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# Current disposition of earwigflies, *Merope tuber* Newman and *Austromerope poultoni* Killington (Mecoptera: Meropeidae), in the Florida State Collection of Arthropods

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**Abstract.** We provide the current holdings of Meropeidae in the Florida State Collection of Arthropods (FSCA). To date, FSCA holds a well-curated collection of extant meropeids representing 17 U.S. states and Western Australia (n = 316 *Merope tuber* Newman, five *Austromerope poultoni* Killington). *Merope tuber* records from Vermont, Texas, and South Carolina are published here for the first time. A total of 298 pinned *M. tuber* and four pinned *A. poultoni*; six *M. tuber* specimens preserved in 95% ethanol; and 12 *M. tuber* and one *A. poultoni* sputter-coated with gold-palladium for SEM are available for researchers interested in studying this unique family of insects.

**Keywords.** Meropeids, systematics, morphology, taxonomy, distribution, biogeography, SEM.

## Introduction

*Merope tuber* Newman, 1838, from North America; *Austromerope poultoni* Killington, 1933, from Western Australia; and *Austromerope brasiliensis* Machado, Kawada, and Rafael, 2013, from the Atlantic Forest biome of Espirito Santo, southeastern Brazil; represent the three known extant species of Meropeidae. An extinct meropeid, *Boreomerope antiqua* Novokschonov, 1995, was described from a compression fossil wing taken from lacustrine claystone in Siberia near Kubekovo Village. Recently, one additional extinct species, *Burmomerope eureka* Grimaldi and Engel, 2013, was described from 99 myo amber found in northern Myanmar. The relationship of the fossil *Sinothauma ladinica* Hong and Zhu, 2007, described from Shaanxi, China, as a meropeid (Hong and Zhu 2007) is dubious (Grimaldi and Engel 2013).

*Merope tuber*, the North American earwigfly, historically has been considered a rare insect and at one time was seldom collected (Esben-Petersen 1915, 1921; Byers 1973, 1993; Kritsky 2011). A single female *M. tuber* was first collected by Edward Doubleday in Trenton Falls, New York in 1837 and subsequently described by Newman (1838; Westwood 1846; Fitch 1872; Somma and Dunford 2007). Fitch (1872) collected additional New York specimens that flew into his cabin, attracted to the lamplight at night. However, in recent years collection records and known geographical range have expanded largely due to passive collection methods using a variety of traps (e.g., pan, picric acid, pitfall, Lindgren funnel,

carbon dioxide, various flight intercepts, molasses, light, glue) (Byers 1973, 2005; Dunford et al. 2007; Barrows and Flint 2009, 2010; Pechal et al. 2011; Somma 2011; Bowles and Sites 2013; Skvarla et al. 2014). Recent active field collections also include finding individuals on carrion (Pechal et al. 2011).

The current known distribution of *M. tuber* includes the eastern deciduous forests or similar relict habitats of eastern and central North America, from southeastern Canada (Ontario and Quebec) southward to the Florida panhandle, and westward to Minnesota, Iowa, eastern Kansas, south to Arkansas, Alabama, and Mississippi (Barnes 1956; Weidner 1964; Byers 1973, 1993; Webb et al. 1975; Pothier 1997; Dunford and Krauth 2005; Schiefer and Dunford, 2005; Cheung et al. 2006; Dunford et al. 2007; Paiero et al. 2010; Somma 2011; Grimaldi and Engel 2013; Skvarla et al. 2014; Schiefer 2015). Although *M. tuber* adults are relatively frequently collected using modern techniques, the larvae remain undescribed and most of its life history remains unknown. Adults are nocturnal, sometimes attracted to lights, mostly spend daylight hours under tree bark, logs and stones, and are often collected in mesic deciduous forests near a water source or along margins of marshes (Byers 1973; Byers and Thornhill 1983; Dunford et al. 2007; Ferrington 2008; Barrows and Flint 2009, 2010; Bowles and Sites 2013), and more recently in tallgrass prairies (Paiero et al. 2010). The phenology of adult *M. tuber* varies depending on geographical location but appears to last throughout the summer months and into late fall–early winter (Maier 1984; Byers 1993; Schiefer and Dunford 2005; Dunford et al. 2007; Barrows and Flint 2009, 2010; Somma 2011).

*Austromerope poultoni*, the Australian earwigfly, is commonly associated with forest litter and appears to be active following rains; however, the larva has not been described, and despite being first collected over 100 years ago, most of its life history remains a mystery (Penniket 1977; Faithfull et al. 1985; Smithers 1988; Abbott et al. 2007). Edward Poulton first took a single specimen from under a stone on 31 July 1914 between Yallingup and Lake Caves west of Forest Grove, Western Australia (Killington 1933). This specimen was deposited in the Oxford University Museum of Natural History and remained undescribed for nearly 20 years until Frederick Killington realized its importance and described it as a new genus and species (Killington 1933; Abbott et al. 2007). Since that time, periodic collection records have been made with relatively significant numbers collected in southwestern Western Australia using pitfall traps and light traps in *Eucalyptus* L'Héritier woodland habitats, with capture records ranging from austral July–December (Abbott et al. 2007; Wills 2008). A significant range extension was noted in 1998, when a single female specimen was taken in sand plain vegetation near Eneabba, Western Australia, 240 km north from the known geographical distribution (Abbott et al. 2007).

