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# The Endemic Biota of Oklahoma

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**There has not been a previous effort to document the endemic biota of Oklahoma. Because the state has a wonderful diversity of flora and fauna contained within its geographical borders, there is a need to publish a list of the endemic biota. Herein, we report a total of 20 endemic taxa, including three vascular plants and 17 animals (one flatworm, two amphipods, six isopods, four crayfishes, three millipeds and one salamander) from Oklahoma. By providing an initial report of the endemic plants and animals of the state, it is our hope that researchers as well as the general public will be informed about this unique biota and be stimulated to participate in future research, stewardship and conservation. © 2012 Oklahoma Academy of Science.**

## INTRODUCTION

Oklahoma has a wonderful diversity of plant and animal life contained within its geographical borders. This rich biodiversity is due to several factors including the varied physiography and topography of the land, a long period of stable and favorable climates and habitats, and the fact that Oklahoma was not affected directly by Pleistocene glaciation during the past one million years. Within this biodiversity is an endemic element which is poorly known. To our knowledge, there has not been any previous effort to publish a list of the entire Oklahoma endemic biota. Most Oklahomans are not even aware that we have an endemic element of our state biota as only cursory remarks in scattered published papers suggest this aspect of the state biodiversity. Conversely, our contiguous eastern neighboring state, Arkansas, has enumerated their state endemic biota (presently listed at 110 endemic species) in a number of publications (Robison and Smith 1982; Robison and Allen 1995; Robison et al. 2008; McAllister et al. 2009). The present study brings up-to-date the little known endemic biota of Oklahoma. It is expected that the

continuing study of the state flora and fauna will reveal additional endemic organisms in the Sooner state, including new species. For the purpose of this report, we use the political boundaries of Oklahoma to define the area of endemism. We are cognizant of the artificiality of this delineation; however, we feel it is important to make this part of our state natural heritage known. It is also our belief that exposure of these endemic life forms to the general public will help stimulate future research and preservation.

## MATERIALS AND METHODS

An extensive search of previous literature and the Internet was conducted in an attempt to locate sources for information on Oklahoma endemics. This also included correspondence with various state personnel for additional information not readily available from other sources. Herein we use NatureServe Explorer and Nature Heritage Program state (S, subnational) and rounded global (G) conservation status ranks (NatureServe 2012) for each taxa (when available) and those are included after their scientific name as follows: SNR, GNR (not yet ranked subnationally, globally); S1, G1

(critically imperiled); S2, G2 (imperiled); S3, G3 (vulnerable).

## RESULTS

Currently, there are three vascular plant taxa and 17 species of animals that are endemic to the state boundaries. Together, this brings the total number of Oklahoma state endemic plants and animals presently known to 20 (Table 1). The following is an annotated listing of those taxa.

### ENDEMIC SPECIES OF OKLAHOMA

#### Vascular Plants

Of the over 2,800 vascular plants documented for Oklahoma (Taylor and Taylor 1994; Hoagland et al. 2010; USDA–NRCS 2012), only three endemic taxa are known from the state, namely, *Phlox pilosa* ssp. *longipilosa* (sometimes given full species status as *Phlox longipilosa*), *Leavenworthia aurea* and *Argythamnia humilis* var. *leiosperma*.

**Magnoliopsida: Solanales: Polemoniaceae**  
*Phlox pilosa* ssp. *longipilosa* (Waterf.) Locklear, 1971–Longhair phlox. SNR, GNR.

