ENH117

UF UNIVERSITY of FLORIDA
IFAS Extension

Florida Coonties and Atala Butterflies[1]

Daniel F. Culbert[2]

Sunshine State gardeners have rediscovered the Florida coontie (Figure 1) as a native plant well adapted to Florida yards. Its increased use in landscapes has encouraged the presence of the rare atala butterfly, which uses coontie as a larval host plant. Landscapers and homeowners can encourage either the plant or the butterfly by following the suggestions in this publication.

Figure 1. Coonties are a desirable native plant for Florida landscapes. (Photo: Dan Culbert, UF/IFAS)

Coontie Relatives

The coontie, an unusual Florida native, is a cycad—a "living fossil." These primitive plants were a dominant form of plant life during the dinosaur age. Other introduced cycads commonly grown in Florida are:

- Cardboard plant/Mexican zamia (*Zamia furfuracea*) http://hort.ifas.ufl.edu/shrubs/zamfura.pdf
- King sago (*Cycas revoluta*) http://hort.ifas.ufl.edu/shrubs/cycrev.pdf
- Queen sago (*Cycas rumphii*) (Previously called *C. circinalis.*) http://edis.ifas.ufl.edu/FP161

Coontie Species. There are many different opinions as to the correct name of the species of coontie found growing in Florida. The predominant taxonomic opinion is that there is a single coontie species in Florida (*Zamia floridana*), while others feel the coontie is represented by several species. Other species names proposed by one or more botanists for the Florida coontie include *Z. integrifolia, Z. pumila,* and *Z. umbrosa*. *Z. pumila* is

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2. Daniel F. Culbert, county extension agent III, Okeechobee, FL, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida

the name of a species found growing in the Dominican Republic; however, it is often used in the nursery trade as the botanical name for coontie. Subtle differences in leaflet size and shape, in addition to differences in the native ranges in the state, have been used by some botanists to delineate up to four different ecotypes of coontie (Figure 2).

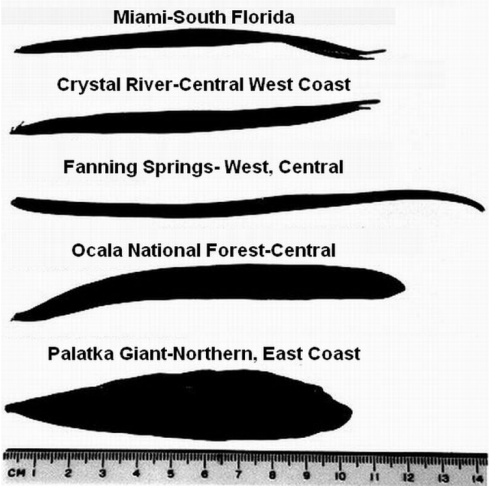

Figure 2. Florida coontie leaflet shapes and ranges. (Data from Broome 2006.)

Habitat and Range

The coontie is native to most of peninsular Florida and southeastern Georgia east of the Apalachicola River (Figure 3). None of the Florida native species are known in the West Indies, but related *Zamia* species are found there. Its natural habitat is dominated by pines and well-drained, sandy, or loamy soils. USDA hardiness zones for the coontie are between 8B and 11, which means it should survive a minimum winter temperature of 15°F.

The coontie was once a common plant in Florida hammocks and pinelands, but because of intensive collection for starch production and landscape use, it is not commonly seen in the wild. The coontie is included in Florida's Commercially Exploited Plant List [FDACS/DPI rule 5B-40.0055 (c)]. Collection of the coontie from the wild is prohibited.

Description

Foliage. This herbaceous plant looks like a small fern or palm. Typically they are 1–3 ft. high (Figure 4), while forms in the Ocala National Forest can be

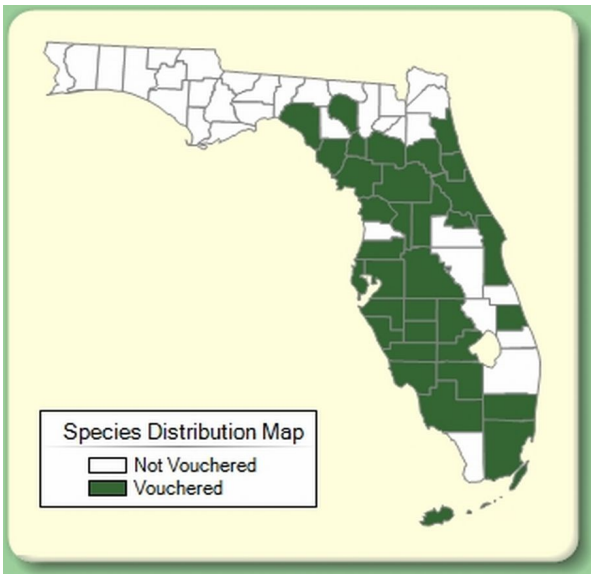

Figure 3. Native range for *Zamia floridana.* (Data from Wunderlin and Hansen 2008.)

