CADDISFLY (TRICHOPTERA) RECORDS FROM THE APACHE NATIONAL FOREST, EASTERN ARIZONA[1]

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ABSTRACT: Fifty-one caddisfly species were collected from 14 sites in the Apache National Forest in eastern Arizona during May 1998 and June 1999. Of these, 33 are reported from the forest for the first time, five are recorded from the state for the first time, one is tentatively recorded from the United States for the first time, and three are new to science. The level of discovery of unreported species during this limited study suggests that documentation of much of the Arizona fauna remains incomplete.

The caddisfly fauna of Arizona is not well known; even a basic checklist for the state is yet to be compiled. Regional and watershed-level studies have recently documented undescribed species and state records (Gray 1981, Moulton et al. 1994, Govedich et al. 1996, Ruiter 1996, 1999). Approximately 118 species are reported from the state, largely through collections made in the 1940s through the 1960s by D. G. Denning and H. H. Ross and through systematic revisions of certain genera (e.g., Flint 1974, 1984, Gordon 1974, Parker and Wiggins 1985). Approximately 176 and 200 species, respectively, are known from the adjacent states of Colorado (Herrmann et al. 1986) and Utah (Baumann and Unzicker 1981).

Arizona shares affinities with both the Nearctic and Neotropical regions due to its geographic location and the presence of the Rocky Mountains. The southwestern one third of the state is composed of the American and Chihuahuan Desert biotic provinces characterized by desert plains below sea level, isolated mountain peaks, and a hot arid climate with few permanent streams (Figure 1) (Bailey 1980). The Rocky Mountains pass through the northeastern two thirds of the state and give rise to the Colorado Plateau Semidesert and Mountain Semidesert–Alpine Meadow biotic provinces which have higher elevation and a cooler climate. The latter province is characterized by elevation frequently greater than 3500 m, snowfall during the winter, and cool permanent mountain streams. The statewide ecological diversity suggests a diverse and interesting fauna although this might be offset somewhat by Arizona's arid climate.

The Apache National Forest encompasses over one million acres in eastern Arizona all contained within the Mountain Semidesert–Alpine Meadow biotic province (Figure 1). The forest's elevation varies from 1130 to 3710 m and contains habitats ranging from alpine forests and meadows to high desert

[1] Received June 5, 2000. Accepted July 25, 2000.

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plateau and chaparral. There has not been a concerted effort to inventory the caddisflies of the forest. To date, 31 species have been reported, largely through piecemeal collections (Table 1). The purpose of this research was to study the summer-emergent caddisflies of the forest in order to increase the knowledge of the overall statewide fauna.

STUDY SITES

Caddisflies were collected from the following 14 sites within the Apache National Forest. Sites 1–12 were located in Apache County; sites 12–14 in Greenlee County. Latitude, longitude, and elevation were recorded at all sites with a handheld GPS unit. Site numbers correspond to those in Table 2 and Figure 1.

Site 1: Mineral Creek, Forest Road 64, N 34.1810°, W 109.6300°, 2438 m
Site 2: Fish Creek, State Highway 260, N 34.0512° W 109.5430°, 2957 m
Site 3: South Fork, Little Colorado River, South Fork Campground, N 34.0782°, W 109.4104°, 2347 m
Site 4: West Fork, Little Colorado River, Forest Road 575, near Greer, N 33.9938°, W 109.4649°, 2713 m
Site 5: Headwaters, East Fork, Little Colorado River, Forest Road 113, N 33.9312°, W 109.4872°, 2530 m
Site 6: East Fork, Black River, Three Forks Crossing, Forest Road 249, N 33.8550°, W 109.3148°, 2530 m
Site 7: Unnamed Spring into Site #6
Site 8: Nutrioso Creek, U.S. Highway 191, N 33.9185°, W 109.1818°, 2469 m
Site 9: West Fork, Black River, West Fork Campground, N 33.7779°, W 109.4048°, 2438 m
Site 10: East Fork, Black River, Forest Road 276, near Aspen Campground, N 33.8044°, W 109.3194°, 2286 m
Site 11: San Francisco River, Luna Lake Spillway, Forest Road 570, N 33.8280°, W 109.0809°, 2408 m
Site 12: Black River Mainstem, Forest Road 25, N 33.7052°, W109.4526°, 2164 m
Site 13: Blue River, Forest Road 281, near Upper Blue Campground, N 33.6635°, W 109.0917°, 1768 m
Site 14: Blue River, Forest Road 475, N 33.2833°, W 109.1833°, 1280 m

