

## ROBBER FLIES (DIPTERA: ASILIDAE) OF ARKANSAS, U.S.A.: NOTES AND A CHECKLIST<sup>1</sup>

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**ABSTRACT:** A checklist of 131 species of robber flies from Arkansas is presented. It includes 101 species studied by the authors, of which 66 species are here recorded for the first time from the state. Seven more species have been recorded in the literature, and 23 species that might occur in the state have never been recorded. The Arkansas robber fly fauna has close affinities with the fauna of the eastern United States. Distributional notes are given for several species, and biological notes are presented for *Orthogonis stygia*. *Ceraturgus fasciatus* is resurrected from synonymy with *C. cruciatus*.

**KEY WORDS:** Robber flies, Asilidae, Arkansas, *Ceraturgus fasciatus*, *Orthogonis*, *Zabrops*

Robber flies comprise one of the most taxonomically diverse, speciose, and conspicuous families of Diptera. More than seven thousand species have been described worldwide, and about one thousand are known to occur in the Nearctic Region (Geller-Grimm 2005, Poole 1996). Most species have restricted ecological requirements and are rather locally distributed. Within their broader ranges, individuals tend to be found in isolated, local colonies (Martin 1965).

Most North American robber flies are associated with dry, open habitats, and the family has a predominantly southern and western distribution. Asilids have been collected from short, mixed, and tallgrass prairies, glades, savannas, and open woodlands. Adult robber flies are opportunistic, aerial predators of many kinds of insects. Upon seizing its prey, the fly kills it with paralyzing saliva injected through its hypopharynx. The liquefied contents of the victim are then sucked up through the proboscis. Certain robber fly species seem to prefer bumblebees, wasps, dragonflies, grasshoppers, or beetles. The larval stage is spent in the soil, among plant roots, or in decaying stumps and logs, usually within the galleries of wood-boring insects. Asilid larvae are predators or ectoparasites that feed on eggs, larvae, or pupae of other insects. Larvae of most species that have been reared feed on white grubs (Coleoptera: Scarabaeidae), but some have been known to prey on larvae of other beetle families, Hymenoptera, Diptera, or Orthoptera eggs (Knutson 1972, Lavigne et al. 1978, Wood 1981, Foote 1991).

Their specialized habitats and other species-specific specializations, together with their ecological roles as primary predators among the insects, make robber flies significant elements of the ecosystem. Along with butterflies (Lepidoptera), tiger beetles (Coleoptera: Carabidae), and dragonflies (Odonata), robber flies are increasingly viewed as a focal group of conservation concern.

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Due to the dependence of some species on much-reduced habitat types, such as prairies, there is concern that several species may have experienced population declines. In general, grasslands support a highly diverse robber fly fauna, and perhaps the most serious historic anthropogenic stress on robber fly populations has been the destruction of grasslands by farming, overgrazing, fire suppression, vehicular traffic, and introduction of weeds. Forest species may be adversely affected by logging operations, especially those that remove woody debris used as breeding sites by asilid larvae. Of the 101 species of Asilidae recorded from Canada's Montane Cordillera Ecozone, 8 are considered endangered, threatened, or vulnerable. Most of these species are associated with vanishing grasslands (Cannings 1998). In Finland, some robber flies have declined due to changes in forestry and agricultural practices (Väisänen 1982).

To date, there has been no systematic inventory of robber flies in Arkansas. Before 2005, only 42 species from Arkansas had been recorded in the published literature. *Ceraturgus cruciatus* (Say) was the first species recorded from the state. Say (1823) described it as *Dasyopogon cruciatus* from "Arkansa." Up to 1964, only 4 more species were recorded (Back 1909, Wilcox 1936b, 1960, Martin 1957). That year, Whitcomb and Bell (1964) identified 21 species (excluding one misidentification) of Asilidae from Arkansas cotton fields, all new records for the state. The specimens they collected form the core of the University of Arkansas Arthropod Museum (UAAM) robber fly collection. Their *Nerax rufibarbis* (Macquart) is a junior synonym of *Efferia pogonias* (Wiedemann), and their *Proctacanthella leucopogon* (Williston) is apparently misidentified *Philonicus rufipennis* Hine. The following year, Martin (1965), unaware of the 1964 report, was able to tally only 12 species from Arkansas, and he also found other states bordering the Mississippi River to have a dearth of species. Scarbrough (1972) recorded 22 species found in the northeastern part of the state. Twelve of those were new state records. Scarbrough's Arkansas specimens are now at the National Museum of Natural History and the University of Arkansas Arthropod Museum. Accomplished robber fly taxonomist Joe Wilcox recorded *Ceraturgus cornutus* (Wiedemann) from Arkansas in an unpublished generic revision dated 1975. Adisoemarto and Wood (1975) recorded one more species, Bullington (1986) recorded two, and Warriner (2004) recorded one. Several more records appear in the unpublished draft *Catalog of the Robber Flies (Diptera: Asilidae) of the Nearctic Region* by Eric M. Fisher and Joe Wilcox dated 1997. Recent collecting and analysis have revealed that Arkansas has a fauna of more than one hundred recorded robber fly species, plus another 20% of that number that potentially occur here but have not yet been found.