Waterfall (1971) originally described *Phlox pilosa* ssp. *longipilosa* from the north slope of the granite mountains south of Lake Altus, Kiowa County. However, Taylor and Taylor (1981) reduced the plant to a variety of *P. pilosa*, and Locklear (2009) made a nomenclatural name change to a subspecies. This plant is a perennial herb of the Phlox family and grows to 20–45 cm in height. It has linear leaves toward the base, but they become lanceolate near the top; flowers are purple blooms 10–12 mm in length. Flowering season is late May to early June. This plant inhabits soils derived from granitic rock and is associated with mixed grass prairie or live oak or post oak woodlands (Locklear 2009; ONHI 2011). Hoagland et al. (2010) reported 10 to 20 populations of this plant in Greer and Kiowa counties in

**Table 1. The Oklahoma endemic biota.**

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#### PLANTAE

**Class Magnoliopsida: Order Solanales:**

**Family Polemoniaceae**

*Phlox pilosa* ssp. *longipilosa*

**Order Capparales: Family Brassicaceae**

*Leavenworthia aurea*

**Order Euphoriales: Family Euphorbiaceae**

*Argythamnia humilis* var. *leiosperma*

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#### ANIMALIA

**Phylum Platyhelminthes: Class Cestoidea:**

**Family Bothriocephalidae**

*Bothriocephalus euryciensis*

**Phylum Arthropoda: Subphylum Crustacea: Order Amphipoda**

**Family Allocrangonyctidae**

*Allocrangonyx pellicucidus*

**Family Crangonyctidae**

*Stygobromus bowmani*

**Order Isopoda: Family Asellidae**

*Caecidotea acuticarpa*

*Caecidotea adenta*

*Caecidotea mackini*

*Lirceus trilobus*

**Family Trichoniscidae**

*Amerigoniscus centralis*

*Miktoniscus oklahomensis*

**Order Decapoda: Family Cambaridae**

*Cambarus subterraneus*

*Cambarus tartarus*

*Orconectes difficilis*

*Orconectes saxatilis*

**Class Diplopoda: Order Chordeumatida:**

**Family Trichopetalidae**

*Trigenotyla blacki*

*Trigenotyla seminole*

*Trigenotyla vaga*

**Phylum Chordata: Subphylum Vertebrata:**

**Class Amphibia**

*Plethodon sequoyah*

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the Quartz and Wichita Mountains of south-western Oklahoma, and an additional population from adjacent Comanche County; however, the latter population has not been rediscovered. In any one population, there may be hundreds of individuals.

**Magnoliopsida: Capparales: Brassicaceae**  
*Leavenworthia aurea* Torr., 1937–Golden gladecress. S2, G2.

*Leavenworthia aurea*, a member of the mustard family, was originally described by Torrey (1937) from Fort Towson, “Arkansas” (now Choctaw County, Oklahoma), Texas, and Alabama (Hoagland et al. 2004). The Alabama specimens were later determined to be misidentified while the Texas plants were first elevated to *L. texana*, reduced to a separate variety of *L. aurea* (*L. aurea* var. *texana*, but now *L. texana*), leaving *L. aurea* as a state endemic to Oklahoma (Hoagland et al. 2004). The Oklahoma endemic differs by having a paler yellow petal color, differences in apical leaf segments (Mahler 1987), and chromosome number. *Leavenworthia aurea* is confined to glade areas at 25 sites in Choctaw and McCurtain counties (Hoagland et al. 2004). Each population may include hundreds of individuals.

**Magnoliopsida: Euphoriales: Euphorbiaceae**

*Argythamnia humilis* (Engelm. & A. Gray) Mull. Arg. var. *leiosperma* (Waterf.)–Low silverbush. SNR, GNR.

This variety of silverbush is a perennial subshrub or forb/herb which has been found only in the far western panhandle of Cimarron County (Hoagland et al. 2010). The seeds of this variety are basically smooth with several whitish slightly roughened encircling bands (Kartesz 1994). This plant is being re-evaluated; therefore, whether or not it is a true endemic may change in the future.

## Animals

Oklahoma supports a rich diversity of animals, including several species that

inhabit subterranean habitat. The endemic fauna includes one flatworm, two amphipods, six isopods, four crayfishes, three millipeds, and one amphibian.

### Platyhelminthes

**Cestoidea: Bothriocephalidea: Bothriocephalidae**

*Bothriocephalus euryciensis* Schaefer and Self, 1978—a salamander tapeworm. SNR, GNR.