Meropidae is one of the best-known relict groups in Insecta and represents an intriguing case in biogeography (Penny 1975; Grimaldi and Engel 2013). The phylogenetic position of meropids may place them close to Eomeropidae (Tillyard 1926, 1935; Grassé 1951; Remington 1968; Grimaldi and Engel 2005, 2013) (but see Friedrich et al. 2013), probably basal to more derived mecopterans (Willmann 1987, 1989; Whiting 2002), and possibly the sister group to Bittacidae (Friedrich et al. 2013). Meropid larval morphology could provide a clue to the proposed phylogenetic link between mecopterans and siphonapterans (Richards 1965; Simiczyjew 2002; Whiting 2002; Grimaldi and Engel 2005; Misof et al. 2014); however, the lack of larval descriptions for Meropidae and Eomeropidae impede an accurate reconstruction of the relationships and evolutionary changes of Mecoptera and related groups (Friedrich et al. 2013). Grimaldi and Engel (2013) hypothesize that the likely explanation for the extremely disparate ranges of the three extant meropid species is due to extinction within intervening areas; thus, meropids represent an interesting and perhaps declining insect lineage with evolutionary insights into some important relationships within the Holometabola. Rix et al. (2015) noted the biogeographical significance of the discovery of *A. poultoni* in southwestern Australia and hypothesized that despite changes in global vegetation during the time of their existence, fauna in this biodiversity hotspot have remained morphologically conservative in evolutionary terms and tolerant of global climate changes.

We report herein the current holdings of two species of Meropidae in the Florida State Collection of Arthropods (FSCA), which we are using, in part, for a future study on biogeography and distribution. Additionally, we encourage collectors/researchers to use these specimen records to continue to pursue studies with the objectives of elucidating additional morphological, distributional, life history, and phylogenetic information about this unique family of insects.

## Materials and Methods

The Mecoptera Collection at FSCA located in the Doyle Conner Center (Division of Plant Industry [DPI], Florida Department of Agriculture and Consumer Services [FDACS]) is adjacent to the University of Florida's McGuire Center for Lepidoptera and Biodiversity (MGCL), Florida Museum of Natural History (FLMNH), and is the largest in the southeastern U.S. The Collection presently contains 20 drawers of mostly pinned mecopteran adults, representing more than 4800 specimens (Dunford et al. 2013; Somma et al. 2014). Moreover, FSCA houses and curates MGCL mecopteran specimens. The Collection has been used extensively in recent years for several studies covering Florida Mecoptera (Dunford et al. 2007; Somma and Dunford 2008, 2009; Somma 2010; Somma et al. 2013, 2014) and *M. tuber* throughout its range in North America (Dunford et al. 2006).

Specimens were examined, counted, and dates, locality, and collector data were recorded from specimen labels. Specimens prepared for scanning electron microscopy (SEM) were sputter-coated with gold-palladium using a Denton Desk Vacuum III and imaged with a JEOL JSM-55-10LV (Low Vacuum) Scanning Electron Microscope. We captured SEM images for this study using accelerating voltages of 11 kV (*M. tuber*) or 14 kV (*A. poultoni*).

In 2004 the collection held only 15 *M. tuber* specimens (representing six states) and has expanded largely due to its discovery in Florida, numerous acquisitions from various states, and resurgence of interest in this insect (Fig. 1–2, 4) (Dunford et al. 2007; Somma et al. 2014). We acquired five *A. poultoni* (Fig. 3, 5–7) from a specimen exchange with the Department of Conservation and Land Management, Western Australia. During this exchange ten *M. tuber* (five males/five females, Essex County, Virginia, collected 9 September–6 October by David R. Smith) were gifted to the Western Australian Museum (WAM) on 27 April 2007.

## Results and Discussion

FSCA holds a sizable and well-curated collection of meropeids representing 17 U.S. states and Western Australia ( $n = 316$  *M. tuber*, five *A. poultoni*; Table 1). At present the collection holds 298 pinned *M. tuber* and four pinned *A. poultoni*; six *M. tuber* specimens preserved in 95% ethanol (Florida, Virginia, West Virginia, and Tennessee); and 12 *M. tuber* (Florida, North Carolina, Tennessee, and Wisconsin) and one *A. poultoni* sputter-coated with gold-palladium for SEM (Table 1).

Many states represented by *M. tuber* specimens housed in FSCA also have been documented or reviewed in previous literature derived from other collections: Massachusetts (Johnson 1913; Byers 1973), New York (Newman 1838; Fitch 1872; Byers 1973), Maryland (Byers 1973; Scarbrough 1980), North Carolina (Brimley 1938; Byers 1973), West Virginia (Byers 1973; Coffman 1982), Virginia (Barber 1904; Byers 1973), Florida (Somma 2011); Kentucky (Byers 1973; Byers and Covell 1981), Tennessee (Caron 1967; Byers 1973), Missouri (Byers 1973), Indiana (Byers 1973), Michigan (Byers 1973; Thornhill and Johnson 1974), Wisconsin (Byers 1973; Dunford and Krauth 2005), and Oklahoma (Byers 1993). Herein we publish for the first time *M. tuber* state records from Vermont, Texas, and South Carolina (Table 1); however, *M. tuber* from Texas and South Carolina previously have been reported from websites (Anonymous 2015; S. Moorman in McLeod 2015).