Artigas and Papavero (1997) subdivided the genus *Efferia*. They placed some species in old genera, including *Nerax*, which had been treated as a synonym. They also described five new genera – *Albibarbefferia*, *Aridefferia*, *Carinefferia*, *Pogoniefferia*, and *Tuberculefferia* – to receive other species. The latest catalog of robber fly genera recognizes all of these genera (Geller-Grimm 2003).

However, we feel that the subdivision of *Efferia* was based on insufficient evidence and continue to use *Efferia sensu lato*.

### METHODS

Specimens were keyed to genus using Wood's (1981) key, and they were keyed to species using the references cited therein or more recent works. The unpublished draft catalog of Nearctic robber flies was indispensable for determining which species probably occur in Arkansas. Specimens from the following collections were studied: California Academy of Sciences, Department of Entomology, San Francisco (CASE); Hot Springs National Park Collections, Hot Springs, Arkansas (HSNP); Louisiana State Arthropod Museum, Department of Entomology, Louisiana State University, Baton Rouge (LSAM); Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts (MCZH); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (NMNH); K.C. Emerson Museum, Oklahoma State University, Stillwater (OSEC); Snow Entomological Collections, University of Kansas Natural History Museum, Lawrence (SEMC); and the University of Arkansas Arthropod Museum, Department of Entomology, Fayetteville (UAAM).

### DISTRIBUTIONAL, TAXONOMIC, AND BIOLOGICAL NOTES

Notes are here provided on several species for which our records significantly extend the known ranges, provide new biological or taxonomic information, or correct inaccurate published data. These notes are arranged alphabetically by species name.

#### *Atomosia punctifera* Hermann

This taxon was described by Hermann (1912) as a Mexican variety of *Atomosia rufipes* Macquart. Fisher and Wilcox raised it to species rank in their unpublished catalog and recorded it from Kansas to Texas and Mississippi as well as Mexico. Beckemeyer (2001), under the influence of the Fisher and Wilcox catalog, published this new status without annotation or comment.

*Atomosia punctifera* has not been recorded from Arkansas, although it occurs in at least two neighboring states.

#### *Ceraturgus cornutus* (Wiedemann)

Arkansas: Benton County, 7 June 1933, 1 female, S. A. Summerland, UAAM.

In his unpublished revision of *Ceraturgus*, Joe Wilcox recorded the following specimens from Arkansas: Washington County: 5 June 1960, 12 June 1939 and 17 June 1941, one with a second label, *Oenothera*, 3 females, UAAM (examined by JW, now apparently lost).

***Ceraturgus fasciatus* Walker**

Unpublished revisionary work on the genus *Ceraturgus* by the senior author has resulted in *Ceraturgus fasciatus* being resurrected from synonymy with *C. cruciatus* (Say). The Midwestern species *Ceraturgus cruciatus* has not been recorded from Arkansas since Say (1823) described it from the state. *Ceraturgus fasciatus* has not been recorded from Arkansas, although it is known from nearby localities in Mississippi. From there its range extends to the Northeast. The ranges of the two species apparently do not overlap.

***Cyrtopogon lutatius* (Walker)**

Arkansas: Logan County, Mt. Magazine State Park, N 35°10.550' W 93°37.063', oak-hickory forest, 4-18 May 2004, 1 female, J. K. Barnes, UAAM; Pulaski County, Little Rock, flight intercept trap, 10 April 1998, 1 female, B. Baldwin, UAAM.

*Cyrtopogon lutatius* was previously known from Michigan to Nova Scotia, south to Pennsylvania (Martin and Wilcox 1965). These Arkansas records significantly extend the southwestern corner of the known range.

***Diogmites angustipennis* Loew**

Some Arkansas *Diogmites* specimens could be identified as *D. symmachus* Loew using existing keys (Bromley 1936b, Artigas 1966). We are considering these to be light colored variants of *D. angustipennis*. Loew (1866) described *D. angustipennis* in 1866 from two relatively robust and dark colored females collected in Kansas. A few years later, he described *D. symmachus* Loew from two smaller, light colored specimens collected in Texas, both a male and a female (Loew 1872). In females from both type series, abdominal tergites 1-5 and the corresponding sternites are dull and pollinose, whereas tergites 6-8 and the corresponding sternites are glabrous except for the lightly pollinose extreme lateral edges of tergite 6. *D. angustipennis* is common and widespread in Arkansas. In a similar, but as yet undescribed, species, females have abdominal tergites 1-6 pollinose and dull dorsally, tergites 7-8 glabrous dorsally and dull laterally, and all abdominal sternites pollinose and dull. This new species is apparently rare in Arkansas, occurring only in the southwest portion of the state, but it is widespread from Colorado and Kansas south to the United States border from California to Louisiana. More will be said about synonymy, and the new species will be described, in a future publication.

