Zootaxa 4338 (3): 533–545
http://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4338.3.8
http://zoobank.org/urn:lsid:zoobank.org:pub:5F0274A4-60D8-44CD-BD88-C6017F203C51

A review of North American *Elonus* species, with description of *E. gruberi* n. sp. (Coleoptera: Tenebrionoidea: Aderidae)

NICOLAS GOMPEL
Ludwig-Maximilians Universität München, Fakultät für Biologie, Biozentrum, Großhaderner Strasse 2, 82152 Planegg-Martinsried, Germany. E-mail: gompel@biologie.uni-muenchen.de

Abstract

This work provides a taxonomic survey of the North American species of the genus *Elonus* Casey, 1895 (Coleoptera: Tenebrionoidea: Aderidae). It includes the description of a new species, *Elonus gruberi* **n. sp.** from the United States, related to *E. hesperus* Werner, 1990 and to *E. basalis* (LeConte, 1855). A review and key to the North American species is provided.

Key words: Coleoptera, Tenebrionoidea, Aderidae, United States, dichotomous key

Introduction

Aderidae (Coleoptera: Tenebrionoidea) represents a small family of poorly studied beetles, whose systematics await major revision and definition. In comparison to other regions of the world, the North American Aderidae have received more attention and are overall easier to identify to the species level thanks to the work of the late Floyd Werner (Werner, 1990, 1992). Some genera, however, such as *Zonantes* Casey, *Vanonus* Casey, and *Elonus* Casey, appear fairly homogeneous in their general habitus appearance, and likely contain more species than are currently known. Six species from North America are currently placed in the genus *Elonus* Casey, 1895 (Chandler, 2002). A re-examination of *Elonus basalis* (LeConte, 1855) specimens from my own collection raised some doubts about the homogeneity of the series. The systematic comparison of all male genitalia led me to unambiguously identify a second species in the series. To resolve which of the two species was the true *Elonus basalis*, I studied the type specimens of *E. basalis* as well as *Elonus princeps* Casey, 1895, a junior synonym of *E. basalis.* This work was extended to all other North American *Elonus* species and their types were examined. These studies revealed that several specimens I collected from Wisconsin belong to a new, distinct species, which is described here. Comparative illustrations of several morphological characters are included, which enable the identification of all seven species. Several hundred *Elonus* specimens were examined and a map of their geographical distributions is provided along with a newly proposed key to the North American species.

Valuable morphological characters for the identification of *Elonus* species. Detailed examination of specimens through this study revealed that several morphological characters display clear variation between species and appear stable within species. These characters include:

Elytral pubescence (Figure 4e–j). Specimens should be examined under incident light, with the light beam almost horizontal, striking the specimen laterally. Elytral pubescence is composed of longer setae arising from the primary, larger punctation and shorter more numerous setae arising from the cuticle. The longer pubescence has a homogeneous distribution on the elytral surface; it varies in color and also in the degree of decumbence. The short setae vary in their distribution on the elytra between species, from uniform to patterned, with these patterns distinct at low magnification under a stereomicroscope (e. g., Figure 1a); color variation of the pubescence is also a key characteristic.

Curvature of male mesotibiae. The observation angle can bias the interpretation of this trait and give the impression that a tibia is straighter than it actually is. In case of uncertainty, it is desirable to pluck one leg off and mount it flat, ventral side facing upward, next to the specimen.

Accepted by T. Grzymala: 27 Sept. 2017; published: 26 Oct. 2017

Brush of male metafemora. The spectacular modification of the underside of the male femora (Figure 3o–u) is helpful for assignment to species group, but not always for species placement. The main differences reside in the extent of a proximal excavation and the size of the brush. These characters are difficult to appreciate on isolated specimens, and require a near-horizontal illumination and a high magnification.

Male genitalia (Figure 2a–g). The male genitalia vary in size and shape between species. To examine their shape, the male genitalia must be mounted with their dorsal surface facing upwards.

Werner (1992) used eye separation, expressed as a percentage of head width, to characterize species. I have not used this character here because the variable inclination of the head on mounted specimens makes this character prone to biases in appreciation.

Material and methods

A total of 311 specimens were examined for this study. Specimens were obtained from colleagues or Museum collections. Museum collections are referred to in the text with the following acronyms:

BMNH	British Museum of Natural History, London, England.
MEMC	Mississippi Entomological Museum Collection, Starkville, MS, USA.
MCZC	Museum of Comparative Zoology Collections, Harvard University, Cambridge, MA, USA.
MNCN	Museo Nacional de Ciencias Naturales, Madrid, Spain.
MNHN	Muséum National d'Histoire Naturelle de Paris, France.
NGPC	Nicolas Gompel's personal collection, Munich, Germany
USNM	United States National Museum, Smithsonian Institution, Washington, D.C., USA.
UNHC	University of New Hampshire Insect and Arachnid Collections, Durham, NH, USA.
WIRC	University of Wisconsin Insect Research Collection, Madison, WI, USA.