The meropeid collection at FSCA is a valuable tool providing researchers a significant number of specimens that may be useful for detailed morphological or molecular studies. *Merope tuber* specimens are represented from throughout much of the eastern and midwestern United States, and two Central Plains states (Oklahoma and Texas), offering quick reference to geographical variation that may not be otherwise apparent. Numerous specimens from some limited localities (e.g., Cambridge, New York; Table 1) suggest the presence of earwigfly hotspots that require further investigation. In addition, access to *A. poultoni* specimens allows for further comparison of functional morphologies between two highly disjunct meropeid species (Fig. 4–8). Herein we illustrate previously unreported details of the jugal lobe and associated ridged metanotum on *A. poultoni* (Fig. 7–8) which suggest presumptive functions of stridulatory or wing interlocking mechanisms similar to *M. tuber* (Hlavac 1974; Sanborne 1982; Gorb 1998, 1999; Machado et al. 2013). The function of the greatly elongate male genital claspers (basistyles



plus dististyles: Fig. 3–5) of meropeids remains unknown. We hypothesize they are used to reach around the broad wings of females during courtship and copulation, while simultaneously repelling rival males.

We hope that the preliminary data we provide encourages further work with meropeids and dissemination of associated collections data. This is crucial for a group representing a relict lineage extending from the mid-Mesozoic with only three extant species surviving an extensive extinction (Novokschonov 1995; Grimaldi and Engel 2013). A comprehensive review on the biology and biogeography of *M. tuber* is forthcoming from us.

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TABLE 1. Detailed holdings for meropeids, *Austromerope poultoni* (n=5) and *Merope tuber* (n=316), in the Florida State Collection of Arthropods current 25 December 2015. Data on locality, collection dates, collectors, and determiners were obtained from specimen labels. Some fine details of locality data from specimen labels are not listed. Important locality data not provided on specimen labels are in brackets. Acronyms used for localities on labels are TVA (Tennessee Valley Authority), NRC (Natural Resources Center), TSU (Tennessee State University), and NCRS (Nursery Crop Research Station). All individuals collected from Haywood County, North Carolina (except one male collected by B. A. Harrison); and Blount and Sevier Counties, Tennessee, were from within the Great Smoky Mountains National Park. All individuals collected from Hardy County, West Virginia; and Clarke and Essex Counties, Virginia, were obtained through a specimen exchange with the National Museum of Natural History (NMNH), Smithsonian Institution.

Locality	Dates	Number of Males/Females	Collector(s)
<b><i>Austromerope poultoni</i> – AUSTRALIA:</b>			
WESTERN AUSTRALIA near Yornup, FORESTCHECK Site 5	30 Nov. 2001	2 <sup>♂</sup> /3	I. Abbott, T. Burbidge & A. Wills
<b><i>Merope tuber</i> – U.S.A.:</b>			
VERMONT Bennington Co., Beartown, town of Sandgate	26–27 Sept. 2011	0/3	H. Romack
MASSACHUSETTS Essex Co., Merrimacport	11–16 June 1954	0/1	E. I. Coher
NEW YORK [Tompkins Co.], Ithaca	18 July 1938	0/1	J. G. Franclemont
[Tompkins Co.], Ithaca	8 July 1938	1/0	J. G. Franclemont
Washington Co., Cambridge	1–7 July 2009	6/7	H. Romack
Washington Co., Cambridge	8–15 July 2009	3/11	H. Romack
Washington Co., Cambridge	16–23 July	2/6	H. Romack
Washington Co., Cambridge	23 Sept. 2009	0/1	H. Romack
Washington Co., Cambridge	20 June 2010	2/2	H. Romack
Washington Co., Cambridge	21 June 2010	1/0	H. Romack
Washington Co., Cambridge	22 June 2010	1/0	H. Romack
Washington Co., Cambridge	27 June 2010	2/2	H. Romack
Washington Co., Cambridge	4 July 2010	1/3	H. Romack
Washington Co., Cambridge	11 July 2010	2/8	H. Romack
Washington Co., Cambridge	18 July 2010	1/3	H. Romack
Washington Co., Cambridge	25 July 2010	1/4	H. Romack
Washington Co., Cambridge	1 Aug. 2010	2/6	H. Romack
Washington Co., Cambridge	8 Aug. 2010	1/4	H. Romack
Washington Co., Cambridge	15 Aug. 2010	0/2	H. Romack
Washington Co., Cambridge	22 Aug. 2010	0/1	H. Romack
Washington Co., Cambridge	26 June 2011	1/0	H. Romack
Washington Co., Cambridge	27 June 2011	0/1	H. Romack
Washington Co., Cambridge	2 July 2011	1/0	H. Romack
Washington Co., Cambridge	9 July 2011	1/1	H. Romack
Washington Co., Cambridge	10 July 2011	1/0	H. Romack
Washington Co., Cambridge	12 July 2011	1/0	H. Romack
Washington Co., Cambridge	13 July 2011	0/1	H. Romack
Washington Co., Cambridge	16 July 2011	1/0	H. Romack
Washington Co., Cambridge	17 July 2011	1/0	H. Romack
Washington Co., Cambridge	29 July 2011	2/0	H. Romack
Washington Co., Cambridge	31 July 2011	2/1	H. Romack
Washington Co., Cambridge	1 Aug. 2011	0/1	H. Romack
Washington Co., Cambridge	4 Aug. 2011	1/0	H. Romack
Washington Co., Cambridge	6 Aug. 2011	0/1	H. Romack
Washington Co., Cambridge	12 Aug. 2011	0/2	H. Romack
Washington Co., Cambridge	13 Aug. 2011	0/1	H. Romack
Washington Co., Cambridge	15 Aug. 2011	0/2	H. Romack
Washington Co., Cambridge	18 Aug. 2011	1/0	H. Romack
MARYLAND [Montgomery Co.], Silver Spring	30 July 1970	0/1	D. H. Habeck
NORTH CAROLINA Haywood Co., The Purchase, Ferguson Cabin	15–17 Aug. 2003	0/3 <sup>a</sup>	Gary Steck & Bruce Sutton
Haywood Co., The Purchase, Ferguson Cabin	29 Aug.-5 Sept. 2003	0/1	Gary Steck & Bruce Sutton
Haywood Co., The Purchase, Ferguson Cabin	12–15 Aug. 2003	0/1	Gary Steck & Bruce Sutton
Haywood Co., The Purchase, Ferguson Cabin	11–18 July 2003	0/1 <sup>b</sup>	Gary Steck & Bruce Sutton
Haywood Co., The Purchase, The House	29 Jul.-3 Aug. 2003	0/1	Gary Steck & Bruce Sutton