***Diogmites discolor* Loew**

Arkansas: Garland County, Hot Springs, 13 August 1962, 1 female, E. Cochran, OSEC; Montgomery County, Mt. Ida, 23 July 1963, 1 male, M. E. Cochran, UAAM.

Most recorded specimens of *D. discolor* have been collected from Ohio and Kentucky east to Massachusetts and Virginia, but the species has also been

recorded from Alabama (Artigas 1966, Martin and Wilcox 1965). These records extend the southwestern border of the known range.

***Echthodopa formosa* Loew**

Arkansas: Craighead County, Craighead Forest Park, woodland trail, 22 April 2004, 1 male, N. Lavers, UAAM; Greene County, Crowley's Ridge State Park, woodland path, 10 May 2004, 1 male, N. Lavers, UAAM; Poinsett County, Lake Hogue, open woodland, understory in sun, 15 April 2004, 2 males, N. Lavers, UAAM.

*Echthodopa formosa* was previously known to range from Massachusetts to Mississippi (Adisoemarto and Wood 1975).

***Echthodopa pubera* Loew**

Arkansas: Boone County, Baker Prairie Natural Area, 30 May 2003, 1 male, M. D. Warriner, UAAM.

This is the most southeastern record for this species (Adisoemarto and Wood 1975).

***Efferia kansensis* (Hine)**

Arkansas: Crawford County, 19 June 1964, 2 males, 1 female, UAAM; ex *Desmodium*, 6 July 1970, 1 male, P. Tugwell, UAAM; 6 August 1970, 1 male, P. Tugwell, UAAM.

*Efferia kansensis* was previously known only from Kansas, Oklahoma, and Texas (Wilcox 1966).

***Efferia prairiensis* (Bromley)**

Arkansas: Greene County, Scatter Creek Wildlife Management Area, path in grassland, 16 June 2004, 1 female, N. Lavers, UAAM; Poinsett County, Lake Hogue, 26 July 2003, 1 male, N. Lavers, UAAM.

*Efferia prairiensis* was previously known only from Kansas, Oklahoma, and Texas (Wilcox 1966).

***Efferia texana* (Banks)**

Arkansas: Calhoun County, 2 July 1964, 1 female, UAAM; Garland County, Hot Springs National Park, 18 June 1961, 1 female, HSNP; Montgomery County, Richardson Bottoms, 5 September 2003, 1 female, T. D. Marsico, UAAM; Pulaski County, 22 May 1965, 1 female, H. R. Dodge, UAAM; 12 June 1965, 1 male, H. R. Dodge, UAAM.

*Efferia texana* was previously known from Oklahoma, Texas, and Arizona (Wilcox 1966).

***Heteropogon macerinus* (Walker)**

Arkansas: Cross County, Village Creek State Park, 9 September 2003, 1 female, N. Lavers, UAAM; 25 August 2005, 1 female, N. Lavers, UAAM; Craighead County, Bono Bog, 26 August 2005, 1 female, N. Lavers, UAAM.

*Heteropogon macerinus* was previously recorded from New York to Kentucky (Martin and Wilcox 1965).

***Laphria affinis* Macquart**

Arkansas: Pulaski County, Little Rock, Malaise trap, 4 October 1999, 1 male, B. Baldwin, UAAM.

Most species of *Laphria* fly in late spring or early summer. *Laphria affinis*, however, flies in late summer and fall. It was previously recorded from Massachusetts to Georgia and Louisiana (Bromley 1934b, Martin and Wilcox 1965). McAtee and Banks (1920) found this species to be plentiful in Washington, D.C., in autumn, and they identified two prey species, one a staphylinid beetle and the other a chrysomelid beetle. Bromley (1934b) found this species to be quite common at Chadbourne, Columbus County, North Carolina, in September and October 1925. One individual fed on a lampyrid beetle.

***Laphria divisor* (Banks)**

Arkansas: Stone County, Sylamore Creek, trail, open woodland, understory in sun, 5 May 2004, 1 male, N. Lavers, UAAM.

*Laphria divisor* was previously known from Ontario, Maine to Wisconsin, and south to North Carolina and Illinois (Martin and Wilcox 1965, Skevington 1999).

