Why some species are 'successful' invaders

August 23 2012

(Phys.org)—Researchers at the Hawai'i Institute of Marine Biology (HIMB), an organized research unit within the University of Hawai'i at Mānoa's School of Ocean and Earth Science and Technology, have made a remarkable new discovery.

Biological invasions with known histories are rare, especially in the sea. Fifty-five years ago, the Hawai'i Division of Fish and Game (now Division of Aquatic Resources) undertook an ambitious fishery-enhancement program by releasing 12 species of snappers and groupers in the Hawaiian Islands.

This unintentional "experiment" resulted in the introduction of three reef fishes, Lutjanus fulvus (Blacktail Snapper, to'au), Cephalopholis argus (Peacock Hind, roi) and Lutjanus kasmira (Bluestripped Snapper, ta'ape). While the introductions were well intentioned, these species have not become popular food fishes in Hawai'i and are now largely viewed as a threat to native Hawaiian fauna.

To gain a better understanding of what factors lead to the success of invasive species, researchers from HIMB—Drs. Michelle Gaither, Robert Toonen and Brian Bowen—used genetic tools to study the spread of these species and to look for changes in genetic diversity following introduction.

These fish were brought to Hawai'i from French Polynesia in the South Pacific and were introduced in several events between 1955 and 1961. Most of the introduced fish were released near O'ahu, with a small

number of the roi near Hawai'i Island.

Within 15 years, all three species had been recorded near each of the Main Hawaiian Islands (MHI). Historical records show that initially to'au remained scarce, roi had modest population expansion, and ta'ape experienced rapid population growth reaching Midway Atoll, 2100 km northwest of Oahu, within 35 years.

In contrast to the highly successful ta'ape, roi has spread only halfway up the archipelago to French Frigate Shoals (FFS), while to'au has remained restricted to the MHI.

By combining historical records and genetic tools, HIMB scientists have found that the observed genetic architectures of the sampled fish were significantly altered following introduction.

Ta'ape, which spread the quickest and is the most abundant, was able to maintain genetic diversity similar to its parent population in French Polynesia, while the species that lagged behind, toau, lost much of the genetic diversity found in the original founders, and has not become as widespread or as abundant as the other two species.

These findings emphasize the importance of lag periods and fast population growth for the success of invasive species.

Dr. Michelle Gaither, expresses why this research is so important and the implications of these findings: "We now have a better idea of why some species are more successful invaders than others. The faster a species becomes established in its new environment, the faster it finds food and begins to reproduce, the more likely it is to maintain the genetic diversity that is so important to its long-term success as an alien species."

Provided by University of Hawaii at Manoa