Haywood Co., The Purchase, The House	8–12 Aug. 2003	0/1	Gary Steck & Bruce Sutton
Haywood Co., The Purchase, The House	20–24 July 2004	1 <sup>b</sup> /0	Gary Steck & Bruce Sutton
Haywood Co., Purchase Knob, unnamed spring	6 Aug. 2003	0/1	Gary Steck & Bruce Sutton
Haywood Co., Hwy 276, S turn on Edwards Cove Rd, Vance Enterprises, N°35.67361, W°83.08472	2 June 2007	1/0	Bruce A. Harrison
WEST VIRGINIA			
Hardy Co., 5 km NE Nathias, 38°55'N, 78°49'W	2–16 July 2002	9 <sup>f</sup> /12 <sup>f</sup>	David R. Smith
VIRGINIA			
Clarke Co., University of Virginia, Blandy Exp. Station, 2 mi S Boyce	21 Aug. –8 Sept. 1993	6 <sup>f</sup> /1 <sup>f</sup>	David R. Smith
Essex Co., 1 mi SE Dunnsville, 37°2'N, 76°48'W	9 Sept. –6 Oct. 1997	11/28	David R. Smith
Louisa Co., Klope Farm, 4 mi S of Cuckoo	1–12 July 1988	1/4	David R. Smith
SOUTH CAROLINA			
Oconee Co.	26 Sept. 1967	0/1	P. J. Ely
FLORIDA			
Liberty Co., The Nature Conservancy, Apalachicola Bluffs Preserve, Travelers Tract	20 April–4 May 1996	2 <sup>c</sup> /0	P. E. Skelley & P. W. Kovarik
Liberty Co., The Nature Conservancy, Apalachicola Bluffs Preserve, Travelers Tract	2–13 June 1996	0/1	P. W. Kovarik
Liberty Co., The Nature Conservancy, Apalachicola Bluffs [Preserve], Travelers Tract	10–24 Aug. 1996	0/1	P. W. Kovarik
Liberty Co., The Nature Conservancy, Apalachicola Bluffs [Preserve], Travelers Tract	7–21 Sept. 1996	0/1	P. W. Kovarik
Liberty Co., The Nature Conservancy, Apalachicola Bluffs [Preserve], Travelers Tract	16–30 Nov. 1996	1/0	P. W. Kovarik
Leon Co., Tall Timbers Research Station, Woodyard Hammock	4–17 May 1996	1/4	P. W. Kovarik
Leon Co., Tall Timbers Research Station, Woodyard Hammock	17–28 June 1996	2/5 <sup>d</sup>	P. W. Kovarik & Zhang X.-c.
Leon Co., Tall Timbers Research Station, Woodyard Hammock	27 July–11 Aug. 1996	3/6	P. W. Kovarik & Zhang X.-c.
Leon Co., Tall Timbers Research Station, Woodyard Hammock	22 Sept.–5 Oct. 1996	1/0	P. W. Kovarik & Zhang X.-c.
Leon Co., Tall Timbers Research Station, Woodyard Hammock	20 Oct.–3 Nov. 1996	2/3	P. W. Kovarik & Zhang X.-c.
Leon Co., Tall Timbers Research Station, Woodyard Hammock	3–17 Nov. 1996	0/1	P. W. Kovarik & Zhang X.-c.
Leon Co., Tall Timbers Research Station, Gays Island	June–July 1996	4 <sup>d</sup> /2	P. W. Kovarik & Zhang X.-c.
KENTUCKY			
“Lyon Co.” [sic, Trigg Co.], TVA, Golden Pond	June 1964	2/0	—
“Lyon Co.” [sic, Trigg Co.], TVA, Golden Pond	June 1964	0/1	—
“Lyon Co.” [sic, Trigg Co.], Golden Pond	25 May–10 June 1964	0/1	Mac Tidwell
“Lyon Co.” [sic, Trigg Co.], Golden Pond	Aug. 1964	1/0	Mac Tidwell
[Madison Co.], Cowbell Creek Area, Berea College Forest	22–29 July 2013	0/1	Chapman & Stedenfeld
[Madison Co.], Horse Cove Rd., Berea College Forest	22–29 July 2013	0/1	Chapman & Stedenfeld
TENNESSEE			
Blount Co., Cades Cove, Abrams Creek	7–9 July 2003	0/1	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Abrams Creek	20–23 July 2003	0/1 <sup>b</sup>	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Abrams Creek	6–8 Aug. 2003	0/1	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Abrams Creek	27 June 2004	1 <sup>c</sup> /0	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Mill Creek	8–10 June 2004	1/0	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Mill Creek	10–18 June 2004	0/1	V. Taylor & A. J. Mayor
Blount Co., Cades Cove, Wildcat Branch	17 July 2003	0/1	A. Nichter
Blount Co., Cades Cove, Wildcat Branch	3 June 2003	0/2 <sup>f</sup>	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Wildcat Branch	22–28 June 2003	1 <sup>b</sup> /0	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Wildcat Branch	17–23 July 2003	0/1	Gary Steck & Bruce Sutton
Blount Co., Cades Cove, Wildcat Branch	27 Jun–2 July 2004	0/1	V. Taylor & A. J. Mayor
Blount Co., Cades Cove, Wildcat Branch	20–23 July 2004	0/1	V. Taylor & A. J. Mayor
Sevier Co., Twin Creeks NRC	2–9 July 2004	0/1	V. Taylor & A. J. Mayor
Sevier Co., Twin Creeks NRC	10–17 Aug. 2004	0/1 <sup>b</sup>	A. J. Mayor
Sevier Co., Twin Creeks NRC	10–17 Aug. 2004	0/1	A. J. Mayor
Sevier Co., Twin Creeks NRC	17–31 Aug. 2004	0/1	A. J. Mayor
Sevier Co., Old Sugarlands [Historic Site], N of Civilian Conserv. Corps Camp	27 June–15 July 2005	0/2 <sup>g</sup>	A. J. Mayor
Warren Co., McMinnville, TSU NCRS	20–28 May 2002	0/1	J. B. Oliver
Warren Co., McMinnville, TSU NCRS	27 May–3 June 2002	1/0	J. B. Oliver
Warren Co., McMinnville, TSU NCRS	27 May–3 June 2002	1/0	J. B. Oliver