MATERIALS AND METHODS

Larvae and pupae were collected by hand-picking from riverine rocks and woody debris from sites 2 and 4–7 in early May 1998, and from site 8 in late June 1999. Some larvae were preserved in 70% EtOH. The remainder were air-transported to Minnesota where they were reared to adult in a 3 m x 0.6 m x 0.6 m refrigerated tank with simulated ambient temperature, current, and photoperiod.

Adults were collected from sites 1, 3–4, 6, and 8–14 in mid–late June 1999 using either an 8-watt portable ultraviolet light placed over a white enamel pan filled with 70% EtOH, or with two 15-watt ultraviolet lights suspended adjacent to a white bedsheet with subsequent capture of specimens in a cyanide

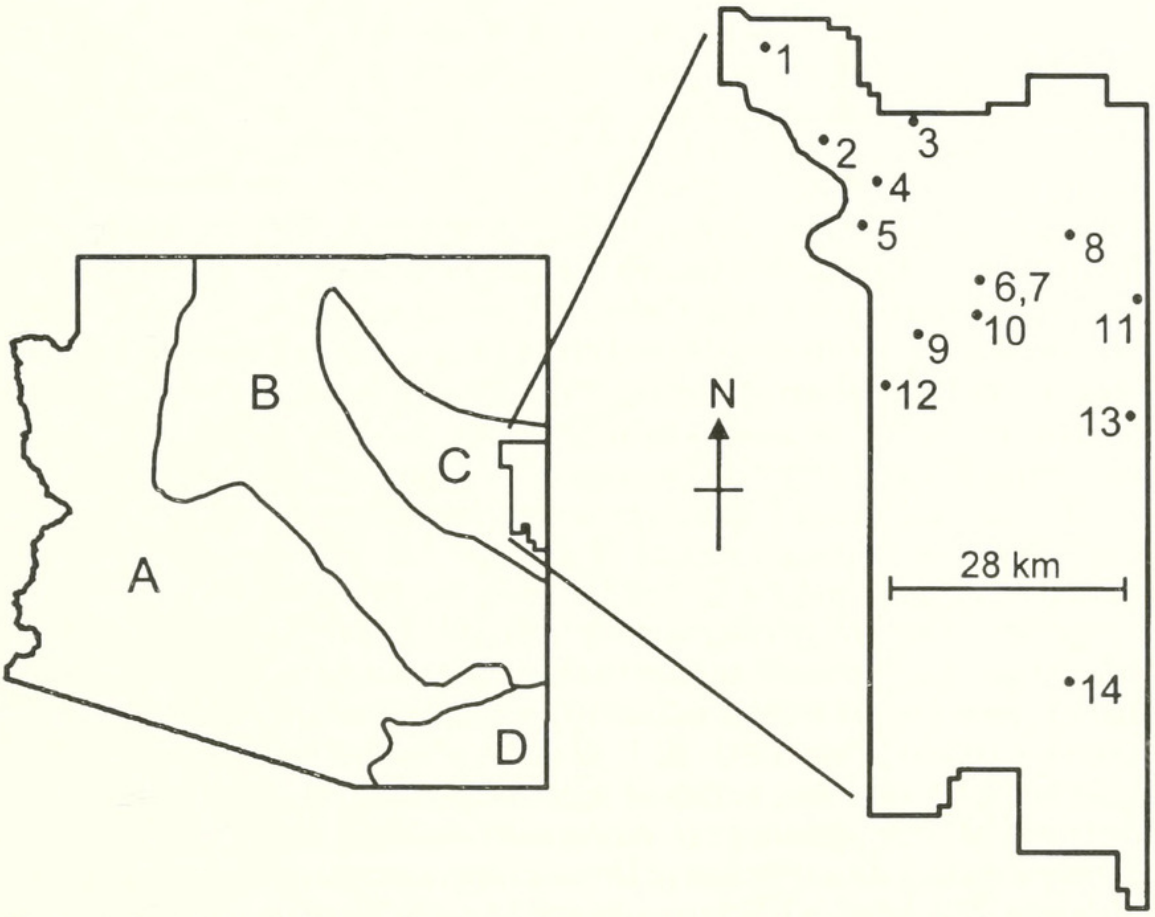

Figure 1. The state of Arizona showing the location of the Apache National Forest and the four biotic provinces occurring within the state, A: American Semidesert and Desert, B: Colorado Plateau, C: Arizona/New Mexico Mountain Semidesert–Alpine Meadow, D: Chihuahuan Desert. Inset: Area of Apache National Forest in greater detail showing collecting localities. Site numbers correspond to Table 2 and "Study Sites" section.

killing jar. Both of these methods were employed shortly before dusk until approximately two hours after dusk. Adults were also collected by diurnal sweeping of riparian vegetation and by passing an aerial net through mating swarms. All specimens mentioned herein are deposited in the University of Minnesota Insect Collection, Saint Paul, Minnesota (UMSP).

RESULTS AND DISCUSSION

Table 2 summarizes the 51 species collected from the 14 localities and denotes forest, state, and country records. Thirty-three species are reported from the forest for the first time, bringing the known total to 46. Sites were not sampled with equal collecting effort so Table 2 should not be interpreted as an exhaustive site comparison.

Five species are reported from Arizona for the first time, all of which have been collected previously from the western United States. *Cheumatopsyche enonis* Ross has been reported from Colorado, Idaho, Montana, Nevada, New