as much as 4–5 ft. tall. The coontie has stiff, featherlike leaves, up to 3 ft. in length, which are attached to a thick, shortened stem. New leaves uncurl from the top of this stem. The thickened underground rootlike structure is called a caudex (Figure 7) and can be branched multiple times. Coontie leaves have slender leaflets, 3–6 in. long and attached like the pinnae of a feather along the stalk (rachis). The dark green leaflets are stiff and glossy.

Figure 4. Several coonties in the landscape of Selby Botanical Gardens, Sarasota. (Photo: Dan Culbert,UF/IFAS)

Flowers and Fruit. This primitive plant is dioecious; thus, plants are either male or female and produce male or female cones. The sex of young plants cannot be determined until the cones form on the mature plants. Slender male cones are 3–7 in. tall

and produce pollen (Figure 5). Upright brown female cones (Figure 6) are about 6 in. tall and are covered with velvety fuzz. At maturity, the cones of the female plant will crumble open to reveal angular or lobed seeds with an orange red waxy-looking, fleshy coating called the sarcotesta.

Figure 5. Male cones (strobilus) of coontie are thinner and shorter than female cones. (Photo: Dan Culbert, UF/IFAS)

Figure 6. Female (megasporangiate) cone of coontie. Upon maturity, the cone falls apart, revealing individual "seeds" covered with fleshy orange skin. (Photo: Dan Culbert, UF/IFAS)

Nonlandscape Uses

Native Food Source. Spanish writings from the sixteenth century report that the original native Timucuan and Calusa people removed the toxic chemical, cycasin, from the coontie stem (Figure 7) by maceration and washing. They then used the starchy residue to produce a bread. This was an important food source that sustained them throughout most of the year.

Figure 7. The coontie's underground stem is more properly called a *caudex*. It contains both starch and a water soluble toxin. (Photo: Stephen Brown, UF/IFAS Lee County)

The Seminole Indians learned this process from the Timucuan and Calusa natives they displaced. The common name, "coontie," is derived from the Seminole phrase "conti hateka," which means white root or white bread. Another name for the coontie is "Seminole bread." The Seminoles also used the starchy stem to make another dish called "sofkee stew."

Starch Industry. Around 1825, early settlers in the Fort Lauderdale area learned the Seminole's technique of removing the toxin cycasin from the coontie to produce starch. By the 1880s, several mills were in business in Miami. During WWI, one mill was processing as much as 18 tons of coontie daily for military purchase. The starch content was said to range from 20% in winter to a low of 8% in summer. By 1911, the starch was known as "Florida Arrowroot."

Florist Greens. Florists sometimes use coontie leaves as greenery in floral arrangements. The foliage provides tropical appeal in arrangements and has the ability to last as a cut green. Cut foliage is bunched and shipped from local sources to florists.

Landscape Characteristics and Uses

Coontie's high drought and moderate salt tolerance make it an excellent choice as a low-maintenance landscape plant for coastal Florida. The coontie can be planted in a variety of light conditions, from deep shade to full sun. Well-drained soils are needed, and a small amount of organic material will enhance growth. It may be used as a specimen, a foundation planting, or as a massed planting for groundcover. When used for groundcover, space the plants 12–20 in. apart. Do not plant them where foot traffic is likely to occur.

Because it is illegal to collect these plants from the wild, plants used for landscape purposes are nursery grown. The natural taproot is easily damaged when these cycads are transplanted from natural areas.

Propagation

Seed Collection. Seeds from the coontie are slow to germinate, and, when they do, the plant grows slowly. A nursery-raised plant may take five years to reach marketable size. This is why coonties are expensive and sometimes difficult to locate in nurseries. Established plantings provide seed for propagation. Artificial pollination may improve seed set because male and female cones may not be receptive at the same time. Successful germination is accomplished by collecting the crumbled female cones.

Seed Preparation. The orange red, fleshy covering—the sarotesta—must be removed, as it contains germination inhibitors. Some nursery workers float the seeds in water and pour off the floating, nonviable seeds. It has also been suggested that rattling seeds may have reduced viability.

