. 860, the *Coral Reef Conservation Act Reauthorization and Enhancement Amendments of 2009*, through the support of the Chairwoman and the bill's numerous cosponsors. Today, I am not going to discuss H.R. 860, which is being reviewed by the Department and other interested Departments and agencies. We look forward to the opportunity to submit written comments at a later date.

NOAA's mission is to understand and predict changes in the Earth's environment and to conserve and manage coastal, marine, and Great Lakes' resources to meet our nation's economic, social, and environmental needs. Today, I will discuss the importance of protecting coral reefs and the goals of NOAA's Coral Reef Conservation Program, which was authorized by the *Coral Reef Conservation Act of 2000.*

Why Coral Reefs Are Important

Coral reefs, often called the "rainforests of the sea," are among the oldest and most diverse ecosystems on the planet and have become an integral part of the culture, heritage, and economies of societies around the world. These ecosystems provide important economic and environmental benefits in the form of food, jobs, natural products, pharmaceuticals, and shoreline protection.

Coral reef ecosystems provide resources and services worth billions of dollars each year to the United States economy and economies worldwide. Coral reefs have been estimated to support several million different species. They house more than one third of all described marine species — more species per unit area than any other marine

environment — including about 4,000 known species of fish and 800 species of hard coral. Approximately half of all federally managed fish species depend on coral reefs and related habitats for a portion of their life cycles. NOAA's National Marine Fisheries Service estimates the annual dockside commercial value to U.S. fisheries from coral reefs is over $100 million per year, while the annual value of reef-dependent recreational fisheries probably exceeds $100 million per year. Local economies also receive billions of dollars from visitors to reefs through diving tours, recreational fishing trips, hotels, restaurants, and other businesses based near reef ecosystems. In the Florida Keys, for example, coral reefs attract more than $1.2 billion annually from tourism. In addition, coral reef structures buffer shorelines against waves, storms, and floods, helping to prevent loss of life, property damage, and erosion. Numerical modeling performed by NOAA's Geophysical Fluid Dynamics Laboratory and Princeton University suggests healthy reefs can also provide protection and reduce damage from tsunamis.

Increasing Threats to Coral Reefs

A combination of stressors has caused a rapid decline in the health of many coral reef ecosystems globally, and if left unchecked this decline will lead to significant social, economic, and environmental consequences. For example, staghorn and elkhorn corals, once the dominant shallow-water corals in Florida and the Caribbean, declined an estimated 97 percent during the 1980s and 1990s. This observed decline led NOAA to list these species as threatened in May 2006. They were the first coral species to be listed under the *Endangered Species Act*. The Global Coral Reef Monitoring Network estimated in the 2008 edition of its *Status of Coral Reefs of the Worlds Report* that 19 percent of the world's coral reefs have been destroyed. The Network predicts an additional 15 percent of the world's coral reefs face impending destruction from adverse human activities in the next 10 to 20 years, and 20 percent are under threat of loss in the next 20 to 40 years.

Globally, coral reefs are under stress from many different sources, including increased sea-surface temperatures, pollution, increased fishing pressure, harmful fishing practices, incompatible coastal uses, invasive species, extreme events like hurricanes and coastal flooding, and physical damage such as ship groundings. Increased human population in coastal areas exacerbates many of these factors. Climate change (in particular, increases in global air and ocean temperatures) threatens coral reef ecosystems through increased occurrence and severity of coral bleaching and disease events, sea level rise, and storm activity. Increased absorption of atmospheric carbon dioxide into the oceans also leads to "ocean acidification" and reduces calcification rates (and thus growth rates) in reef-building organisms, which affects the reef's ability to maintain itself against forces that cause reef erosion.

Impacts from Global Fishing Pressures

Rapid human population growth, the use of more efficient fishery gear, destructive fishing techniques, and inadequate management and enforcement have led to the depletion of key functional groups of reef species in many locations, with cascading impacts on coral reef habitats and associated species and ecosystems. While some successes have been achieved in the United States by banning certain gear types and

protecting vulnerable fish habitat, the CRCP considers global fishing pressures to be one of the most significant threats to coral reefs worldwide.

Landbased Sources of Pollution

Healthy coral reefs require good water quality to grow, remain viable, and provide ecosystem benefits. Land-based sources of pollution can threaten reef resources by harming sensitive species, altering species composition, disrupting critical ecological functions (i.e., photosynthesis), and impeding normal growth and settlement of stony corals and other benthic invertebrates. Reef systems are impacted by a variety of pollutants, including sediments, nutrients, and chemical contaminants. Pollution enters reef ecosystems in many ways, ranging from specific point-source discharges such as sewage pipes and vessels, to more diffuse sources such as run-off associated with agriculture, coastal development, and road construction. Reef degradation is even greater in areas where the loss of wetlands or other associated habitats has reduced the system's natural ability to filter nutrients and other pollutants before reaching the reefs.

Physical Damage to Reefs

Every year, many boats run aground on coral reefs, causing significant damage to these fragile ecosystems. These vessel groundings are not well documented in all regions, but where recorded the numbers are astounding. For example, seven incidents occurred in the U.S. Virgin Islands and Puerto Rico in January of this year where coral damage has either been confirmed or is highly likely. Emergency restoration, involving coral stabilization and reattachment, following these incidents is critical because often very large colonies are damaged or broken free. These impacted colonies represent corals that are often hundreds of years old. These corals play a key part in reproductive strategy of the reef, and are likely resilient enough to have survived bleaching and disease events in the past.