Mexico, Oregon, Utah, and Wyoming (Gordon 1974, Anderson 1976, Roemhild 1982, Ruiter and Lavigne 1985, Herrmann et al. 1986); *Culoptila thoracica* (Ross) from Colorado, New Mexico, Utah, and Wyoming (Flint 1974, Baumann and Unzicker 1981, Waltz and McCafferty 1983); *Micrasema onisca* Ross from California, Nevada, Oregon, and Utah (Ross 1947, Anderson 1976, Chapin 1978, Baumann and Unzicker 1981); *Neotrichia osmena* Ross from Colorado, Utah, and Wyoming (Blickle 1979, Herrmann et al. 1986); and *Protoptila erotica* Ross from Colorado, Montana, New Mexico, Utah, and Wyoming (Baumann and Unzicker 1981, Roemhild 1982, Waltz and McCafferty 1983, Ruiter and Lavigne 1985, Herrmann et al. 1986). The presence of these species in eastern Arizona is not unexpected and the lack of prior documentation probably reflects infrequent regional collecting.

Oecetis metlacensis Bueno, a common Neotropical species ranging from Costa Rica north through Mexico (Flint et al. 1999), is tentatively reported from both Arizona and the United States for the first time. This species is a component of the *Oecetis avara* group which has been the source of considerable taxonomic confusion; species of *O. avara* (Banks), *O. disjuncta* (Banks), and *O. metlancensis* exhibit substantial genitalic similarity (e.g., Smith and Lehmkuhl 1980, Chen 1993, R. J. Blahnik, personal communication). The male genitalia and wing length of specimens collected in this study match those of UMSP specimens of *O. metlacensis* collected from Costa Rica more closely than they do a selection of United States specimens of *O. avara* and *O. disjuncta*. The Arizona specimens do not, however, have the wing spots characteristic of all three species and so it is possible that they might represent an additional, undescribed *O. avara* group species.

Three species new to science were collected in conjunction with this study. *Lepidostoma* sp. 1 known only from its type locality, Site 13, is currently being described by the author (Houghton in press). The two *Neotrichia* species are being described by Keth and Harris as part of a review of the genus and are likely to occur in other areas of the southwestern United States (A. C. Keth, personal communication).