To speed germination, the thick, stony layer—the sclerotesta—may be scarified by mechanical means (e.g., filing) or by chemical treatment (one hour of sulfuric acid followed by two days of gibberellic acid to initiate embryo growth).

Planting. Seeds should be covered with a thin layer of soil. Within six weeks of sprouting, seedlings are transplanted to containers.

Coonties with a single taproot may become pot bound in containers. These plants will be more difficult to establish in the landscape than those with more fibrous root systems. Dr. Bijan Dehgan developed a procedure to modify the taproot into a branching root system. Experienced nursery growers can consult his methods as noted in the references.

Soil and Fertilizer. Natural conditions for coonties indicate a need for well-drained soil. A successful soilless media for container production has been suggested as follows: one part Metro-Mix 500 (W. R. Grace Co.) or similar mix, one part sharp sand, one part perlite, one part pine bark, 5 lbs. of Dolomite, and 3 lbs. of Perk micronutrient per cubic yard.

Cyanobacteria (blue green bacteria) are known to associate with surface (apogeotropic or coralloid) roots of *Zamia*, allowing it to grow in poor soil conditions. These symbiotic organisms have the ability to take nitrogen from the air and change it into nitrogen nutrients. Using nitrate nitrogen fertilizer reduces the effectiveness of symbiosis, while ammoniacal forms encourage the uptake of nitrogen into the cycads. In the wild, a soil pH of 6.0 or more has been noted in locations with dense, healthy coontie plants.

Coontie Pest Management

Coonties have adapted to the natural environment of Florida over several thousand years. Weeds are best controlled by mulching around the coontie plants to prevent turf or other plants from competing with this slow-growing native. However, do not allow mulch to lie in contact with the crown, as this may encourage rot. Diseases have been noted in cases of excessive irrigation.

Some of the very few significant insect pests common to coontie are Florida red scale (*Chrysomphalus aonidum)* and hemispherical scales (*Saissetia coffeae*) (Figure 8). Damage to coontie leaves by scale feeding may result in irregular yellow patches on the leaves (Figure 9). Mealybugs, such as

the longtailed mealybug (*Pseudococcus longispinus*), also are found on landscape coonties (Figure 10). These sap-feeding insects encourage the development of sooty mold (Figure 11). Mealybug destroyers (*Cryptolaemus montrouzeri*) are often seen on coonties, feeding on red scale. They look similar to mealybugs (Figure 12).

All of these pests can be controlled with insecticidal soaps or other contact insecticides. Identify any predators before using chemical insecticides to reduce pest populations. Check with your county Extension office for the latest chemical pesticide recommendations.

Figure 8. Florida red scales and hemispherical scales. (Photo: Lyle Buss, UF/IFAS)

Figure 9. Damage to coontie leaf due to scale insects. (Photo: Lyle Buss, UF/IFAS)

Atala Butterfly

The coontie serves as the sole host plant for larvae of the rare atala butterfly (*Eumaeus atala*), once thought to be extinct in Florida (Figure 13). The hungry larvae are able to withstand the coonties' natural toxins and, in turn, incorporate them into their tissues, rendering the larvae and adults unpalatable to various predators, particularly birds. The bright colors of the larvae and adult butterflies (Figure 14) warn predators that they are toxic.

Figure 10. Longtailed mealybugs on cycad leaf. (Photo: Lyle Buss, UF/IFAS)

Figure 11. The leaves of this coontie are covered with black sooty mold, a result of a heavy insect infestation. (Photo: Dan Culbert, UF/IFAS)

Figure 12. Mealybug (L) being consumed by mealybug destroyer (R). (Photo: Sonya Broughton, Department of Agriculture & Food Western Australia, Bugwood.org)

Range. The atala has been reported in Florida from Dade County north into Martin County. Documented reports of atala also have come from Pinellas County (Figure 15). In 1993, this butterfly

Figure 13. Adult atala butterflies. (Photo: Dan Culbert, UF/IFAS)

Figure 14. Dorsal (top) side of atala wings. (Photo: Jerry Butler, UF/IFAS)

was sighted in St. Lucie and Indian River counties. The expanded presence of atala butterflies can be attributed to the increased use of coonties in the landscape. Nursery-grown coonties that originate from more southern locations have been a source of atalas in other areas of Florida.