*Bothriocephalus euryciensis* is an endemic tapeworm originally taken from the intestinal tract of dark-sided salamanders (*Eurycea longicauda melanopleura*). It is known only from hosts collected at Adair Cave, Adair County (Schaefer and Self 1978). The intensity of infection ranged from six to 19 cestodes per host (Schaefer and Self 1978). Although specimens of *E. l. melanopleura* have been examined from two caves in neighboring Arkansas, no *B. euryciensis* were found (McAllister and Bursley 2004).

### Arthropoda

**Crustacea: Amphipoda: Allocrangonyctidae**

*Allocrangonyx pellucidus* Mackin 1935–Oklahoma cave amphipod. S2, G2.

The type locality of this stygobite amphipod is in Johnston County at a spring upstream of Tishomingo National Fish Hatchery (Mackin 1935). This state endemic is also known from Murray and Pontotoc counties, and is endemic to the Arbuckle–Simpson aquifer/hydrologic basin within subterranean waters and spring runs at 18 sites (Graening et al. 2006b, 2011). In addition, Graening et al. (2011) provided a photograph of *A. pellucidus*.

### Amphipoda: Crangonyctidae

*Stygobromus bowmani* Holsinger 1967–Bowman’s Cave amphipod. S1, G1.

The type locality of this amphipod is a seep at a Girl Scout camp (Camp Scott), 3.2 mi (5.1 km) south of Locust Grove, Mayes County. Hubricht (1943) collected 22 specimens of amphipods at this seep and erroneously reported them as *Sympleonia*

*clantoni*. Holsinger (1967) later referred 17 of these specimens to the new species, *Stygobromus bowmani*, and the remaining five to *Stygobromus ozarkensis*. To date, this is the only known collection site for this stygobite species.

#### Isopoda: Asellidae

*Caecidotea acuticarpa* Mackin and Hubricht, 1940—a cave obligate isopod. S1, G2.

Mackin and Hubricht (1940) originally described this isopod from Byrd's Mill Spring, Pontotoc County. Lewis et al. (2006), in a synopsis of subterranean asellids of Oklahoma, reported it was also known from Johnston, Murray, and Seminole counties. This species is endemic to the Arbuckle–Simpson Uplift of the state where it has been found in 21 sites (Graening et al. 2011). A photograph of *C. acuticarpa* can be found in Graening et al. (2011).

*Caecidotea adenta* (Mackin and Hubricht 1940)—a cave obligate isopod. S1, G1.

The type locality of this isopod is a deep limestone sink cave, 15 mi (24.1 km) south of Mountain View in the Wichita Mountains, Kiowa County. A total of five males and five females were collected by J. Mackin in November 1936 (Mackin and Hubricht 1940). More recently, a female specimen of a subterranean *Caecidotea* was collected from Panther Creek CCC Cistern in the Wichita Mountains in Comanche County. The slender gnathopod of this specimen suggests it is *C. adentata*; however, collection of a male is necessary to confirm this tentative identification (Graening et al. 2007). Therefore, *C. adenta* is a stygobitic isopod thus far known from a single site in Kiowa County (Lewis 1982, 2001; Lewis et al. 2006; Graening et al. 2007, 2011).

*Caecidotea mackini* Lewis, 2006—Long's Cave isopod. S1, GNR.

The type locality of *C. mackini* is Long's Cave, ca. 7.5 mi (12 km) south of Jay, Delaware County (Lewis et al. 2006). Entry into the system supporting *C. mackini* requires

snorkeling gear at low base-flow conditions (Lewis et al. 2006). Graening et al. (2011) provided a photograph of *C. mackini*.

*Lirceus trilobus* Hubricht and Mackin, 1949—an isopod. S1, GNR.

The type locality of this isopod is woodland pools, Girl Scout camp (Camp Scott), 3.2 mi (5.1 km) south of Locust Grove, Mayes County (Hubricht and Mackin 1949). *Lirceus trilobus* is so far known only from the type locality (Graening et al. 2007).

#### Isopoda: Trichoniscidae

*Amerigoniscus centralis* Vandel, 1978—Cave sow bug. S1, G1.

