Adaptations of an Understory *Geonoma*

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1. Rare, well-developed aerial sucker on *yanga* stem, 1.47 m above ground.

The peculiar morphology of *Yanga* (*Geonoma pinnatifrons* var. *martinicensis*) is uniquely adapted to life in the forest understory.

Yanga is the common name on Dominica for *Geonoma pinnatifrons* Willd. var. *martinicensis* (Mart.) Henderson, which until recently was known as *Geonoma interrupta* (Ruiz & Pavon) Mart. var. *interrupta* (Henderson 2011). The latter species is now believed to be confined to South America, whereas *G. pinnatifrons* var. *martinicensis* is known from Guadeloupe, Martinique, Dominica and St. Lucia (Henderson 2011). *Yanga* is Dominica's only

native species of clustering palm, as well as the island's smallest native species of palm in terms of its stem-diameter.

The stem of the *yanga* bears prominent leaf scars, and while young, is tan-colored, very smooth to the touch and resembles a piece of sugar-cane. However, as the palm grows older and taller, its stem roughens somewhat, providing a substrate for the establishment and growth of a variety of epiphytes including lichens, mosses, vanilla and a few other orchids, ferns, bromeliads, and bird's nest anthurium, among other species of *Anthurium*. Climbers such as *Asplundia rigida,* gesneriads, philodendrons, non-woody vines and even lianas, sometimes grow up the stem of adult *yanga* palms.

Between 2007 and 2012 the author, then a Forest Officer with the Forestry, Wildlife & Parks Division in Dominica, and a team of assistants conducted some basic research on the *yanga* on the island (James 2012). The team collected data on some of the palm's physical characteristics (stem height, stem size and number of leaves in crown), the reproductive status of each palm at the time of observation and cluster information, i.e. number of stems in each cluster and the number of basal suckers. Additional information was gathered for individual palms in terms of the shape of the stem, the presence of above-ground roots and the types of plants hosted by the *yanga* palms. The team gathered data from 426 clusters of palms in six sites, which were distributed in the Morne Trois Pitons and Morne Diablotin National Parks and the Northern and Central Forest Reserves. The research was supported in part by a grant from the South Florida Palm Society.

The tallest *yanga* that we measured had a stem height of approximately 8.76 m (28.7 ft), but the mean height was 2.99 m. Stem diameter ranged between 2.7 cm and 6.7 cm at or near breast-height; mean stem diameter was 4.3 cm. We found that clusters contained between 1 and 8 palms with defined stems, along with 0 to 27 basal suckers. A few of the smaller clusters had no basal suckers.

Yanga occasionally has suckers that are produced some distance up the stem. We call these aerial suckers, to differentiate them from suckers produced at the base of the cluster (basal suckers). The production of aerial suckers by the *yanga* is rather rare. Our team encountered only 18 palms with aerial suckers among the 1,063 palms in our survey (<2%). Among the palms that we documented with aerial suckers, the largest number of such suckers found on a single stem was six. Only one stem in a cluster produces aerial suckers; the team never observed two or more stems in a cluster with aerial suckers.

2. Small, tightly-packed adventitious roots on *yanga* stem, well above ground.

These aerial suckers are sometimes produced over 1 m above the ground, and initially at least, they have no direct connection with the ground. They may even be referred to as semi-parasitic, dependent upon the mother for water and mineral salts but relying on their own photosynthesis for at least some of their nutrients.

Only one of the aerial suckers that the team encountered had a well-defined, measurable stem. That sucker, located at 1.47 m up the stem from the base of the mother (the highest such sucker documented), had a stem that was 0.65 m long (Fig. 1). The other aerial suckers encountered had virtually no defined stem.

In addition to basal and aerial suckers, *yanga* also produces basal adventitious roots, and

3. Bulge and short prop roots on stem of *yanga*, resembling a giant spider.

when they reach the ground, they are referred to as prop roots. Occasionally, one encounters *yanga* palms with adventitious roots over a meter above ground, emerging in the air and growing downward toward the ground (Fig. 2). The palms do not have to be reproductively mature to begin producing adventitious roots.

Aerial roots and suckers are not unique to *yanga*. *Hyospathe* species produce aerial shoots from dormant axillary buds (Skov & Balslev 1989). Another palm that produces aerial branches is *Pinanga rivularis*, although the branches arise from the internodal position (Dransfield 1992). A greater number of palms produce aerial roots. In addition to the taxa just mentioned, a large number of *Chamaedorea* species produces aerial roots (Hodel 1992). Examples include *C. stolonifera*, *C. metallica*, *C. serpens* and *C. ernesti-augusti*. The ability of some *Chamaedorea* species to produce aerial roots, especially in response to the stem's contact with a moist substrate, is the basis for the horticultural technique of air-layering. Many *Chamaedorea* palms can be air-layered in order to produce smaller, shorter plants (Hodel 1992). The rattans *Calamus javensis*, *C. heteroideus* and *C. reinwardtii* can root whenever their stems touch the ground (Watanabe et al. 2006).

These palms, along with *yanga*, have in common an unstable habitat. Many are palms of wet forests on slopes, where they are at risk of erosion and landslides. They are also palms of the understory, where lush life in the cool shade can suddenly be cut short by a falling limb or tree. Indeed, falling debris or falling trees are a major cause of death for understory plants, and palms are no exception (De Steven & Putz 1985). *Pinanga rivularis* is a rheophyte, a plant growing on the banks of fast-moving rivers and streams, where erosion frequently uproots plants and deposition can bury plants. The rattan palms are lianas, which fall from the canopy when they become too heavy for their supporting trees and branches.

As a relatively small-diameter, flexible-stem palm living in the understory, *yanga* is well adapted to the perils of the rain forest environment by virtue of the peculiarities of its stem. Its ability to produce adventitious roots insures that a palm stem, once knocked

down, does not perish. It shares this survival strategy with other understory palms such as *Geonoma congesta* (Chazdon 1992) and *Geonoma brevispatha* (Souza et al. 2003). The clustering growth habit insures that the plant survives, even if individual stems are killed. Its ability to produce suckers some distance from the base of the stem means that fallen stems can regenerate and survive.

One *yanga* palm, which had most likely been pinned to the ground by a fallen tree or large tree branch for several years, was observed in 2012 growing in an L-shape, and had produced a set of prop roots on the underside of its stem where it contacted the soil, giving that part of the stem the resemblance of a giant spider (Fig. 3).

Falling tree limbs, heavy lianas, toppling trees and shifting substrates can take down an understory plant such as *yanga*. *Yanga* must be able to survive under those conditions, which it can as long as some the palm's roots remain in the soil. Equipped with its ability to produce basal and aerial suckers and adventitious roots, *yanga* seems well prepared to survive in the rain forest environment.

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