

FOUR WESTERN CHEILANTHOID FERNS IN OKLAHOMA

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ABSTRACT

The diversity of ferns in some of the more arid climates of western Oklahoma is surprising. This article examines four Oklahoma cheilanthoid ferns: *Astrolepis integerrima*, *Cheilanthes wootonii*, *Notholaena standleyi*, and *Pellaea wrightiana*. With the exceptions of *A. integerrima* and *P. wrightiana* which occur in Alabama and North Carolina respectively, all four species reach their eastern limits of distribution in Oklahoma. Included in this article are common names, synonyms, brief descriptions, distinguishing characteristics, U.S. and Oklahoma distribution, habitat information, state abundance, and a dichotomous key to selected cheilanthoids. The Oklahoma Natural Heritage Inventory has determined that all but one (*N. standleyi*) are species of concern in the state.

INTRODUCTION

Almost half of the ferns in the family Pteridaceae are xeric adapted ferns. In Oklahoma six genera and sixteen species in the family are known to occur. They live on dry or moist rocks and can be found in rock crevices, at the bases of boulders, or on rocky ledges. Common associated species include lichens, mosses, liverworts, and spike mosses. Two physical characteristics that unite the family are the marginal sori (Figure 1) and the lack of a true indusium. A sorus is a cluster of spore producing sporangia. A true indusium is a sterile flap of tissue that is either attached on the side or base of the sorus or the center or underneath the sorus (Figure 2). Five of the six genera have instead, false indusia formed by the revolute or reflexed margins of blade (Figure 3).

There are two families of ferns with genera in Oklahoma with both marginal sori and false indusia: the maidenhair fern, family Pteridaceae and the bracken fern *Pteridium*, in the family Dennstaedtiaceae. Bracken ferns are found in the pine forest

of eastern Oklahoma, while most members of the Pteridaceae occur in western Oklahoma (Taylor & Taylor 1991).

Statewide, the most common species in the Pteridaceae is *Pellaea atropurpurea* (Figure 4), which can be found throughout the body of the state and Cimarron County in the panhandle. The rarest are *Cheilanthes borridula* and *Cheilanthes lindheimeri*. *Cheilanthes borridula* and *Cheilanthes lindheimeri* have only been seen in one county each, Murray and Comanche respectively. Descriptions and distributions of these two species have been previously addressed (Smith 2009).

The four cheilanthoids described in this article: *Astrolepis integerrima* (Figure 5); *Cheilanthes wootonii* (Figure 6); *Notholaena standleyi* (Figure 7); and *Pellaea wrightiana* (Figure 8), are well adapted to xeric habitats due to their small stature, leathery blades, false indusia, light colored surfaces, and their scaly, hairy or waxy surfaces. All these morphological features help conserve moisture (Moore 2007). Apogamous reproduction is another means by which cheilanthoids are adapted

to live in xeric habitats. Sexual reproduction is not required, thus moisture is not required for “production of the sporophyte generation” (Wagner and Smith 1993).

All four species are found on more than one rock type. *Astrolepis integerrima* is known to occur on limestone rock in the Arbuckle Mountains (Figure 9); on granite rock in the Wichita Mountains (Figure 10); and on sandstone rock at Black Mesa (Figure 11). *Cheilanthes wootonii* is found in

the Wichita Mountains, at Black Mesa, and also on red sandstone rock in the Caddo Hills (Figure 12). *Notbolaena standleyi* and *Pellaea wrightiana* are known to occur at Black Mesa and in the Wichita Mountains.

What makes these four species so interesting is their limited distribution, rarity, rocky habitats, and their morphologies that enable them to live in xeric habitats.

THE SPECIES

(FNA 1993; Tyrl et al. 2010; Hoagland et al. 2010; USDA-NRC 2010; Allison & Stevens 2001)

Astrolepis integerrima (Hook.) Benham & Windham
Long Cloakfern

Synonyms:

Cheilanthes integerrima (Hook.) Mickel

Notbolaena integerrima (Hook.) Hevly

Notbolaena sinuata (Lag. ex Sw.) Kaulf, var. *integerrima* Hook.

Description:

plants are perennials; from rhizomes

fronds all alike; blades 1-pinnately compound to pinnate-pinnatifid

stipe (petiole) brown

sori on margins

false indusia absent

pinnae oblong to ovate

Distinguishing Characteristics:

The absence of false indusia and presence of stellate to coarsely ciliate scales on adaxial blade surface

State Status: S1, critically imperiled species in Oklahoma with 5 or fewer occurrences or very few individuals or acres

U.S. Distribution: Alabama, Arizona, Nevada, New Mexico, Oklahoma, and Texas

Oklahoma Distribution: Cimarron, Comanche, Kiowa, and Murray counties

Cheilanthes wootonii Maxon
Beaded Lipfern

Synonyms: none

Description:

plants are perennials; from rhizomes
fronds all alike; blades 3-4-pinnately compound at the base
stipe (petiole) dark brown
sori on margins
false indusia formed by the revolute margins of the blade
pinnae lanceolate