Climate Change and Ocean Acidification

The rapid increase in atmospheric carbon dioxide over the past two centuries and the current trajectories expected over the coming decades pose a unique and daunting challenge to coral reef ecosystems through both rising ocean temperature and impacts on ocean chemistry. As global temperatures have risen over the past 30 years, there has been a corresponding increase in the frequency of extremely high sea-surface temperatures and coral bleaching events in many tropical regions. Coral bleaching is a response of corals to unusual levels of stress primarily thought to be associated with high light and unusually high sea-surface temperatures. Bleaching occurs when a coral expels the symbiotic algae that live in its tissues. It is thought that corals expel their symbiotic counterparts due to the loss of photosynthetic function of the algae. These algae provide the coral with essential nutrients and give the coral its coloration. Loss of the symbiotic algae leaves the coral tissue pale to clear and, in extreme cases, causes a bleached appearance. Corals often recover from mild bleaching. However, if the stress is prolonged and/or intense, the corals may weaken, causing them to be more susceptible to disease and other stressors, or die from direct thermal stress. Through satellite and onsite monitoring, NOAA tracks the sea-surface temperature and irradiance conditions,

providing critical notifications to coral reef managers about the potential onset of mass coral bleaching.

A growing number of studies now demonstrate that ocean acidification, as a direct consequence of rising concentrations of CO_2, may have important consequence for coral reefs. Recent studies have demonstrated ocean acidification has already reduced the ability of corals to build their skeletons at reefs across the Great Barrier Reef and Arabian Gulf. Other work has shown that changing ocean chemistry may make corals susceptible to bleaching at lower temperatures and have impacts across many parts of coral reef ecosystems.

There is still much that we do not know about the effects of bleaching-associated mass coral mortality and ocean acidification on the functioning of coral reef ecosystems and associated ecosystem services, such as fisheries, coastal protection, recreation, and tourism industries. However, we do know that rising temperatures and ocean acidification act in concert with local threats, such as land-based sources of pollution and overfishing. These local factors can make reefs less resilient to climate change and, conversely, climate change reduces the ability of coral reefs to cope with local stress.

Importance of Reducing Threats

In its January 2006 report *In the Front Line: Shoreline Protection and Other Ecosystem Services from Mangroves and Coral Reefs*, the United Nations Environment Programme (UNEP) estimated the value of coral reefs to be between $100,000 to $600,000 per square kilometer. As such, coral reefs are among the most valuable resources of island and coastal communities. As part of their evaluation, UNEP considered the loss to local economies if the ecosystem services attributed to coral reefs were lost. UNEP predicted that "over a 20-year period, blast fishing, overfishing and sedimentation in Indonesia and the Philippines could lead to a net economic loss of $2.6 billion and $2.5 billion respectively." Further, in an extensive economic evaluation, the World Resources Institute estimated that coral reef degradation continuing through 2050 could reduce benefits from fisheries, dive tourism, and shore protection by a predicted total of $350 million to $870 million in the Caribbean.

The Future of NOAA's Coral Program

In an effort to assess the efforts, progress, and implementation of NOAA's Coral Reef Conservation Program since its inception, the Program underwent an external review in September 2007. Using the results of the external review as a guide, the CRCP is currently reviewing our portfolio to increase effectiveness of conservation efforts. We plan to sharpen our goals, place more emphasis on coral reef management, and increase our international presence. Coral reefs are in trouble and we must continually adapt our approaches to management in order to keep up with the rising challenges. The primary goals of the CRCP are to protect, conserve, restore and manage coral reef resources in a way that ensures their continuation as functioning components of marine ecosystems and maintain biodiversity. To sharpen NOAA's coral conservation priorities and narrow our activities to be as effective as possible, the CRCP has developed a Roadmap that builds on the Program's existing goals and objectives, the *National Action Strategy* and other

previously developed plans to successfully address threats, improve management, and reverse the degradation and loss of coral reef ecosystems.

Under the CRCP Roadmap, the Program is primarily focused on efforts to address coral reef management needs. The Program will emphasize work on three key threats:

1. Impacts of Fishing,
2. Land-Based Pollution and Water Quality, and
3. Impacts from Climate Change.

To address these priority threat areas, NOAA's CRCP will continue its leadership in conducting research necessary for effective ecosystem-based management. We will place greater emphasis on management-relevant science and develop coral conservation tools and products that are user friendly. We will also strengthen our partnerships and leverage resources with coral reef managers at the federal, state, territorial, and local level.

Conclusion

Much remains to be done to halt the degradation of coral reefs. Reauthorization of the CRCA is an important step for continuing our work to protect and restore coral reefs in the United States and abroad. The CRCA is an important tool that provides us with authority and funding authorization for the scientific understanding, protection, and management of these highly important and fragile ecosystems. We look forward to working with you to reauthorize the CRCA. Thank you for your time and consideration. I would be happy to answer any questions you might have.