Additionally, two other noteworthy species were collected during this study. *Ithytrichia mexicana* Harris and Contreras was previously known from only five specimens collected from three localities in Arizona, New Mexico, and Tamaulipas, Mexico (Moulton et al. 1999). I collected 128 specimens from Sites 3, 9, and 10 combined suggesting that this species is more common than previously reported. *Limnephilus sperryi* Banks was known previously from the holotype and allotype collected from "the White Mountains of Arizona" (Banks 1943)—both specimens are now missing (Ruiter 1995)—and from three males collected near Greer, Arizona (near Site #4) in 1962 (Ruiter 1995). I reared a single adult male collected during May 1998 from Site #7, an ephemeral snowmelt tributary of Site #6.

Table 1. Caddisflies known from the Apache National Forest prior to 1998 along with the locality reference. All taxa are arranged alphabetically. Specimens were not confirmed.

Taxon	Reference
APATANIIDAE	
Apatania arizonica Wiggins	Ruiter 1996
BRACHYCENTRIDAE	
Brachycentrus americanus (Banks)	Flint 1984
B. occidentalis Banks	Flint 1984
GLOSSOSOMATIDAE	
Culoptila kimminsi Denning	Denning 1965
C. moselyi Denning	Denning 1965
Glossosoma ventrale Banks	Ruiter 1996
HYDROBIOSIDAE	
Atopsyche sperryi Denning	Moulton et al. 1994
HYDROPSYCHIDAE	
Cheumatopsyche arizonensis (Ling)	Gordon 1974
HYDROPTILIDAE	
Hydroptila consimilis Morton	Ross 1944
LEPIDOSTOMATIDAE	
Lepidostoma knulli Ross	Moulton et al. 1994
L. ormeum Ross	Ruiter 1996
L. unicolor (Banks)	Ruiter 1996
LEPTOCERIDAE	
Oecetis disjuncta (Banks)	Ruiter 1996
Ylodes reuteri MacLachlan	Glover 1996
LIMNEPHILIDAE	
Anabolia bimaculata (Walker)	Ruiter 1996
Clistoronia maculata (Banks)	Banks 1943
Hesperophylax magnus Banks	Parker and Wiggins 1985
H. occidentalis (Banks)	Parker and Wiggins 1985
Limnephilus abbreviatus Banks	Ruiter 1996
L. diversus (Banks)	Ruiter 1996
L. frijole Ross	Ruiter 1995
L. lithus (Milne)	Ruiter 1995
L. moestus Banks	Ruiter 1996
L. sperryi (Banks)	Ruiter 1995
L. spinatus Banks	Ruiter 1995
Onocosmoecus unicolor (Banks)	Ruiter 1996
POLYCENTROPODIDAE	
Polycentropus arizonensis Banks	Ruiter 1995
P. gertschi Denning	Ruiter 1996
RHYACOPHILIDAE	
Rhyacophila rotunda Banks	Ruiter 1996
SERICOSTOMATIDAE	
Gumaga griseola (MacLachlan)	Ruiter 1996
UENOIDAE	
Oligophlebodes minutus (Banks)	Moulton et al. 1994

Table 2. The 51 caddisfly species collected from 14 sites within the Apache National Forest, eastern Arizona in 1998 and 1999. All taxa are arranged alphabetically. Forest, state, and national records denoted by single, double and triple asterisks, respectively. Undescribed taxa are in **boldface** type. Site numbers correspond with those in Figure 1 and in the "Study Sites" section.