Distinguishing Characteristic:

The glabrous adaxial surface and the costal scales on the abaxial surface that can obscure the ultimate segments

State Status: S2, imperiled species in Oklahoma with 6-20 occurrences or few remaining individuals or acres

U.S. Distribution: Arizona, California, Colorado, Nevada, New Mexico, Oklahoma, Texas, and Utah

Oklahoma Distribution: Canadian, Cimarron, Comanche, Greer, and Kiowa counties

Notholaena standleyi Maxon
Star Cloak Fern

Synonyms:

Cheilanthes hookeri (Kummel.) Domin
Cheilanthes standleyi (Maxon) Mickel

Description:

plants are perennials; from rhizomes
fronds all alike; blades pentagonal in outline; deeply pinnatifid
Scales absent on blades
stipe (petiole) brown
sori on margins
false indusia formed by the revolute margins of the blade

Distinguishing Characteristic:

Pentagonal blades with the white to cream to yellowish cream color on abaxial surfaces

State Status: Not a species of concern

U.S. Distribution: Arizona, Colorado, New Mexico, Oklahoma, and Texas

Oklahoma Distribution: Cimarron, Comanche, Greer, and Kiowa counties

Pellaea wrightiana Hook.
Wright's Cliffbrake

Synonym:

Pellaea ternifolia (Cav.) Link. var. *wrightiana* (Hook.) A. F. Tryon

Description:

plants are perennials; from rhizomes
fronds all alike; blades 2-pinnately compound at the base
stipe (petiole) dark brown
sori on margins
false indusia formed by the revolute margins of the blade
pinnae with 3-9 ultimate segments (pinnules)

Distinguishing Characteristic:

Apices of pinnules mucronate

State Status: SH, historically known species from Oklahoma, but possibly extirpated; not seen in 15

U.S. Distribution: Arizona, Colorado, New Mexico, North Carolina, Oklahoma, Texas, and Utah

Oklahoma Distribution: Cimarron, Comanche, Greer, Johnston, Kiowa, Murray, and Ottawa counties

CONCLUSION

Because they are classified as rare and limited in their distribution, conservation of habitats for these four species is important. We are fortunate in Oklahoma to have state parks, state resort parks, and wildlife refuges which conserve these species by conserving habitat. In your search for these ferns, I encourage you to use regional manuals and field guides as well as *Keys and Descriptions for the Vascular Plants of Oklahoma* (Tyril et al. 2010). When using a key to identify ferns, it is important to use a good glossary of terms. If you don't have one you can use online resources such as *Pteridophytes of Wisconsin: Ferns and Fern Allies* (Fewless 2010).

I hope readers will keep the Oklahoma Biological Survey informed on the status of these four species, including *Notholaena standleyi*. If and when you find

these species, take good photos, record accurate location information, and send the photos and location information to Oklahoma Biological Survey (www.biosurvey.ou.edu). I know they will appreciate it.

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**KEY TO THE CHEILANTHOID FERNS
OF CANADIAN, CIMARRON, COMANCHE, GREER, JOHNSTON,
KIOWA, AND MURRAY COUNTIES OF OKLAHOMA**

This key includes the four western cheilanthoids discussed in the article plus eight additional species. The key is designed to enable the reader to make a positive identification of the four target species, only in the counties where the four species have been reported. It is important to remember that the other eight species can be found outside of these seven counties. They have been included in this key to allow the reader to make a positive identification on the four species that this article has targeted.

1. Blades pentagonal or deltoid in outline; abaxial surfaces covered by white to cream to yellowish waxy powder, otherwise glabrous.
 2. Blades pentagonal in outline; simple pinnatifid. *Notolaena standleyi*
 2. Blades deltoid in outline; 3- to 5-pinnately compound. *Argyrosma dealbata*
1. Blades of various shapes, but not pentagonal or deltoid in outline; abaxial surfaces of blades green in color or obscured by abundant hairs or scales.
 3. Adaxial surfaces of blades with scabrous pustulose (broad-based) hairs *Cheilanthus horridula*
 3. Adaxial surfaces of blades glabrous or of various pubescence, but not having scabrous pustulose hairs.
 4. Blades 1-pinnately compound. *Astrolepis integerrima*
 4. Blades 2- to 4-pinnately compound.
 5. Rachis and costal scales absent.
 6. Abaxial surfaces of blades glabrous or with a few scattered hairs along major veins.
 7. Abaxial surfaces of blades glabrous; apices conspicuously mucronate. Rachis glabrous. Stipes dark brown. *Pellaea wrightiana*
 7. Abaxial surfaces of blades with a few scattered hairs along major veins; apices obtuse to slightly mucronate. Rachis with segmented hairs Stipes reddish purple to black. *Pellaea atropurpurea*
 6. Abaxial surfaces of blades pubescent.
 8. Blades 3-pinnate at base; abaxial surfaces densely pubescent. *Cheilanthus feei*
 8. Blades 2-pinnate-pinnatifid at base; abaxial surfaces sparsely pubescent. *Cheilanthus lanosa*
 5. Rachis and costal scales present.
 9. Adaxial surfaces of blades glabrous or appearing to be tomentose. Costal scales on abaxial surfaces often concealing ultimate segments.
 10. Adaxial surfaces glabrous. Revolute margins on abaxial blade surfaces conspicuous..... *Cheilanthus wootonii*
 10. Adaxial surfaces appearing to be tomentose. Revolute margins on abaxial blade surfaces not conspicuous *Cheilanthus lindheimeri*
 9. Adaxial surfaces pubescent. Costal scales on abaxial surfaces not concealing ultimate segments.
 11. Rachis and costal scales lanceolate to ovate, conspicuous. *Cheilanthus eatonii*
 11. Rachis and costal scales linear and inconspicuous. *Cheilanthus tomentosa*