Warren Co., McMinnville, TSU NCRS	3–10 June 2002	1/1	N. N. Youssef
Warren Co., McMinnville, TSU NCRS	24–30 June 2002	0/1	N. N. Youssef
Warren Co., McMinnville, TSU NCRS	1–8 July 2002	0/1	J. B. Oliver
Warren Co., McMinnville, TSU NCRS	1–8 July 2002	1 <sup>b</sup> /0	J. B. Oliver
Knox Co., Heiskell, East Bullrun Valley Dr	22 Sept. 2001	1/0	Z. Smith
MISSOURI			
Columbia Co.	7 Sept. 1967	1 <sup>b</sup> /0	—
INDIANA			
Cass Co., Louisville Cement Quarry	4 Aug. 1980	0/1	W. Bicha
MICHIGAN			
Kalamazoo Co., T2S-R12W	13 June 1980	0/2	D. P. Cowan
Kalamazoo Co., T2S-R12W	10 July 1980	1/1	D. P. Cowan
Kalamazoo Co., T2S-R12W	12 July 1980	1/1	D. P. Cowan
Kalamazoo Co., T2S-R12W	13 July 1980	0/2	D. P. Cowan
Kalamazoo Co., T2S-R12W	15 July 1980	0/1	D. P. Cowan
Kalamazoo Co., T2S-R12W	21 July 1994	0/1	D. P. Cowan
Kalamazoo Co., T3S-R10W	28 Aug. 1980	1/0	D. P. Cowan
Kalamazoo Co., T3S-R10W	3 Sept. 1980	0/1	D. P. Cowan
Kalamazoo Co., T3S-R10W	11 Sept. 1980	0/1	D. P. Cowan
Kalamazoo Co.	16 July 1980	1/0	D. P. Cowan
Kalamazoo Co.	1 Aug. 1980	0/1	D. P. Cowan
WISCONSIN			
Lafayette Co., 3 mi N of Argyle	26 June–11 July 2001	0/1	C. M. Brabant
Lafayette Co., 3 mi N of Argyle	26 June–11 July 2001	2 <sup>1</sup> /0	C. M. Brabant
Lafayette Co., 3 mi N of Argyle	11 July–5 Aug. 2001	0/3 <sup>j</sup>	C. M. Brabant
Lafayette Co., 3 mi N of Argyle	5–27 Aug. 2001	0/4	C. M. Brabant
Lafayette Co., 3 mi N of Argyle	5–27 Aug. 2001	3 <sup>8</sup> /0	C. M. Brabant
Lafayette Co., 3 mi N of Argyle	27 Aug. –14 Sept. 2001	0/1	C. M. Brabant
Lafayette Co., 3 mi N of Argyle	27 Aug. –14 Sept. 2001	1/0	C. M. Brabant
Sauk Co., Hemlock Draw	7–13 July 1999	1/1	A. S. Ramsdale
OKLAHOMA			
Latimer Co.	Oct. 1992	1/0	Karl Stephen
Latimer Co.	Sept. 1991	1/0	Karl Stephen
Latimer Co.	Aug. 1990	0/2	Karl Stephen
Latimer Co.	Aug. 1991	0/1	Karl Stephen
TEXAS			
Sabine Co., 9 mi E of Hemphill “beech bottom”	5–17 June 1989	1/1	R. Anderson & E. Morris

<sup>a</sup> One individual illustrated in Dunford et al. 2005, 2006; Dunford and Somma 2008.

<sup>b</sup> Gold-palladium sputter-coated for SEM and illustrated in Dunford et al. 2008.

<sup>c</sup> One individual gold-palladium sputter-coated for SEM and illustrated in this study; the other individual in vial of 95% ethanol.

<sup>d</sup> One individual illustrated Dunford et al. 2007.

<sup>e</sup> Gold-palladium sputter-coated for SEM and illustrated in this study.

