NATIONAL CENTERS FOR COASTAL OCEAN SCIENCE

Alien[1] Species Early Detection and Warning System

NOAA Ocean Service

Background

Invasive species affect each of our lives, all regions of the United States, and every nation in the world. Society pays a great price for invasive species – costs measured not just in billions of dollars, but also in unemployment, damaged goods and equipment, power failures, food and water shortages, environmental degradation, increased rates and severity of natural disasters, disease epidemics, and even lost lives. Stimulated by the rapid global expansion of trade, transport, and travel, invasive species and their costs to society are increasing at an alarming rate (National Invasive Species Council Management Plan 2001). After habitat destruction, biological invasion is considered the second largest cause of native species and biological diversity loss. Some of the most serious and costly alien species involve diseases (e.g., West Nile virus and fish whirling disease), agricultural pests (e.g., African honey bees and Mediterranean fruit flies), and a host of relatively innocuous species whose sheer numbers overwhelm ecosystems (e.g., purple loosestrife, zebra mussels, European green crabs, and feral pigs).

Approach

Effective control of invasive species has been hampered by the lack of monitoring for alien species at frequent enough intervals in regions of concern; a means to report, verify the identifications, and warn of new sightings; and risk assessments that predict the likelihood of a particular species becoming invasive.

NOAA has initiated a new program with the primary goal of detection, quantifying the possible risk, and warning managers before a respective alien species spreads beyond its point of initial introduction and invades US coastal waters. This program has six components: 1) a warning system to alert regional managers, 2) an inventory of coastal marine species against which alien species can be determined, 3) a national information dissemination system, 4) risk assessments and predictions of alien species becoming invasive, 5) an early detection and monitoring system for alien species, and 6) a Federal-State response plan for taking mitigative actions. The first three were initiated in FY02 through a Hawaiian Pilot Project. After the Pilot early detection and warning system is tested in FY03, then other regional data nodes will be added. The full national early detection and warning system for US coastal species should be operational within five years. The success of this initiative is contingent upon strong partnerships within NOAA, other agencies, and non-governmental organizations.

Figure 1. Invading zebra mussels (A) are having a devastating impact on the aquatic ecosystem (B). Photos: Great Lakes Sea Grant Exotic Species Library, NOAA Great Lakes Research Laboratory.

Warning System for Alien Species

NOAA is developing a warning system that would automatically notify managers of the collection of coastal marine alien species that may be new to their region. Once taxonomic experts have confirmed the identification of a species alien to a region, then the general public would be notified and the national coastal species inventory would be revised.

Inventory of Coastal Marine Species

Currently there is no inventory of US coastal species, so answering relatively basic questions relating to the identification, status, and trends of alien species is difficult. An up-to-date inventory of all native and alien species known to inhabit US State, Territorial, and US Freely Associated Pacific Island coastal waters is essential to building an early detection and warning system for the nation's managers. This critical step will involve compiling and peer-reviewing an initial list of at least 20,000 species of algae, higher plants, inverte-

[1] 'Alien' species are non-native or nonindigeneous introduced, either intentionally or unintentionally, to a region that have established, reproducing populations. Such populations often appear, flourish for a while in relatively restricted areas of the coastline, and then die out. Invasive' species, however, are thriving alien populations, expanding their range with generally increasing ecological, environmental, economic, or human health consequences.

Figure 2. European green crabs invaded the US East Coast in the 1800s and the West Coast in the late 1980s (Photo: Smithsonian Environmental Research Center).

brates, fish, and marine mammals. Besides listing scientific and common names where available, the 'official' list will identify the status of all species (e.g., alien, endangered species) by coastal location (e.g., state, island, estuary).

National Information Dissemination System

The primary information sytem would be a national website linking a series of regional data nodes. NOAA is building a site that will serve as the 'one-stop' portal for the public to access the early warning system, other components of the national program, and other relevant information in partner web sites. There would be quick log-on access for registered and new users. Among the services available would be a list of taxonomic experts who could verify new species. The computer system would have a unique easy-to-access database of existing species in a region linked to associated environmental data so that managers could compare potential sightings of species to the official regional list, obtain maps of species distributions, and even download associated environmental data.

Risk Assessments and Predictions

Not all alien species become invasive. As new alien species appear in coastal waters, coastal managers need scientific evaluations of the likelihood that these alien species will become invasive based upon environmental tolerances and other characteristics of the species. Such information coupled with options for action if required help the manager to respond and mitigate damage. NOAA and a few other agencies have prepared integrated assessments quantifying the risk of a new alien species becoming invasive under different options for action. NOAA and its partners will develop these for all coastal alien species.

Early Detection and Monitoring

Periodic monitoring of the full community of coastal organisms (e.g., algae, higher plants, invertebrates, fish, and marine mammals), especially in areas of concern (e.g., estuaries, ports, coral reefs, marine protected areas), is needed for the early detection of coastal alien species. To maximize and not duplicate currently funded efforts, this initiative will integrate databases from existing coastal marine monitoring programs so that the data can be reassembled by species and geographic area. Not just agencies, but non-governmental and volunteer programs will be encouraged to share data.

If substantive gaps exist in coverage after integrating current monitoring databases, then program partners will develop a plan to ramp up monitoring capacity (e.g., monitor other taxa, not just commercial fish and shellfish species) and expand into areas of concern not regularly assessed.

Federal-State Rapid Response Plan

The response plan will identify federal and regional capabilities and resources that could be mobilized to assist the States, Territories, and Commonwealths in their efforts to respond to and mitigate impacts from alien species that pose a high risk of becoming invasive. It will define who is responsible for taking action, how decisions are made, agency resources and capabilities, and methods for financial actions.

Hawaiian Pilot Project

Implementation of this new program began in FY02 as a pilot project for coastal waters off Hawaii. The Hawaiian Pilot Project is the first in a series of acquisitions of regional data sets. As each regional data node is completed it will be integrated into a national early warning system, the basis for which is an up-to-date inventory of all native, alien, and invasive species known to exist in the coastal waters of US States, Territories, and US-affiliated Islands. The Bishop Museum, one of many program partners, is developing the baseline list of Hawaiian coastal species. In FY03, the Pilot inventory of species, the warning system, and the national information dissemination system will be completed and tested. Following testing of the Hawaiian Pilot project, regional nodes, as they are completed, will be added to build the national system.

Figure 3. Beautiful but dangerous, lionfish are a new East Coast invasive. Photo: Paula Whitfield.

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