	Site													
Taxon	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
BRACHYCENTRIDAE														
Brachycentrus americanus (Banks)									X					
B. occidentalis Banks					X									
Micrasema onisca Ross **						X								
CALAMOCERATIDAE														
Phylloicus aeneus (Hagen) *						X								
GLOSSOSOMATIDAE														
Culoptila cantha (Ross) *														X
C. moselyi Denning			X											
C. thoracia (Ross) **										X				X
Glossosoma ventrale Banks				X		X		X	X	X				
Protoptila erotica Ross **														X
HELICOPSYCHIDAE														
Helicopsyche borealis (Hagen) *		X	X	X		X			X	X	X	X	X	X
H. mexicana Banks *		X	X			X								
HYDROBIOSIDAE														
Atopsyche sperryi Denning			X			X			X	X				
HYDROPSYCHIDAE														
Cheumatopsyche arizonensis (Ling)			X			X					X		X	
C. enonis Ross **														X
C. pinula Denning *						X			X	X		X	X	
Hydropsyche auricolor Ulmer *													X	X
H. occidentalis Banks *						X			X	X		X	X	
H. oslari Banks *			X	X		X		X	X	X				
H. venada Ross *	X					X								
Smicridea dispar (Banks) *														X
HYDROPTILIDAE														
Hydroptila arctia Ross *			X			X			X	X		X	X	X
H. hamata Morton *			X										X	
H. rono Ross *			X							X				
Ithytrichia mexicana Harris & Contreras*			X						X	X				
***Neotrichia* sp. 1**						X								X
***N.* sp. 2**												X		X
N. osmena Ross **										X			X	
Ochrotrichia dactylophora Flint *			X							X		X	X	X
O. ildria Denning & Blickle *			X							X				
O. stylata (Ross) *														X
Zumatrichia notosa (Ross) *										X		X		
LEPIDOSTOMATIDAE														
***Lepidostoma* sp. 1**													X	
L. knulli Ross						X			X					
L. ormeum Ross				X										

Table 2 (continued)

Taxon	Site													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
LEPTOCERIDAE														
Nectopsyche stigmatica (Banks) *						X			X					
Oecetis disjuncta (Banks)			X	X		X			X		X		X	X
O. metlacensis Bueno ***						X			X					
Ylodes reuteri (MacLachlan)											X			
LIMNEPHILIDAE														
Clistoronia maculata (Banks)				X										
Hesperophylax magnus Banks								X						
H. occidentalis (Banks)				X	X	X								
Limnephilus lithus (Milne)			X			X			X				X	
L. sperryi (Banks)							X							
ODONTOCERIDAE														
Marilia flexuosa Ulmer *						X				X				
PHILOPOTAMIDAE														
Chimarra ridleyi Denning *														X
C. utahensis Ross *			X			X			X	X				X
POLYCENTROPODIDAE														
Polycentropus arizonensis Banks			X	X					X					
P. halidus Milne *													X	X
PSYCHOMYIIDAE														
Psychomyia flavida Hagen *										X		X		
SERICOSTOMATIDAE														
Gumaga griseola (MacLachlan)			X		X	X		X						
UENOIDAE														
Oligophlebodes minutus (Banks)				X										

Approximately 18% (9 of 51) of the caddisflies collected during this study were previously unknown from Arizona. Other recent regional inventories in the state have had discovery levels of 20% (10 of 49) (Moulton et al. 1994) and 18% (7 of 40) (Ruiter 1996). The discovery of 26 state species records for Arizona in these three limited studies confirms the lack of taxonomic knowledge of the Arizona caddisfly fauna. A total of 124 species have now been reported from the state. There are likely many additional Arizona species and records awaiting discovery in this ecologically diverse state.

ACKNOWLEDGMENTS

J. Ward, Springerville Ranger District, Springerville, Arizona, provided collecting permits 2107-01 and 2107-02 as well as advice on collecting localities. R. M. Newman, Department of Fisheries and Wildlife, University of Minnesota, allowed use of his rearing facilities. R. J. Blahnik, C. R. Parker, and D. E. Ruiter each examined certain specimens and helped confirm the identity of several species. V. F. Lee, California Academy of Sciences, and C. Favret, Illinois Natural History Survey, made available several holotypes. The comments of R. W. Holzenthal, A. L. Prather, and two anonymous reviewers improved earlier versions of the manuscript. This research was supported by grants from the James W. Wilkie Fund for Natural History, James Ford Bell Museum of Natural History, University of Minnesota; the Theodore Roosevelt Fund, American Museum of Natural History; and additional support from the University of Minnesota Insect Collection. To all the preceding individuals and institutions I extend my sincere appreciation. This is paper number 00-117-0019, Scientific Journal Series, Minnesota Agricultural Experimental Station, Saint Paul, Minnesota.

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