

MECOPTERA (scorpionflies, hangingflies, earwigflies, and allies) at the Florida State Collection of Arthropods

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(<http://www.fsca-dpi.org/MecopteraPage.htm>)

by

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This is a small, “primitive” order of holometabolous insects. The order name is derived from the Greek words *mecos* (=length) and *pteron* (=wing). At present there are approximately fewer than 700 known, extant species arranged in 38 genera and 9 families worldwide. Five families are widely distributed throughout much of the world while the other four are restricted to South America and the Australian region. Two families, Panorpidae and Bittacidae, comprise most of the species. Fossil Mecoptera are well represented in sedimentary rocks of the Lower Permian geological period (approximately 270 million years ago). There are nearly 400 known fossil species in approximately 87 genera and as many as 34 families (although researchers disagree on the exact number of extinct families), exhibiting a greater diversity than extant mecopteran taxa. Because traditional “Mecoptera” lack defining, unifying characters, they may not represent a monophyletic grouping. Recent DNA and older morphological data suggests Mecoptera are closely related to fleas (Siphonaptera). Molecular support for a monophyletic grouping known as the Antliophora (Diptera and (Mecoptera + Siphonaptera)) is strong.

Mecopterans have diverse life histories and morphologies. Many species inhabit mesic, forested environments and feed on decaying vegetation or dead or dying, soft bodied arthropods as larvae and/or adults; some groups are reported to feed on nectar, pollen, carrion, mosses, and larval midges. Eggs are generally ovoid and smooth to finely reticulate. Larvae are generally eruciform or caterpillar-like and have a well developed head capsule with chewing mouthparts. Most groups have thoracic legs and fleshy prolegs on the first eight abdominal segments, while others may be grub-like and lack abdominal prolegs. Pupae are exarate and denticous and many species pupate in the soil. Adult Mecoptera are largely defined by wing venation, wing maculation, and tarsal structure. The head bears prominent eyes (or lacking in some), three large ocelli (or lacking in some), and is extended into a rostrum or beak in most groups, and depending on the food resource, may have short or elongate mandibles; antennae are long and primarily filiform, or nearly moniliform in a few groups. Many Mecoptera have two pairs of membranous wings nearly equal in length, typically with darker spots or bands. In some groups, the wings are reduced or absent. A few natural enemies of Mecoptera have been reported in the literature, such as web-building spiders, damselflies, reduviid bugs, and asilid flies. Since most mecopterans inhabit moist forests, any disturbance reducing

moisture levels (i.e., deforestation, Global Warming) could adversely affect or extirpate the Mecoptera present. In general, Mecoptera are weak fliers, and dispersal can be severely limited if suitable habitat is reduced. This order is of little economic significance but represents a systematically and biologically important, ancient insect lineage.

Extant Mecopteran Families and Their Continental Distributions

Nannochoristidae-southeastern Australia, Tasmania, New Zealand, and southern South America

Bittacidae (hangingflies)-North America, South America, Europe, Africa, Asia, and Australia

Boreidae (snow scorpionflies, “snow fleas”)-mostly boreal and montane regions of North America, Europe, and Asia

Meropidae (earwigflies)-eastern North America and southwest Western Australia

Eomeropidae-southern South America

Apteropanorpidae (wingless scorpionflies)-Tasmania, Australia

Choristidae-southeastern Australia

Panorpididae (short-faced scorpionflies)-Appalachian region and Pacific Northwest of North America, eastern Asia

Panorpidae (scorpionflies)-North America, Europe, Asia

The Mecoptera collection at the Florida State Collection of Arthropods (FSCA), which includes specimens maintained for the McGuire Center for Lepidoptera and Biodiversity (MGCL), presently contains 20 drawers of mostly pinned adults, representing more than 4800 specimens. There are three holotypes and four allotypes located in the collection (see List of Mecoptera Species). Recent donations (2004 through 2012) and gifted specimens representing the families Bittacidae, Boreidae, Meropidae, Panorpididae and Panorpidae, have expanded the collection by more than 1000 specimens. Important recent donors and collectors include David T. Almquist, Wesley J. Bicha, John B. Heppner, Joshua R. Jones, Peter W. Kovarik, Craig M. Brabant, Edward I. Coher, David P. Cowan, Olga Garcia, William L. Grogan, Jr., Bruce A. Harrison, Joseph E. Eger, John Leavengood, William Mauffrey, R. B. Miller, Howard Romack, Scott R. Shaw, Paul E. Skelley, Zell Smith, Lionel A. Stange, Gary J. Steck, Bruce D. Sutton, James R. Wiley, Allan Wills, Nadeer N. Youssef, and the late entomologists Charles Porter, Alistair S. Ramsdale, and Howard V. Weems, Jr. Additionally, important meropeids were gifted to FSCA from the Virginia Museum of Natural History and the National Museum of Natural History (Smithsonian Institution).