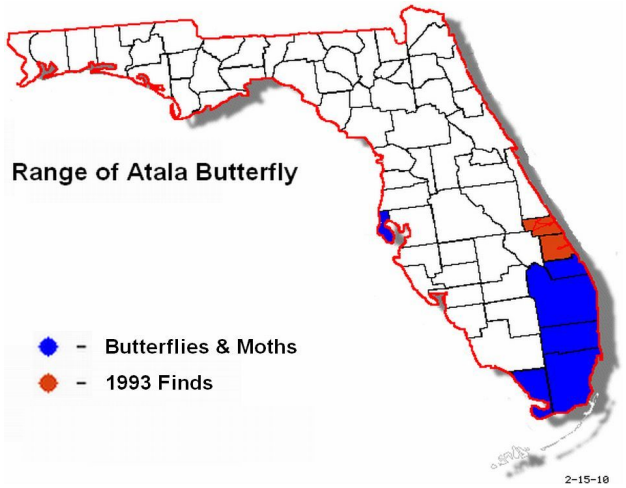

Figure 15. Range map of atala in Florida. (Adapted from USGS Northern Prairie Wildlife Research Center.)

Description. A single female may produce several dozen eggs during her life. The yellow white eggs (Figure 16) are deposited on new growth or near the tip of mature leaflets. Eggs also have been found to be deposited on the female coontie cones (Figure 17). The eggs are deposited singly or in clusters of 5–15 eggs.

Figure 16. Atala egg cluster on coontie foliage. (Photo: Dan Culbert, UF/IFAS)

Figure 17. This cluster of atala eggs on a female (megasporangiate) cone shows a newly hatched larva. (Photo: Dan Culbert, UF/IFAS)

Atala caterpillars, or larvae (Figure 18), are orange red with seven pairs of yellow spots running along the back (dorsal side). These larvae will reach up to 1.25 in. long at maturity. The resulting orange and brown pupae (chrysalises) (Figure 19) are approximately 1 in. long and hang from a silken girdle under coontie leaflets.

Figure 18. Larva (caterpillar) of atala butterfly. (Photo: Jerry Butler, UF/IFAS)

Figure 19. Several pupae of atala suspended under a coontie leaflet. Note cast skin of caterpillar on leaf. (Photo: Dan Culbert, UF/IFAS)

The adult butterfly (see Figure 13) has a wingspan of up to 1.5 in., with its velvety black wings roughly oval in shape. This butterfly holds its wings together while at rest, and the undersides can be easily observed. Metallic blue spots on the hind wing are arranged in three bands. There is an orange red spot on the underside of the hind wing adjacent to the abdomen, which also is orange red in color. The head and thorax are black. Blue bands also occur on the dorsal (top) side of the hind wing (Figure 14). Males have greenish patches on the front wing and top of the hind wing margins. Females have bluish patches across the top of the forewing.

Life Cycle. Eggs of the atala typically hatch in four to five days. Like all butterflies, they go through a four-part life cycle (Figure 20). Younger larvae are typically gregarious, but often become solitary as they mature. The larvae are known to be cannibalistic, especially in captivity.

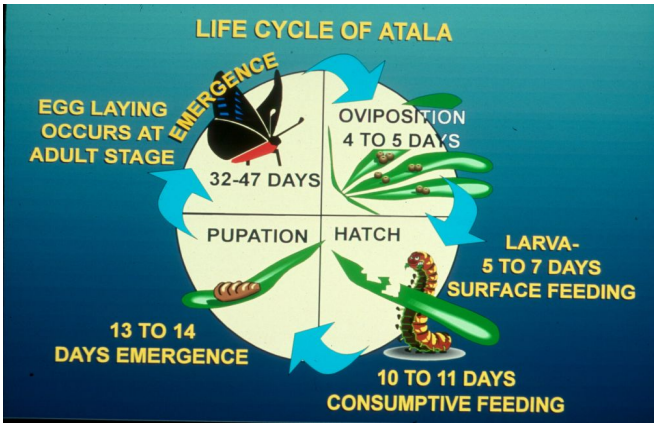

Figure 20. Life cycle of the atala butterfly. (Graphic: Bonnie Pattock, formerly UF/IFAS FMEL)

Larval development lasts approximately 18 days. At the end of this period, the larva will stop feeding, remain stationary, hunch up and attach itself to a frond, and finally molt into the pupa (chrysalis).

The pupal stage lasts about 10 days, but is very temperature dependent. Prior to the emergence of an adult, the outer shell of the pupa becomes opaque and the dark wings of the butterfly become more visible.

The butterfly exhibits a weak, erratic flight and travels close to the ground. Courtship and mating occur in late afternoon. Adults may live for one or more weeks.

All life stages have been observed in every month, so continuous activity is possible through all seasons of the year. Atala have survived a temperature of 29°F (-1.7°C). The exact number of generations per year is variable.