***Laphria vorax* (Bromley)**

Arkansas: Boone County, Baker Prairie Natural Area, Jenkins Road, east section, 11 July 2002, 2 males, M. D. Warriner, UAAM; Baker Prairie Natural Area, 2 July 2003, 1 male, M. D. Warriner, UAAM; Franklin County, Cherokee Prairie Natural Area, 19 May 2003, 1 female, M. D. Warriner, UAAM; H. E. Flanagan Prairie Natural Area, 3 June 2003, 2 males, M. D. Warriner, UAAM.

*Laphria vorax* was previously known from the prairie states Nebraska, Iowa, Kansas, and Oklahoma (Bromley 1934b). The Arkansas records are all from prairie remnant habitats.

***Leptogaster atridorsalis* Back**

Arkansas: Carroll County, Urbanette, N 36°25.064' W 93°28.574', 2-9 July 2004, 1 male, J. K. Barnes, UAAM; Craighead County, 21 June 2005, 1 male, N. Lavers, UAAM; Hempstead County, Rick Evans Grandview Prairie, N 33°48.076', W 93°48.082', 25 May-2 June 2004, 1 male, J. K. Barnes, UAAM.

*Leptogaster atridorsalis* was previously thought to be confined to a rather small area from southern Pennsylvania to North Carolina and westward as far as Indiana (Martin 1957).

***Machimus virginicus* (Banks)**

Arkansas: Clay County, Chalk Bluff, 30 June 2005, 1 male, N. Lavers, UAAM; Cleburne County, Cherokee Wildlife Management Area, logging road, near pasture, 15 June 2004, 1 male, H. Raney, UAAM; Craighead County, Bono Bog, 22 May 2003, 1 male, 1 female, N. Lavers, UAAM; Craighead Forest Park, 10 May 2003, 1 male, N. Lavers, UAAM; 23 May 2004, 2 males, 1 female, N. Lavers, UAAM; Jonesboro, 28 May 2005, 1 male, 1 female, N. Lavers, UAAM; 1 June 2005, 1 male, N. Lavers, UAAM; Cross County, Village Creek State Park, woodland, 11 June 2004, 1 male, 1 female, N. Lavers, UAAM; Greene County, Crowley's Ridge State Park, 26 May 2003, 1 male, N. Lavers, UAAM; 17 June 1971, 2 males, 2 females, A. G. Scarbrough, UAAM; Scatter Creek, woodland edge, 14 May 2005, 1 female, N. Lavers, UAAM; Scatter Creek Wildlife Management Area, 27 May 2005, 1 male, 1 female, N. Lavers, UAAM; Newton County, woodland trail near Pruitt, 5 June 2004, 2 males, 1 female, N. Lavers, UAAM; Buffalo National River, Cecil Cove Trail, 3 km NW Erbie, 24-28 June 1994, 1 female, C. E. Carlton, UAAM; Perry County, 2 mi. NE Lake Sylvia, 16 June 1993, 1 male, C. E. Carlton, UAAM; Pope County, Piney Creeks Wildlife Management Area, 18 June 2005, 1 male, N. Lavers, UAAM; Scott County, Mill Creek, 5 mi. E of Y City, 21 May 1978, 1 male, G. W. Byers & C. W. Young, SEMC.

Scarbrough (1972) reported *M. notatus* (Wiedemann) from Arkansas, but his specimens are more likely referable to *M. virginicus*. McAtee and Banks (1920) found *M. notatus* and *M. virginicus* to be similar species, distinguishable by characters of the male genitalia. Inspection of the male genitalia of Scarbrough's specimens, and all other male specimens collected in Arkansas, reveals that each half of the epandrium (= superior forceps) has the apex projecting straight backwards as in *M. virginicus*, not downturned as in *M. notatus*.

***Megaphorus clausicellus* (Macquart)**

Whitcomb and Bell (1964) recorded this species from Arkansas cotton fields. We have not been able to confirm its presence in the state. At UAAM, there is a single specimen of *Megaphorus acrus* (Curran) misidentified as *M. clausicellus*. It was collected in Conway County, 29 July 1959.

***Microstylum morosum* Loew**

Arkansas: Howard County, 1994, 1 female, S. Reeder, UAAM.

Until recently, these giant asilids, up to 50 mm long, were known from only Texas, Oklahoma, Kansas, Colorado, New Mexico, and Arizona (Beckemeyer and Charlton 2000). Warriner (2004) recorded the species from Terre Noire

Natural Area, a blackland prairie remnant near Arkadelphia, Clark County, Arkansas. The specimen recorded here was found in the student collection of Southern Arkansas University, Magnolia, and was presented to UAAM as a gift by Dr. Randall Adams.

***Neoitamus orphne* (Walker)**

Arkansas: Polk County, 21-24 April 1998, 1 female, V. L. Moseley, LSAM.

*Neoitamus orphne* was previously recorded from Colorado to Wisconsin and Maine, south to North Carolina (Martin and Wilcox 1965).