Figure 1 Marginal sori, *Pellaea atropurpurea* (all photos by author)



Figure 2 True indusia attached along the sides of the sori, *Asplenium* (spleenwort)



Figure 3 False indusium, *Cheilanthes wootonii*



Figure 4 *Pellaea atropurpurea*, the most common species of pteridaceae in the Oklahoma.



Figure 5 *Astrolepis integerrima* on limestone rock in the Arbuckle Mountains



Figure 6 *Cheilanthes wootonii* growing on sandstone rock in Cimarron County



Figure 7 *Notholaena standleyi* growing on granite rock in the Wichita Mountains



Figure 8 *Pellaea wrightiana* growing on granite rock in Great Plains State Park



Figure 9 Limestone rock in the Arbuckle Mountains



Figure 10 Granite rock at Quartz Mountain Resort Park in the western part of the Wichita Mountains.



Figure 11 Sandstone rock on the Hoot Owl Ranch in Cimarron County (Black Mesa area)

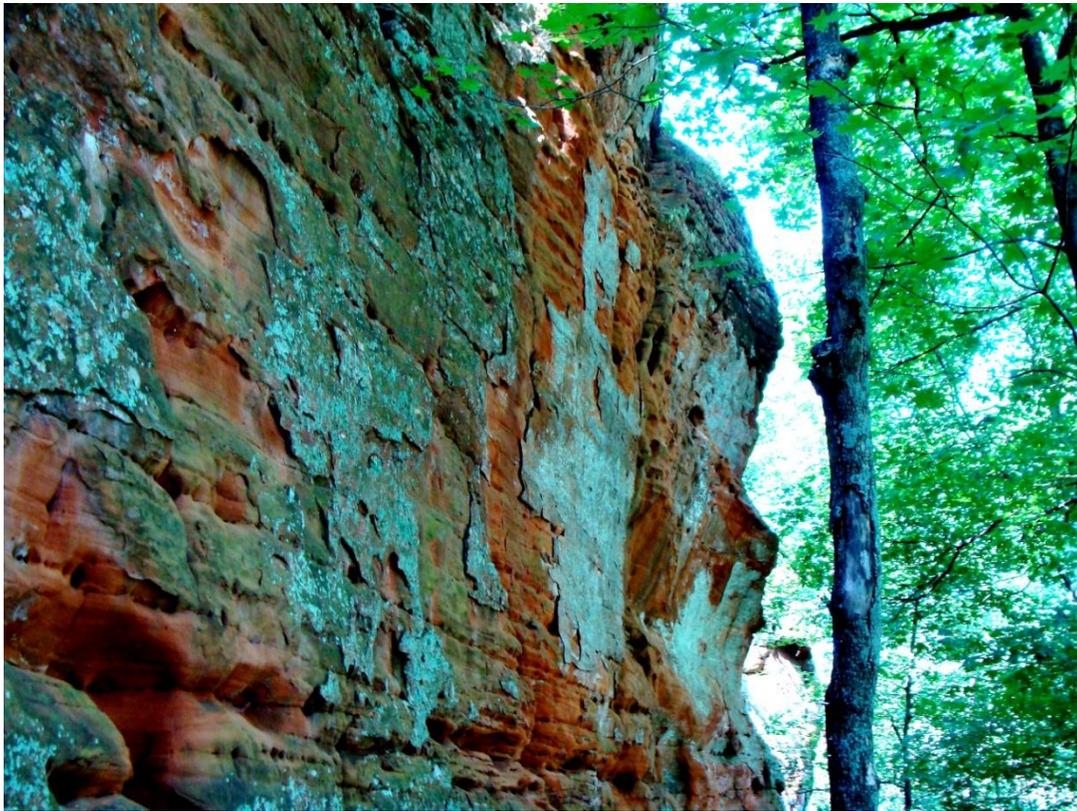


Figure 12 Red sandstone rock in the Caddo Hills