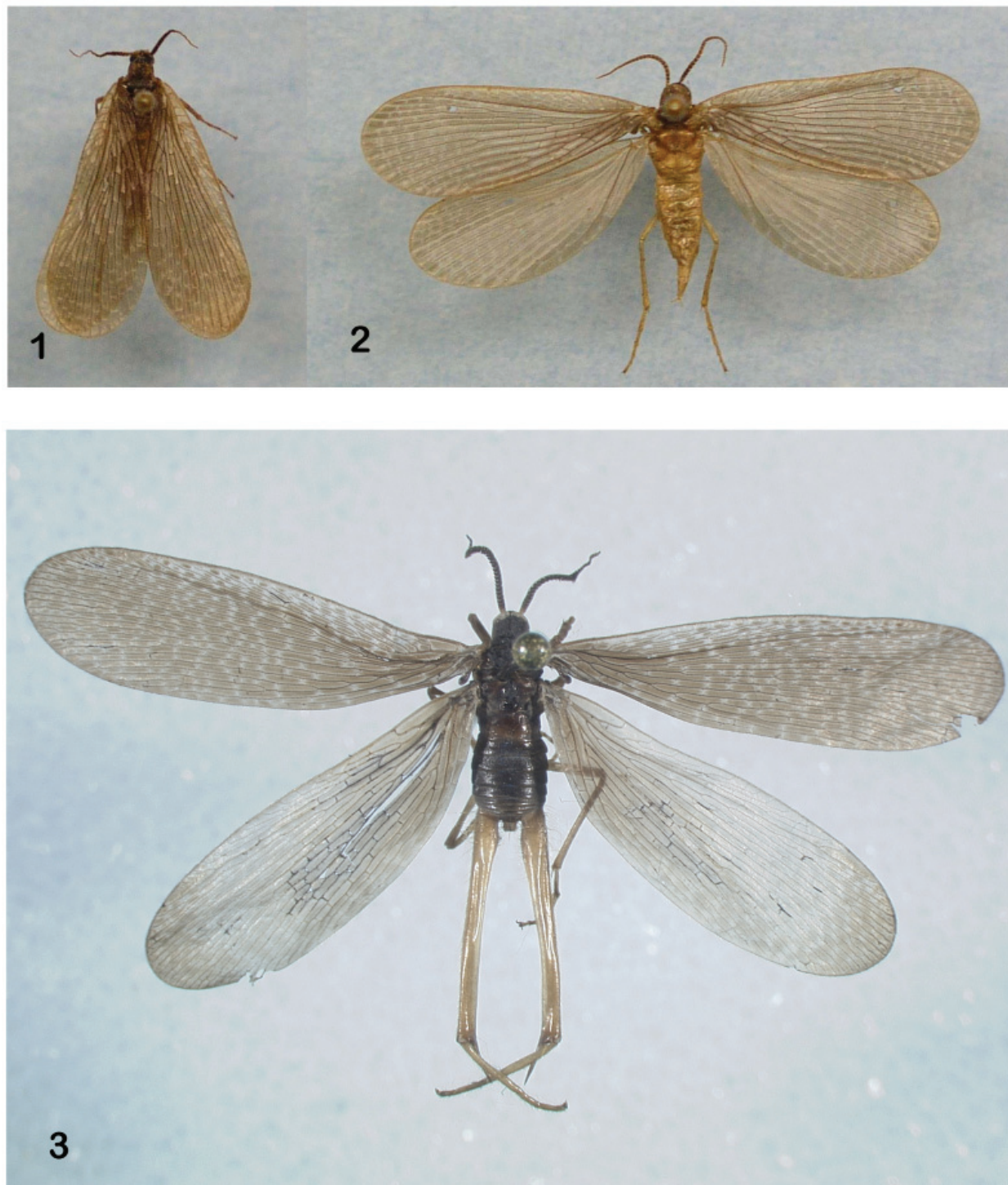
<sup>f</sup> One individual in vial of 95% ethanol.

<sup>g</sup> One individual illustrated in Dunford et al. 2013 and this study, the other gold-palladium sputter-coated for SEM and illustrated in this study.

<sup>h</sup> Data previously published in Bowles and Sites 2013.