***Neomochtherus auricomus* (Hine)**

Arkansas: Carroll County, Urbanette, N 36°25.064', W 93°28.574', 24 August-1 September 2004, 1 male, J. K. Barnes, UAAM; Logan County, Mt. Magazine State Park, N 35°10.550', W 93°37.063', oak-hickory forest, 16 August-1 September 2004, 1 male, J. K. Barnes, UAAM; Montgomery County, Crystal Mountain Scenic Area, 22 September 1993, 2 males, C. E. Carlton, UAAM; off Hwy 270 at Co. 527, 23-30 September 1999, 4 males, C. Lewis, UAAM; Pulaski County, Little Rock, in house, 20 September 1996, 1 female, B. Baldwin, UAAM; Little Rock, Malaise trap, 17 September 1998, 2 males, B. Baldwin, UAAM; Little Rock, 21 October 2003, 1 female, B. Baldwin, UAAM; Washington County, near West Fork, 14634 Hwy 170, 22 September 2004, 1 female, J. J. Riggins, UAAM; woods, 25 September 1984, 1 male, B. White, UAAM.

Oklahoma: Grady County, Tuttle, 17 September 2005, 3 females, B. Baldwin, UAAM; 18 September 2005, 2 males, B. Baldwin, UAAM; 2 October 2005, 2 males, 2 females, B. Baldwin, UAAM.

These records represent a significant range extension from the previously known range, which includes Ontario, Illinois, Ohio, Pennsylvania, New Jersey, and Connecticut (Martin and Wilcox 1965, Skevington 1999).

This species was previously placed in the genus *Asilus*. In their unpublished catalog, Fisher and Wilcox moved it to the predominantly Palearctic genus *Neomochtherus*. Skevington (1999) published this combination without comment, apparently under the influence of the Fisher and Wilcox catalog.

***Nicocles pictus* (Loew)**

Arkansas: Cross County, Village Creek State Park, woodland trail, 5 March 2005, 1 female, N. Lavers, UAAM; Washington County, 1959, 1 female, J. Lindsey, UAAM.

*Nicocles pictus* was previously recorded from New Jersey; Washington, D.C.; Georgia; Florida; and Alabama (Martin and Wilcox 1965). It flies early in the season, and it has been known to prey on ants of the genus *Lasius* and the dung beetle *Aphodius femoralis* Say (McAtee and Banks 1920).



***Orthogonis stygia* (Bromley)**

Arkansas: Clay County, Chalk Bluff, fallen oak log, 8 July 2004, 1 male, N. Lavers, UAAM; poison ivy, 14 July 2004, 1 female, N. Lavers, UAAM; Cross County, Village Creek State Park, oak log in deep woods canyonside, 23 July 2004, 1 male, N. Lavers, UAAM; Phillips County, Saint Francis National Forest, 20 July 2005, 1 male, N. Lavers, UAAM; Washington County, Fayetteville vicinity, 25 June 1962, 1 female, L. J. Paulissen, UAAM.

This exceptionally rare robber fly is large, about 2.5 cm long. With its black and metallic blue coloration, it resembles a spider wasp, family Pompilidae. Bromley (1931a) originally described this species in the genus *Laphria*. Hull (1962) placed it in *Smeringolaphria*, but Martin and Wilcox (1965) placed it in *Orthogonis*, and Eric Fisher (personal communication) finds that it is "definitely congeneric with typical *Orthogonis*." The holotype female was collected in Stovall, Granville County, North Carolina, 26 June 1919, and the paratype females were collected in Overt, Jones County, Mississippi, 20 June 1914. All type specimens were from the Hine Collection, Ohio State University. Bromley (1950) later recorded the species from Gainesville, Alachua County, Florida. Taber and Fleenor (2003) recorded two female specimens in the Texas A&M University Insect Collection collected by Bromley in 1934 in Liberty, Texas, and they reported on a single female that they collected in June in the Ottine Swamps of Gonzales County, south central Texas, but they failed to report the day or year of collection and the specimen depository. The specimen was found on a trail in a swamp characterized by green ash, *Fraxinus pennsylvanica* Marshall, and dwarf palmetto, *Sabal minor* (Jacquin) Persoon. Our specimens include the first recorded males.

On 9 July 2004, at Chalk Bluff, Clay County, Arkansas, NL tried to net a male specimen on a rotting oak log. It escaped, but flew only to the other end of the log, where NL succeeded in capturing it. Two days later, on 11 July, examination of about 20 other logs did not turn up any new specimens, but a second male was found upon returning to the original log. This log was in closed-canopy woods consisting of hardwoods, mostly oaks, with dappled shade. The understory was mostly bare, with only dried leaf litter and the occasional seedling or sapling tree. The log attractive to *O. stygia* was well rotted, about 0.5 m in diameter and 12 m long, and lying on an eastward-facing slope of about 30 degrees. The log was oriented up and down the slope, rather than across it. The soil was highly erodible loess, and there was a stream at the bottom of the slope.