FSCA research associates are currently conducting research on hypothetically primitive mecopteran taxa, such as *Merope tuber* Newman. New *M. tuber* distributional records, biogeographical information, and life history data is actively being obtained. The collection currently holds more than 310 adult *M. tuber* specimens from 17 states located throughout eastern North America.

Recent Publications, Webpages, and Work in Progress

- Dunford, J. C., P. W. Kovarik, L. A. Somma, and D. Serrano. 2007.** First state records for *Merope tuber* (Mecoptera: Meropeidae) in Florida and biogeographical implications. **Florida Entomologist** 90(3): 581-584.
- Dunford, J. C. and S. J. Krauth. 2005.** Neither fly nor earwig: Earwigflies in Wisconsin. **Wisconsin Entomological Society Newsletter** 32(3): 3-4.
- Dunford, J. C., D. Serrano, and L. A. Somma. 2006.** Earwigflies in the Great Smokies. **Southeastern Biology** 53(1): 27-29. (Reprint of Dunford et al. 2005.)
- Dunford, J. C. and L. A. Somma. 2008.** Scorpionflies (Mecoptera). Pp. 3304-3310, plate 97. *In*: J. L. Capinera (ed.). **Encyclopedia of Entomology. Second Ed. Vol. 4. S-Z.** Springer, [Dordrecht].
- Dunford, J. C., and L. A. Somma. 2008.** Scorpionflies (Mecoptera). *In*: J. L. Capinera (ed.). **Encyclopedia of Entomology EBook.** Springer Science + Business Media B. V.; [Dordrecht].
- Dunford, J. C., L. A. Somma, and D. Serrano. 2005.** Earwigflies in the Great Smokies. **ATBI Quarterly, All Taxa Biodiversity Inventory Newsletter** 6(2): 1.
- Dunford, J. C., L. A. Somma, and D. Serrano. 2008.** Earwigflies (Mecoptera: Meropeidae). Pp. 1261-1264. *In*: J. L. Capinera (ed.). **Encyclopedia of Entomology. Second Ed. Vol. 2. D-K.** Springer, [Dordrecht].
- Dunford, J. C., L. A. Somma, and D. Serrano. 2008.** Earwigflies (Mecoptera: Meropeidae). *In*: J. L. Capinera (ed.). **Encyclopedia of Entomology EBook.** Springer Science + Business Media B. V.; [Dordrecht].
- Dunford, J. C., L. A. Somma, and D. Serrano. [in preparation].** Current disposition and holdings for earwigflies, *Merope tuber* Newman and *Austromerope poultoni* Killington (Mecoptera: Meropeidae), in the Florida State Collection of Arthropods.
- Schiefer, T. L. and J. C. Dunford. 2005.** New state record for *Merope tuber* Newman (Mecoptera: Meropeidae) in Alabama. **Journal of Entomological Science** 40(4): 471-473.
- Skelley, P. E., J. C. Dunford, L. A. Somma, and D. Serrano. 2007.** What is it? [An SEM image of the genital claspers of a male *Merope tuber*...] **American Entomologist** 53(2): 124, 93.