This troglobitic species has been found only at the type locality in Murray County at Wagon Wheel Cave, Turner Falls Park (Vandel, 1978; Graening et al. 2007). It is a cave obligate species.

*Miktoniscus oklahomensis* Vandel, 1965—a cave obligate isopod. S1, G1.

This troglobitic species (formerly considered *Miktoniscus racovitzai oklahomensis*) is a single-site state endemic known from Wild Woman Cave, Murray County (Vandel 1965). Vandel (1965) reported that the nominate subspecies, *M. r. racovitzai* Vandel 1950, occurs in caves in Virginia and Kentucky (Graening et al. 2007). A photograph of *M. oklahomaensis* was provided by Graening et al. (2011).

#### Decapoda: Cambaridae

*Cambarus subterraneus* Hobbs III, 1993—Delaware County cave crayfish. S1, G1.

This crayfish species is known only from four sites in three separate caves (Jail, Star and Twin [type locality]) in Delaware County (Hobbs 1993; Graening and Fenolio 2005; Graening et al. 2011). Extensive searches have been conducted to locate additional *C. subterraneus* populations in other caves, but so far none have been recorded (Graening and Fenolio 2005). A photograph of *C. subterraneus* was provided by Graening et al. (2011).



*Cambarus tartarus* Hobbs Jr and Cooper, 1972 – Oklahoma cave crayfish. S1, G1.

This crayfish was described from the type locality, January–Stansberry Cave system, 4.0 mi (6.4 km) north of Colcord, Delaware County (Hobbs and Cooper 1972). Fortunately, this cave system is under the protection of the U.S. Fish and Wildlife Service as part of its Ozark Plateau National Wildlife Refuge. The species was also recently reported from Long’s Cave (an additional cave but fragmented system) but it is still restricted to three subterranean waterways in the Spavinaw Creek drainage of Oklahoma (Graening et al. 2006a). In addition, previous state records of the bristly cave crayfish (*Cambarus setosus*) have been assigned to other Oklahoma species, either *C. subterraneus* or *C. tartarus* (Jones et al. 2005). The Oklahoma cave crayfish is a state listed endangered species (ODWC 2012) because its geographic range is extremely small and it is vulnerable to groundwater pollution or alteration in a relatively limited area. Photographs of *C. tartarus* can be found in Graening et al. (2011).

*Orconectes difficilis* (Faxon, 1898) – Painted Crayfish. S3, G3.

The type locality of this freshwater crayfish is McAlester, Pittsburg County (Faxon 1898). *Orconectes difficilis*, formerly included four subspecies (*O. difficilis blacki*, *O. difficilis maletae*, *O. difficilis hathawayi*, *O. difficilis difficilis*) (Walls, 1985), all of which have been elevated to full species status (see Fitzpatrick 1987; Hobbs 1989). As such, the species currently occurs in Atoka, Latimer, and Pittsburg counties. *Orconectes difficilis* had been recorded from Prairie Grove, Washington County, Arkansas; however, not only was Williams’ (1954) attempt to collect additional material of *O. difficilis* from Prairie Grove unsuccessful, but he did not find the species anywhere else in Arkansas during his survey. Recent collections by the senior author (HWR) and previous collections by R. W. Bouchard in the Prairie Grove area also failed to produce any *O. difficilis*.

We agree with Williams’ questioning the inclusion of *O. difficilis* as part of the Arkansas fauna based upon the Prairie Grove record and consider it not to be part of the Arkansas crayfish fauna as did Bouchard and Robison (1980).

*Orconectes saxatilis* Bouchard and Bouchard, 1976 – Kiamichi Crayfish. S1, G2.

The Kiamichi crayfish was originally described from Pigeon Creek at state highway 63, Le Flore County (Bouchard and Bouchard 1976). Recent surveys located the species in six new streams in the Kiamichi River watershed, all in Le Flore County (Taylor et al. 2004; Jones and Bergey 2007).

## Diplopoda

### Chordeumatida: Trichopetalidae

*Trigenotyla blacki* Shear, 2003—a milliped. S1, G1.