When first spotted, the second male was flying along the ground about 2 m from the log carrying a 6-7 mm ichneumonid or braconid wasp. When pursued, the robber fly made frequent, brief flights, but over a period of two hours or more it always landed on or close to the rotting log, as if it was defending its territory. A male *Laphria grossa* (Fabricius) shared the environs of the log, but it was far less active than the *Orthogonis* male.

NL returned to the same area about 10:00 AM on 14 July and found a male *Orthogonis stygia* active on top of, and in the immediate vicinity of, the rotting log, never flying more than about a meter above the ground. It flew beyond the log about 3 m, then it quickly returned carrying an ichneumonid wasp 8 mm long. NL then walked to the ridge top above the log, about 60-70 m from the log, and there in closed-canopy woods with a dense ground cover of poison ivy and other low, woody plants was a female *O. stygia*. This habitat was much richer in potential prey than the areas being guarded by the males. The female escaped NL's first attempt to net it, but like the males, when pursued, she only flew 2-3 m away and then landed on low vegetation. It was eventually netted. NL returned to the log on 17 July and again found a male *O. stygia* seemingly guarding it. It flew beyond the log and returned with an ichneumonid wasp, 6 mm long.

On 23 July, NL visited Village Creek State Park in Cross County, still on Crowley's Ridge, but some 150 km south of the previous site, where he found similar habitat: closed canopy, oak/beechness forest on loess soil in a steep sided ravine. When he approached a large, rotting log, 16-17 m long and 0.5 m in diameter, positioned up and down a 35 degree, east-facing slope, a male *O. stygia* appeared. It performed what appeared to be a wasp-like warning display, buzzing loudly about 0.3 m from his face. This same behavior had been noted in the males observed at Chalk Bluff. When pursued with an insect net, the fly scrambled away two or three times but refused to leave the log. It was finally caught. Further observation on 27 July revealed no more specimens of *O. stygia* at this site.

The following specimen was examined by Eric Fisher (personal communication) at the California Academy of Sciences, San Francisco: Arkansas: Washington County, Cave Creek Valley, 1000 ft., "1955-56," 1 female, M. Hite, CASE. The following three specimens were examined by JKB at the National Museum of Natural History, Smithsonian Institution, Washington, D.C.: Alabama: 1 female [no other data], NMNH; Oklahoma: Muskogee County, Fort Gibson, 21 July 1937, 1 female, Standish-Kaiser, NMNH; and Mississippi: Oktibbeha County, Agricultural College, July 1894, 1 female, H. E. Weed, NMNH.

### ***Proctacanthella leucopogon* (Williston)**

Whitcomb and Bell (1964) reported finding *Proctacanthella leucopogon* in Arkansas, but this record is probably an error. Many specimens of *Philonicus rufipennis* Hine were found at UAAM misidentified as this species.

### ***Stichopogon colei* Bromley**

Arkansas: Little River County, weeds, 4 July 1961, 2 females, UAAM; Perry County, Toad Suck, 7 September 2003, 1 female, H. Raney, UAAM; Toad Suck Park, along sandy Arkansas River beach, 5 September 2004, 1 female, H. Raney, UAAM.

This species was previously recorded only from Texas (Martin and Wilcox 1965). The three species of *Stichopogon* that are known to occur in the central United States are distinguished from other North American species by the lack of marginal hairs or bristles on the scutellum. *Stichopogon trifasciatus* (Say) is readily distinguished by entirely black tibiae and the silvery pollinose abdominal segments 1, 4, and 8 contrasting sharply with the otherwise velvety black abdomen. *Stichopogon colei* Bromley has the tibiae reddish basally, and it has distinctive black or dark brown triangles on tergites 1-7 (Bromley 1934c, Wilcox 1936a). In the specimens that we have seen the frons and vertex are covered with golden brown pollen. *Stichopogon pritchardi* Bromley has the tibiae yellowish basally and the abdomen is fairly uniformly yellowish red (Bromley 1951). The frons is white pollinose, and the vertex usually has at least a transverse line of golden brown pollen at about the level of the ocellar triangle. It is sometimes very difficult to distinguish between *S. colei* and *S. pritchardi*. Further study might prove them to be synonymous.

### ***Zabrops flavipilis* (Jones)**

Arkansas: Pope County, Holla Bend National Wildlife Refuge, NW side, in shaded woods, perching on leaf tops, 5 July 2005, 1 female, H. D. Raney (UAAM).

The habitat was bottomland hardwood, oak, hickory, and cottonwood in full shade with an open understory of ferns, sapling oaks, and poison ivy. It was several hundred yards from the Arkansas River channel, out of the floodplain except for extraordinary flood years. The soil was covered with rich leaf litter and probably a deeper sandy base. The soils are generally moist, with some puddle and pool areas, but they were mostly dried at the time this specimen was collected. Also found perching on leaf tops in the vicinity were *Diogmites neoternatus* (Bromley) and *Machimus antimachus* (Walker).