- Somma, L. A. 2009.** First record for the recently discovered hangingfly *Bittacus monastyrskiyi* Bicha, 2007 (Mecoptera: Bittacidae) from Há Tay Province, Vietnam. **Insecta Mundi** 0096:1-2.
- Somma, L. A. 2010.** A state record for the Oconee Scorpionfly, *Panorpa oconee* Byers (Mecoptera: Panorpidae), in Florida. **Insecta Mundi** 0135:1-4.
- Somma, L. A. 2011.** New collections and records for earwigflies and scorpionflies (Mecoptera: Meropeidae and Panorpidae) in Florida. **Insecta Mundi** 0165:1-4.
- Somma, L. A. 2011.** The correct publication date for mecopteran insects (Choristidae, Bittacidae, and Panorpidae) described by John Obadiah Westwood, resurrecting *Panorpa confusa* Westwood, 1841, the Confused Scorpionfly. **Zootaxa** 3121:61-65.
- Somma, L. A. 2012.** The dates of Westwood's Mecoptera (Insecta) publications reexamined and further corrected. **Zootaxa** 3332:67-68.
- Somma, L. A. and J. C. Dunford. 2007.** Etymology of the Earwigfly, *Merope tuber* Newman (Mecoptera: Meropeidae): Simply dull or just inscrutable? **Insecta Mundi** 0013: 1-5.
- Somma, L. A. and J. C. Dunford. 2008.** Preliminary checklist of the Mecoptera of Florida: Earwigflies, hangingflies, and scorpionflies. **Insecta Mundi** 0042: 1-9.
- Somma, L. A. and J. C. Dunford. 2008.** Newman, Edward. Pp. 2607-2609. *In*: J. L. Capinera (ed.). **Encyclopedia of Entomology. Second Ed. Vol. 3. L-R.** Springer, [Dordrecht].
- Somma, L. A. and J. C. Dunford. 2008.** Newman, Edward. *In*: J. L. Capinera (ed.). **Encyclopedia of Entomology EBook.** Springer Science + Business Media B. V.; [Dordrecht].
- Somma, L. A. and J. C. Dunford. 2009.** The Florida Scorpionfly, *Panorpa floridana* Byers (Mecoptera: Panorpidae). **Entomology Circular (Division of Plant Industry, Florida Department of Agriculture & Consumer Services)** 420:1-3.
- Somma, L. A. and J. C. Dunford. 2009.** Records for *Bittacus* hangingflies and *Panorpa* scorpionflies (Mecoptera: Bittacidae and Panorpidae) in Florida. **Insecta Mundi** 0084:1-5.
- Somma, L. A. and J. C. Dunford. 2012. Florida Scorpionfly, *Panorpa floridana* Byers (Insecta: Mecoptera: Panorpidae).** Publication # EENY-538. Institute of Food and Agricultural Sciences Extension, University of Florida, Gainesville. 4 pp.
- Somma, L. A. and J. C. Dunford. 2012.** Florida Scorpionfly *Panorpa floridana* Byers. EENY-538. *In*: D. Hagen and S. Gildersleve (eds.), **Featured Creatures EDIS.** Institute

of Food and Agricultural Sciences Extension, University of Florida, Gainesville. Online: <http://edis.ifas.ufl.edu/in949>.

Somma, L. A. and J. C. Dunford. 2012. Florida Scorpionfly - *Panorpa floridana* Byers. EENY-538. In: J. L. Gillett-Kaufman (ed.), **Featured Creatures**. Department of Entomology and Nematology, IFAS, University of Florida, and Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville. Online: <http://entnemdept.ufl.edu/creatures/MISC/scorpionfly.htm>.

List of Mecoptera species at FSCA by family and genus (and number of species represented)

4818 specimens (mostly pinned) in 20 drawers, including 3 holotypes (*Panorpa appalachia* Byers 2002; *P. dividilacinia* Bicha 2006; *P. floridana* Byers 1993) and 4 allotypes (*Panorpa dividilacinia* Bicha 2006; *P. nudiramus* Byers 2002; *P. tecta* Byers 2002; *Neopanorpa similis* Byers 1999).

Nannochoristidae [2 total specimens]

Nannochorista Tillyard (1 species) – 2 specimens

Nannochorista neotropica Navás

Boreidae [78]

Boreus Latreille (5 species) – 78

Boreus brumalis Fitch

B. californicus Packard

B. coloradensis Byers

B. nivoriundus Fitch

B. pilosus Carpenter

Meropeidae [319]

Austromerope Killington (1 species) – 5

Austromerope poultoni Killington

Merope Newman (1 species) – 314

Merope tuber Newman

Eomeropidae [1]

Notiothauma MacLachlan (1 species) – 1

Notiothauma reedi MacLachlan

Panorpodidae [120]

Brachypanorpa Carpenter (5 species) – 69

Brachypanorpa carolinensis (Banks)