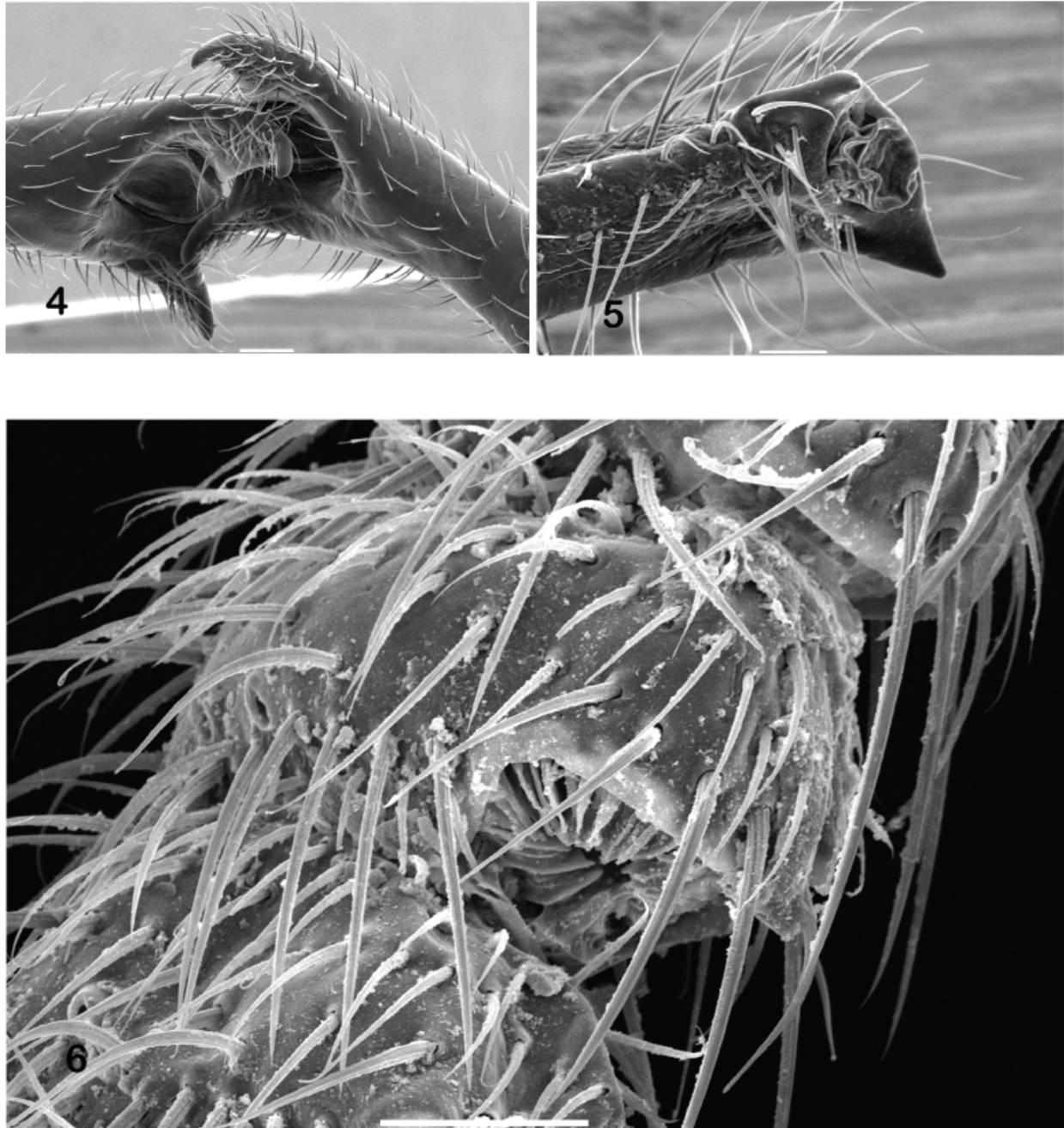
<sup>i</sup> One individual gold-palladium sputter-coated for SEM and illustrated in Dunford et al. 2005, 2006, 2008, 2013; Skelley et al. 2007.

<sup>j</sup> Two individuals gold-palladium sputter-coated for SEM.