This species was described from a female holotype specimen collected in Meadow [county unknown], Nebraska (Jones 1907). Published records also exist for Riley County, Kansas (1 male) and Scioto County, Ohio (1 male) (Fisher 1977). E. Fisher (personal communication) provided the following unpublished records: Iowa: Pottawattamie County, Council Bluffs, 19 July 1940, 2 females, F. S. Stancliffe (Larry Bezark Collection); Missouri: Linn County, Pershing State Park, malaise trap, 16 July 2004, 1 female, D. A. Woller (D. A. Woller Collection).

## CHECKLIST

The recorded robber fly fauna of Arkansas comprises 108 species. We have collected, or studied museum specimens of, 101 species, of which 35 were previously recorded from the state, and 66 are here recorded for the first time (names in boldface type). In most cases specimens are deposited in the UAAM. Another 7 species have been reported in the literature, but we have not yet confirmed their presence in the state (names followed by a dagger, †, followed by

the relevant reference), for a total of 108 recorded species. We consider another 23 species to be potential residents of the state, based on known distributions in nearby states (names followed by an asterisk, \*), for a state faunal list consisting of 131 species. We have adopted the subfamily classification found in Geller-Grimm's (2003) world catalog of robber fly genera.

#### Subfamily Apocleinae

- Efferia aestuans* (Linnaeus)
- Efferia albibarbis* (Macquart)
- Efferia apicalis* (Wiedemann)\*
- Efferia bicolor* (Bellardi)\*
- Efferia kansensis* (Hine)**
- Efferia nemoralis* (Hine)
- Efferia plena* (Hine)**
- Efferia pogonias* (Wiedemann)
- Efferia prairiensis* (Bromley)**
- Efferia texana* (Banks)**
- Mallophora orcina* (Wiedemann)
- Megaphorus acrus* (Curran)
- Megaphorus clausicellus* (Macquart)† (Whitcomb and Bell 1964)
- Megaphorus guildiana* (Williston)\*
- Proctacanthella cacopiloga* (Hine)**
- Proctacanthus brevipennis* (Wiedemann)† (Whitcomb and Bell 1964)
- Proctacanthus duryi* Hine
- Proctacanthus hinei* Bromley
- Proctacanthus longus* (Wiedemann)\*
- Proctacanthus milbertii* Macquart
- Proctacanthus rufus* Williston
- Promachus bastardii* (Macquart)
- Promachus fitchii* Osten Sacken
- Promachus hinei* Bromley
- Promachus oklahomensis* Pritchard\*
- Promachus rufipes* (Fabricius)† (Scarborough 1972)
- Promachus vertebratus* (Say)**
- Triorla interrupta* (Macquart)

#### Subfamily Asilinae

- Asilus sericeus* Say**
- Dicropaltum rubicundus* (Hine)
- Machimus antimachus* (Walker)**
- Machimus erythrocnemius* (Hine)**
- Machimus notatus* (Wiedemann)† (Scarborough 1972)
- Machimus paropus* (Walker)**

*Machimus prairiensis* (Tucker)  
*Machimus sadyates* (Walker)  
*Machimus snowii* (Hine)  
*Machimus virginicus* (Banks)  
*Neoitamus flavofemoratus* (Hine)  
*Neoitamus orphne* (Walker)  
*Neomochtherus auricomus* (Hine)  
*Philonicus rufipennis* Hine

Subfamily Dasypogoninae

*Diogmites angustipennis* Loew  
***Diogmites basalis* (Walker)**  
***Diogmites discolor* Loew**  
*Diogmites misellus* Loew  
*Diogmites missouriensis* Bromley  
*Diogmites neoternatus* (Bromley)  
*Diogmites platypterus* Loew  
*Diogmites properans* Bromley\*  
*Diogmites salutans* Bromley\*  
***Diogmites texanus* Bromley**  
***Niocles pictus* (Loew)**  
*Taracticus octopunctatus* (Say)

Subfamily Dioctriinae

***Echthodopa formosa* Loew**  
***Echthodopa pubera* Loew**  
*Eudioctria tibialis* (Banks)

Subfamily Laphriinae

***Andrenosoma fulvicauda* (Say)**  
***Atomosia glabrata* (Say)**  
***Atomosia melanopogon* Hermann**  
*Atomosia puella* (Wiedemann)  
*Atomosia punctifera* Hermann\*  
*Atomosia pusilla* Macquart\*  
*Atomosia rufipes* Macquart  
*Atomosia sayii* Johnson  
***Cerotainia albipilosa* Curran**  
***Cerotainia macrocera* (Say)**  
***Lampria bicolor* (Weidemann)**  
***Lampria rubriventris* (Macquart)**  
***Laphria affinis* Macquart**  
*Laphria aktis* McAtee† (Bullington 1986)