This milliped is known only from caves in Adair and Delaware counties; the type locality is Stansbury–January Cave, Delaware County (Shear 2003). It is the only true troglobitic milliped known from Oklahoma.

*Trigenotyla seminole* Shear, 2003—a milliped. SNR, GNR.

This milliped is known only from caves in Seminole County, all north of the Canadian River; the holotype is from Whiskey Cave (Shear 2003). Although this species has never been found yet on the surface, it is considered to be troglomorphic (Shear 2003).

*Trigenotyla vaga* Causey, 1959—a milliped. SNR, GNR.

Causey (1959) originally described this milliped from “a river ravine” in Latimer County. Other localities are caves in Johnston and Murray counties and an epigeal site in Le Flore County (McAllister and Shelley 2003; Shear 2003). All of these *T. vaga* records are from south of the Canadian River. The species is expected to be eventually found in Arkansas and/or Texas so its status as an Oklahoma endemic may change in the future.

## Chordata

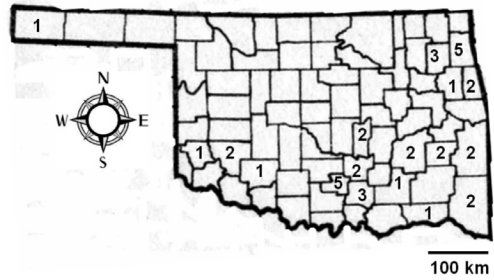
### Vertebrata: Amphibia: Plethodontidae

*Plethodon sequoyah* Highton in Highton, Maha and Maxson, 1989 –Sequoyah slimy salamander. S2, G2.

This salamander is known only from the type locality in Beavers Bend State Park (BBSP), McCurtain County, at an elevation of 140 m (Highton et al. 1989; Huntington et al. 1993; Sievert and Sievert 2011). Interestingly, the junior author (CTM) has observed a thriving population of *P. sequoyah* under rocks and decaying logs along trails in BBSP over the past two decades. The species is a morphological form of the *Plethodon glutinosus* multiple species complex as defined by Highton (1989) and genetic differences and/or range are the only reliable means of separating *P. sequoyah* from similar species (i.e., *Plethodon albagula* or *Plethodon kiamichi*). Indeed, a single specimen of a supposed *P. sequoyah* was reported from extreme southwestern Arkansas (DeQueen Lake, Sevier County) by Trauth et al. (2004, see Fig. 112). This site is only ca. 20 mi (32.2 km) due east of BBSP and at a similar elevation (150 m). However, molecular analysis is necessary to confirm this finding. In the absence of such, we tentatively list *P. sequoyah* as a true endemic of Oklahoma.

## DISCUSSION

In summary, Oklahoma has 20 endemic taxa, including three vascular plants and 17 animals that are endemic to 17 of 77 (22%) counties of the state (Fig. 1). When the 12 ecoregions of the state are examined (OFS 2012), the majority of endemic species are found in the Ozark Highlands (within subterranean habitat) and the Cross Timbers (Fig. 1). In addition, most endemic forms are found in counties in eastern Oklahoma with the fewest species in the northwest, northcentral, and the panhandle of Oklahoma (Fig. 1). We are also aware that there will eventually be future addition of several new species of stygobionts and troglobionts that inhabit groundwater and subterranean habitat to Proc. Okla. Acad. Sci. 92: pp 21-28 (2012)



**Figure 1.** County outline map of Oklahoma with number of endemic species noted for each county.

the state endemic fauna (see Graening et al. 2011, Tables 4.3, 4.5); they include those in the genera *Chaetaspis* (milliped), *Foveacheles* (mite), *Litocampa*, *Occasjapyx*, *Podocampa*, and *Tricampa* (bristletails), *Microcylloepus* (beetle), *Pseudosinella* and *Pygmarrhopalites* (springtails), and *Stygobromus* (amphipod). Continued protection of these state endemic forms is strongly urged as well as unique natural resources, especially subterranean ecosystems.

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