Biological Invasion of Forests on Guam and Other Islands in Micronesia

Aubrey Moore
Cooperative Extension Service / Western Pacific Tropical Research Center
College of Natural and Applied Sciences
University of Guam, Mangilao, Guam

American affiliated island groups in Micronesia include the Territory of Guam, the Commonwealth of the Northern Mariana Islands (CNMI), the Republic of Palau, the Republic of the Marshall Islands, and the Federated States of Micronesia, which includes the states of Yap, Chuuk, Pohnpei, and Kosrae. As the name suggests, the 2,100 islands in Micronesia are small, with Guam being the largest at 212 square miles. Micronesia's forests are under severe attack from invasive species. The most important are:

Ungulates. Pigs and deer were imported for food and caribao (water buffalo) were imported as beasts of burden during colonial times. Prior to WWII, these ungulates were not a problem on Guam because populations were controlled by human hunters. However, access to hunters was denied on most of the one-third of Guam land occupied by the U.S. military. Subsequently, in the absence of predation from natural enemies, ungulate populations have become very high, destroying much of the native forest.

Brown treesnake (BTS), *Boiga irregularis*. Guam's avifauna was extirpated by BTS which arrived shortly after WWII. Cascading effects include loss of ecosystem services provided by birds and other vertebrates such as seed dispersal, insectivory and pollination. Extirpation of birds and other vertebrate insectivores by BTS predation has resulted in high populations of herbivorous invertebrates in Guam's forests.

Cycad Aulacaspis scale (CAS), *Aulacaspis yasumatsui.* The infestation of this armored scale was first detected on ornamental cycads on Guam in the fall of 2003 but it rapidly spread to Guam' s wild, endemic *Cycas micronesica* population and later to wild cycads in the CNMI and Palau. This is a classic case of 'escape from natural enemies'. Plant mortality from the scale infestation was so severe that *C. micronesica* was placed on the IUCN list of threatened species in 2005. Only three years prior, in 2002, a forest survey found *C. micronesica* to be the most numerous tree in Guam's forests. This plant is still under attack by CAS and several other recently arrived invasive species. Mortality exceeds 90% in some forest plots and there is no reproduction.

Coconut rhinoceros beetle (CRB), *Oryctes rhinoceros*. CRB was first detected in Palau just after WWII and on Guam in 2007. Coconut palms, listed as Guam's second most numerous tree in a 2002 forest survey, can be killed by adults which bore into the crowns to feed on sap. Following a failed attempt to eradicate CRB, efforts on Guam are now aimed at developing integrated pest management.

Little fire ant (LFA), *Wasmannia auropunctata*. LFA was first detected on Guam in 2011 at about a dozen distinct sites. LFA devastates the forest by killing wildlife and other arthropods, except for phytophagous hemipterans which are protected in return for honey dew. To date, funds and other resources have not been identified to eradicate or otherwise control this pest.

A major impediment to controlling forest pests in Guam and the rest of Micronesia is a lack of professional capacity. During the past 20 years, the number of PhD level entomologists and plant pathologists practicing in the region has declined from 9 to 3 and from 4 to 1, respectively. During this same period, detections of invasive species affecting forestry and agriculture have increased greatly as a result of globalization and relaxed biosecurity. Coupled with 'the taxonomic impediment', these factors have lead to a gross under-reporting of impacts of invasive species in Micronesia.