***Laphria apila* (Bromley)**  
***Laphria cinerea* (Back)**  
***Laphria divisor* (Banks)**  
***Laphria flavicollis* Say**  
***Laphria grossa* (Fabricius)**  
*Laphria index* McAtee  
***Laphria ithypyga* McAtee**  
***Laphria lata* Macquart**  
***Laphria macquarti* (Banks)**  
***Laphria saffrana* Fabricius**  
*Laphria sericea* Say\*  
***Laphria sricula* McAtee**  
***Laphria thoracica* Fabricius**  
***Laphria vorax* (Bromley)**  
***Orthogonis stygia* (Bromley)**  
***Pogonosoma dorsatum* (Say)**  
*Pogonosoma ridingsi* Cresson\*

## Subfamily Laphystiinae

*Laphystia bromleyi* Wilcox  
*Laphystia notata* (Bigot)\*  
*Laphystia ochreifrons* Curran\*  
***Laphystia sexfasciata* (Say)**  
*Psilocurus birdi birdi* Curran  
*Psilocurus nudiusculus* Loew  
***Zabrops flavipilis* (Jones)**

## Subfamily Leptogastrinae

***Apachekolos tenuipes* (Loew)**  
*Beameromyia disfascia* Martin\*  
***Beameromyia vulgaris* Martin**  
***Leptogaster aegra* Martin**  
***Leptogaster atridorsalis* Back**  
***Leptogaster brevicornis* Loew**  
*Leptogaster flavipes* Loew\*  
*Leptogaster incisuralis* Loew\*  
*Leptogaster murina* Loew  
***Leptogaster virgata* Coquillett**  
*Psilonyx annulatus* (Say)  
***Tipulogaster glabrata* (Wiedemann)**

## Subfamily Ommatiinae

*Ommatius gemma* Brimley

*Ommatius oklahomensis* Bullington and Lavigne\*  
***Ommatius ouachitensis* Bullington and Lavigne**  
*Ommatius tibialis* Say† (Scarborough 1972)  
*Ommatius wilcoxi* Bullington and Lavigne\*

Subfamily Stenopogoninae

*Ceraturgus cruciatus* (Say)† (Say 1823)  
***Ceraturgus cornutus* (Wiedemann)**  
***Ceraturgus elizabethae* Brimley**  
*Ceraturgus fasciatus* Walker\*  
*Ceraturgus mitchelli* Brimley\*  
***Cyrtopogon lutatius* (Walker)**  
***Heteropogon macerinus* (Walker)**  
*Holopogon guttulus* (Wiedemann)\*  
***Holopogon phaeonotus* Loew**  
*Microstylum morosum* Loew  
*Prolepsis tristis* (Walker)  
***Scleropogon subulatus* (Wiedemann)**

Subfamily Stichopogoninae

***Stichopogon colei* Bromley**  
***Stichopogon pritchardi* Bromley**  
*Stichopogon trifasciatus* (Say)  
*Townsendia nigra* Back\*

Subfamily Trigonimiminae

*Holcocephala abdominalis* (Say)\*  
***Holcocephala calva* (Loew)**  
***Holcocephala fusca* Bromley**

## DISCUSSION

The checklist of Arkansas robber flies now comprises 131 species. It includes 101 species studied by the authors, of which 66 species are recorded for the first time from the state. Seven more species have been recorded in the literature, and 23 species that might occur in the state have never been recorded. Preliminary evidence seems to indicate that Arkansas robber fly biodiversity is greatest in areas with friable soils, such as the loess of Crowley's Ridge and the sands of the riparian habitat at Toad Suck on the Arkansas River.

The Arkansas robber fly fauna shares many species with the fauna of the eastern United States, sharing nearly 60% of its species with Kansas (Beckemeyer 2001), which has a fauna consisting of 122 recorded species and another 14 that might occur there, over half of its species with Michigan, which has a fauna con-

sisting of 72 recorded species and another 7 that might occur there (Baker and Fischer 1975), and over half of its species with Ohio, which has a fauna consisting of 90 recorded species and another 9 that might occur there (Bromley 1931b, 1933, 1934a, 1936a, 1947). In contrast, less than 10 percent of Arkansas' species are shared with Utah, which has a fauna consisting of some 158 recorded species (Nelson 1987). The species shared with Utah tend to be those that occur over all or most of the United States, such as *Stichopogon trifasciatus* (Say), *Triorla interrupta* (Macquart), *Efferia aestuans* (Linnaeus), *E. albibarbis* (Macquart), *Machimus paropus* (Walker), and *Proctacanthus milbertii* Macquart.

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