B. jeffersoni Byers

B. montana Carpenter

B. oregonensis (MacLachlan)

B. sacajewea Byers

Panorpodes MacLachlan (3 species) – 51

Panorpodes decorata MacLachlan

P. paradoxus MacLachlan

P. pulchra Issiki

Bittacidae [686]

Apterobittacus MacLachlan (1 species) – 17

Apterobittacus apterus (MacLachlan)

Bittacus Latreille (20 species) – 417 (incl. 2 larvae)

Bittacus andinus Londt and Byers

B. banksi Esben-Petersen

B. chilensis Klug

B. chlorostigma MacLachlan

B. coheri Bicha

B. disternum Byers

B. femoralis Klug

B. formosanus Issiki

B. indicus Walker

B. laevipes Navás

B. mexicanus Klug

B. monastyrskiyi Bicha

B. nipponicus Navás

B. occidentis Walker

B. pilicornis Westwood

B. punctiger Westwood

B. spatulatus Byers

B. stigmaterus Say

B. strigosus Hagen

B. texanus Banks

Harpobittacus Gerstaecker (4 species) – 7

Harpobittacus australis (Klug)

H. phaeoscius Riek

H. rubricatus Riek

H. tillyardi Esben-Petersen

Hylobittacus Byers (1 species) – 240

Hylobittacus apicalis (Hagen)

Issikiella Byers (1 species) – 1

Issikiella byersi Penny and Arias

Orobittacus Villegas and Byers (1 species) – 4

Orobittacus obscurus Villegas and Byers

Panorpidae [3612]

Neopanorpa Weele (11 species) – 75

Neopanorpa formosana (Navás)

N. k-maculata Cheng

N. makii Issiki

N. malaisei Byers

N. nielsenii Byers

N. ophthalmica Navás

N. parvula Willmann

N. siamensis Byers

N. similis Byers [**ALLOTYPE**]

N. vietnamensis Willmann

N. youngi Byers

Panorpa Linnæus (79 species) – 3537 (incl. 7 larvae)

Panorpa acuminata Byers

P. acuta Carpenter

P. alpina Rambur

P. americana Swederus

P. anomala Carpenter

P. appalachia Byers [**HOLOTYPE**]

P. azteca Byers

P. banksi Hine

P. banksiana Penny and Byers

P. bicornuta MacLachlan

P. bifida Carpenter
P. bimacula Byers
P. bistriata Issiki
P. braueri Carpenter
P. capillata Byers
P. carolinensis Banks
P. choctaw Byers
P. claripennis Hine
P. cognata Rambur
P. communis Linnæus
P. confusa Westwood
P. consuetudinis Snodgrass
P. contorta Byers
P. debilis Westwood
P. dissimilis Carpenter
P. dividilacinia Bicha [**includes HOLOTYPE & ALLOTYPE**]
P. dubitans Carpenter
P. ensigera Bicha
P. esakii Issiki
P. ferruginea Byers
P. flexa Carpenter
P. floridana Byers [**includes HOLOTYPE**]
P. fluvicaudaria Miyake
P. galerita Byers
P. germanica Linnæus
P. gracilis Carpenter
P. helena Byers
P. hungerfordi Byers
P. hybrida MacLachlan
P. insolens Carpenter
P. isolata Carpenter
P. japonica Thunberg
P. latipennis Hine
P. lewisi Maclachlan
P. longicornis Carpenter
P. longiramina Issiki and Cheng
P. lugubris Swederus
P. maculosa Hagen
P. mirabilis Carpenter
P. nebulosa Westwood
P. neglecta Carpenter
P. nipponensis Navás
P. nudiramus Byers [**includes ALLOTYPE**]
P. nuptialis Gerstaecker
P. ochraceocauda Issiki
P. ochraceopennis Miyake

P. oconee Byers
P. pachymera Byers
P. pallidimaculata Issiki
P. palustris Byers
P. penicillata Byers
P. pryeri MacLachlan
P. robusta Carpenter
P. rufa Gray
P. rufostigma Westwood
P. sentosa Byers
P. setifera Webb
P. sigmoides Carpenter
P. speciosa Carpenter
P. subfurcata Westwood
P. submaculosa Carpenter
P. subulifera Byers
P. tecta Byers [ALLOTYPE]
P. truncata Byers
P. venosa Westwood
P. vernalis Byers
P. virginica Banks
P. vulgaris Imhoff and Labram
P. wormaldi MacLachlan