Legal Status

At present, the atala is not listed at the state or federal level. It is, however, identified in Florida's Comprehensive Wildlife Conservation Strategy as a "Species of Greatest Conservation Need." Nonetheless, it remains rare and often quite local throughout its reduced range in Florida.

Continued habitat loss and alteration make this insect vulnerable to extinction, but no special permit is required at this time for either control or collecting purposes.

Atala Management

The atala often experiences boom and bust years. Some sites may experience high numbers of organisms, which can render some plants unsightly (Figure 21). Voracious atala larvae can defoliate coonties in weeks (Figure 22). While insect control may be desired in some locations, the atala larvae inflict only minimal and temporary damage to the coontie plant. The plants will quickly recover. Whenever possible, atala management programs should first involve collection from unwanted sites and relocation to other repository sites, preferably on conservation lands. The presence of adults and immature stages often serves as an ideal opportunity

for public interpretation, particularly in parks, botanical gardens, zoos, or nature centers.

Figure 21. Damage to coontie plants from atala caterpillar feeding. (Photo: Dan Culbert, UF/IFAS)

Figure 22. Closeup of coontie foliage showing superficial and consumptive feeding damage from atala caterpillars. (Photo: Dan Culbert, UF/IFAS)

Application of Pesticides. Little research has been done to verify effective control of this caterpillar. Chemical insecticides may be effective based on their use on other caterpillars. Most caterpillars can be controlled by spraying with *Bacillus thuringensis* (*Bt)* products, such as Dipel and Thuricide. These are bacterial spores that produce a toxin in the stomach of the caterpillar and provide specific control for most forms of caterpillars.

One trial (Culbert 1994) showed no difference between different forms of *Bt* products, but use of these materials did result in reduced atala caterpillar populations.

Contemporary approaches to pest control suggest that a variety of methods be used. The concept of integrated pest management (IPM) is to use a variety of control measures to keep pest populations below acceptable levels of damage. Because of the unusual nature of the atala butterfly, an IPM approach, including relocation of this insect, is suggested.

Atala Gardening

Relocation to Butterfly Gardens. When this insect causes unwanted damage to landscape coonties, an alternative to insecticidal applications can be attempted. Before other means of control are initiated, the atala's eggs, larvae, or pupae may be relocated to another site. Butterfly gardeners can encourage atala, but only at the expense of the coontie's appearance. Consider neighbors whose coonties may also be affected by atala from your butterfly garden.

Interested persons may wish to contact botanical gardens, conservation groups, or their county Extension office for assistance in relocating an unwanted colony or in establishing the atala as part of a butterfly garden.

Environmental Requirements for the Atala. As the atala is a neotropical butterfly, its range is limited by cold temperatures. Expect a killing frost to eliminate or reduce the insect population. Because cold temperatures are moderated by large bodies of water, successful sites in more northerly areas should be close to the ocean.

Larval Food and Nectar Plants. Other cycads have been shown to support the dietary needs of the atala, such as the newly emerging fronds from cardboard plant, queen sago, and other exotic *Zamia* species. Caterpillars prefer to eat the young shoots of the coontie. One butterfly enthusiast (Kilmer 1993) suggested that 12 larvae are needed to establish a colony on one plant, and that eight or more large coonties (12–16 in. tall) are needed for the atala colony to survive.

The adult atala requires specific nectar plants. Known nectar plants used by atala butterflies have compound flowers with short, tubular corollas. Plants identified as nectar sources for the atala butterfly are listed in Table 1.

There may be other environmental factors necessary for the survival of a relocated atala colony. Before relocation begins, potential relocation sites

should be carefully evaluated for their ability to sustain the atala and for their impact on adjacent landscapes.

Table 1. Nectar plants for the adult atala butterfly

Botanical name	Common name(s)
Bidens bipinnata	Spanish needles, beggarticks
Bucida buceras	Black olive
Buddleia lindleyana	Butterfly bush
Cnidoscolus chayamansa	Chaya
Cordia globosa	Bloodberry
Dombeya spp.	Pink powder puff
Eupatorium odoratum	---
Forestiera segregata	Florida privet, inkberry
Lantana spp., esp. *L. involucrata*	Lantana
Macadamia integrifolia	Macadamia nut
Murraya koenigii	Curry tree
Persea americana	Avocado
Psychotria nervosa	Wild coffee
Randia aculeata	White indigo berry
Rhus copallina	Winged sumac
Sabal palmetto	Cabbage palm
Schinus terebinthifolius	Brazilian pepper tree
Schoepfia scheberi	Whitewood
Serenoa repens	Saw-toothed palmetto
Source: Data from Culbert 1994.	

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