# Trees' diminished resistance to tropical cyclone winds attributed to insect invasions

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The 300+ species of cycads comprise the most threatened group of plants studied to date. Guam's *Cycas micronesica* is being endangered by recent alien insect invasions. Credit: Thomas Marler

Guam experiences more tropical cyclones than any other state or

territory in the United States. These cyclones—called typhoons in the western Pacific Ocean—can be devastating to Guam's dense native forests. The impact of large-scale tropical cyclones affects the health of managed and unmanaged forests, urban landscapes, and perennial horticulture plantings for many years after the actual storm. In fact, the island's forests are often called 'typhoon forests' because their health and appearance is inextricably defined by the most recent typhoons.

As recently as 2002, *Cycas micronesica* was the most abundant tree species in Guam. The species is recognized for its innate ability to recover from damage after a tropical cyclone. Resprouting on snapped tree trunks, or "direct regeneration", enabled *C. micronesica* to sustain its status as the most abundant tree in Guam through 2002. Although native tree species like *C. micronesica* possess traits that enable them to recover from tropical cyclone damage, invasive pests and other environmental challenges are compromising the species' resiliency.

Thomas Marler from the College of Natural and Applied Sciences at the University of Guam, and John Lawrence from the U.S. Department of Agriculture, Natural Resources Conservation Service reported on a large-scale study of *Cycas micronesica* in *HortScience*. The team compared the impact of two tropical cyclones—Typhoon Chaba in 2004, and Typhoon Paka in 1997—on the resilience and health of *Cycas micronesica*. They noticed that the proportion of trees exhibiting "mechanical failure" during Typhoon Chaba—in which peak wind speeds were less than half of those in Typhoon Paka—surpassed the damage documented during the more powerful Typhoon Paka. "We set out to determine how a tropical cyclone with moderate wind speeds could impose greater mechanical damage to a highly resistant tree species than a more powerful event only 7 years earlier," explained Marler.

Marler and Lawrence discovered that although Typhoon Paka compromised the ability of the *C. micronesica* canopy to avoid wind

drag, it was alien invasions following Typhoon Paka that virtually eliminated *C. micronesica*'s resilience to tropical cyclone damage. The data showed that stem decay caused by earlier damage from a native stem borer reduced the species' tolerance to external forces, resulting in stem failure in Typhoon Chaba. Invasions of two invasive insects (*Aulacaspis yasumatsui* in 2003 and *Chilades pandava* in 2005) were found to be responsible for the 100% mortality of the intact portions of the trees' snapped stems during the 5 years after Typhoon Chaba.

"A span of less than one decade allowed two alien invasions to eliminate the incipient resilience of a native tree species to tropical cyclone damage," the authors wrote. "This study underscores the fact that many years of observations after tropical cyclones are required to accurately determine [trees'] resilience."

**More information:** The complete study and abstract are available on the ASHS *HortScience* website: hortsci.ashspublications.org/c … tent/48/10/1224.full

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