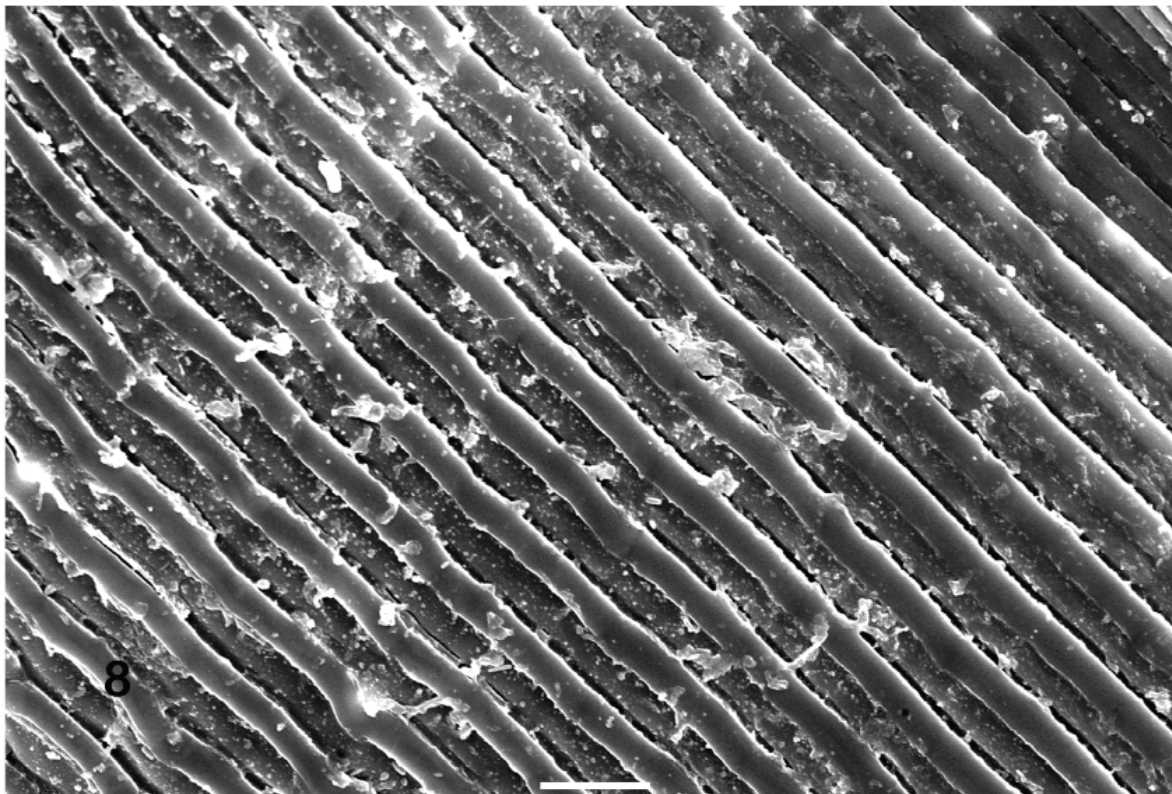
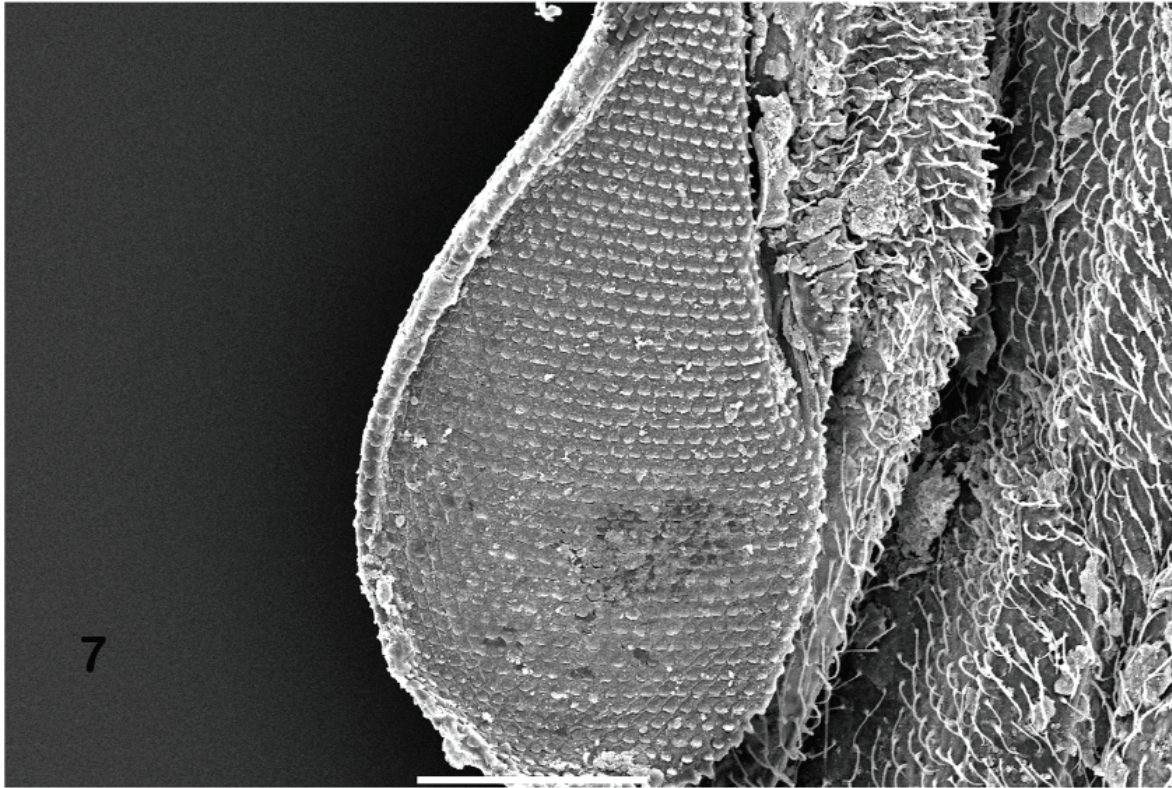
**Figures 1–3.** Dorsal views of adult meropeids. **1)** Female *Merope tuber*, Cades Cove, Abrams Creek, Blount County, Tennessee, Great Smoky Mountains National Park, USA, collected 7–9 July 2003; wings unspread. Body length = 10.5 mm. Photograph by David Serrano. **2)** Female *Merope tuber*, Ferguson Cabin, The Purchase, Haywood County, North Carolina, Great Smoky Mountains National Park, USA, collected 15–17 August 2003; wings spread. Body length = 11 mm. Photograph by David Serrano. **3)** Male *Austromerope poultoni*, near Yornup, Western Australia, Australia, collected 11 November 2001; wings spread. Body length = 7.0 mm; basistyle length = 7.6 mm. Photograph by Louis A. Somma.





**Figures 4–6.** SEM images of male meropeids. **4)** *Merope tuber* Apalachicola Bluffs Preserve, Nature Conservancy, Liberty County, Florida, USA, collected 20 April–4 May 1996; anterodorsal view of distal tips of dististyles. Image originally shot at 130x; scale bar = 100  $\mu\text{m}$ . **5)** *Austromerope poultoni* near Yornup, Western Australia, Australia, collected 11 November 2001; dorsocaudal view of distal tip of right dististyle. Image originally shot at 330x; scale bar = 50  $\mu\text{m}$ . **6)** SEM image of undescribed sensila on flagellomeres of right antenna of *Austromerope poultoni*, near Yornup, Western Australia, Australia, collected 11 November 2001; dorsal view, lower left is distalmost. Image originally shot at 50x; scale bar = 500  $\mu\text{m}$ . Photographs by Louis A. Somma.





**Figures 7–8.** SEM images of undescribed presumptive stridulatory or wing interlocking structures on male *Austromerope poultoni*, near Yornup, Western Australia, Australia, collected 11 November 2001. **7)** Jugal lobe of right wing; ventral view. Image originally shot at 250x; scale bar = 100  $\mu\text{m}$ . **8)** Ridged surface of right metanotum; dorsal view. Image originally shot at 1200x; scale bar = 10  $\mu\text{m}$ . Photographs by Louis A. Somma.