Many specimens were dissected, cleaned and re-mounted. Male genitalia were briefly cleaned in 10% KOH, washed in water and mounted in DMHF (Steedman, 1958) on a plastic card pinned beneath the specimen. Entire beetles, or details, were photographed using a Leica M420 Makroskop equipped with a Manta G-609B/C camera (GigE camera with Sony ICX694, Allied Vision, Exton, PA) driven by nVision software (Impuls Imaging GmbH, Türkheim). Stacks of images were projected into single extended depth-of-field images using Helicon Focus software (HeliconSoft). All Images were enhanced using Adobe Photoshop. Measurements were made using a stage micrometer that was imaged under the same conditions, or directly on a Leica MZ6 stereoscope, using an eyepiece graticule. Information relating to material examined is listed as follows: Country, State/Department: Locality, collection information (Collector), date of collection (number of specimens of each sex, current host collection acronym). The abbreviation "sp." indicates a specimen of undetermined sex. All specimens of *Elonus gruberi* **n. sp.** examined in this study are labeled as holotype or paratypes.

Key to North American *Elonus* Species

1. Elytra uniformly dark brown with pattern of white setae consisting of a median wavy transverse stripe, two basal patches, and an apical band (Figure 1i) . . . . . *E. nebulosus* (LeConte, 1875)
- Elytra bicolored: base entirely orange or with an orange blotch on each elytron, rest of the elytra brown to black (Figure 1a–h) 2
2. Short elytral pubescence between punctures dense, white, uniform, distinctly visible under lateral illumination (Figure 4e–f) 3
- Short elytral pubescence between punctures sparser, darker, hardly visible, or limited to suture and a post-median stripe (Figure 4g–j) 4
3. Elytra brown (except base), uniformly covered with long erected yellow setae (Figure 4f). forelegs and midlegs reddish. Male mesotibiae strongly curved (Figure 3l) . . . . . *E. hesperus* Werner, 1990
- Elytra black, long pale pubescence darker, only with white setae along suture (Figure 4e). Male mesotibiae with moderate curvature (Figure 3n) . . . . . *E. chisosensis* Werner, 1992
4. Base of elytra marked with a solid, uninterrupted transverse orange stripe, only moderately narrower in scutellar region (Figure 4c) 5
- Base of elytra marked with orange patches confined to humeral callus on each side; or orange markings forming a continuous stripe but with a strong constriction in the scutellar region (Figure 4a, b) . . . . . *E. gruberi* **n. sp.**

5. Elytra with a post-median band of whitish pubescence, distinct under side illumination, composed of short recumbent setae interspersed between elytral punctation (Figure 4h, arrows). Male genitalia much longer than in other species (Figure 2a) . . . . . *E. basalis* (LeConte, 1855)
- Elytra without pattern of whitish pubescence 6
6. Thorax and head half the width of elytra at their base; male mesotibiae with a kink (Figure 3m). . . *E. excavatus* Werner, 1992
- Thorax and head at least 60% of elytra width at their base; male mesotibiae evenly curved. . . . . *E. simplex* Werner, 1992

Taxonomic survey of the North American *Elonus* species

The work of Werner (1992) lists six *Elonus* species, offers a key to their identification, and illustrates diagnostic characters. The comparison of holotypes and paratypes of all species left no doubt that these are all distinct species. Their identification using Werner's key, however, is not easy, as his illustrations are often difficult to interpret. To facilitate the identification of species in this homogeneous group, photographs of the male habitus for each species, the female habitus of some species, the male genitalia, and selected morphological details of both sexes are included in the present work.

Genus *Elonus* Casey

Elonus Casey, 1895:774 (type species *Xylophilus nebulosus* LeConte, 1875, designated by Werner, 1990: 228)

Elonus basalis (LeConte, 1855)

(Figures 1a; 2a,h; 3b,i,p; 4c,h; 5)

Xylophilus basalis LeConte, 1855: 276; LeConte, 1878: 426, 463; Champion, 1890: 175; Champion, 1890: 266; Pic, 1894: 428. ♂ holotype: MCZC [examined, dissected, remounted]
Elonus basalis LeConte; Casey, 1895: 776; Pic, 1896: 50; Werner, 1990: 228; Werner, 1992: 248
Hylophilus (Elonus) basalis LeConte; Pic, 1902: 7; Pic, 1905: 237, 274; Pic, 1910: 6.
Elonus princeps Casey, 1895: 775; Pic, 1896: 50. ♀ holotype: USNM [examined, remounted]
Xylophilus princeps Casey; Pic, 1896: 53.
Hylophilus (Elonus) princeps Casey; Pic, 1902: 10; Pic, 1905: 237, 274; Pic, 1910: 14

Type locality. United States, Illinois.

Distribution. Canada (Ontario, Quebec), United States (Arkansas, Delaware, District of Columbia, Florida, Illinois, Indiana, Iowa, Kansas, Louisiana, Maine, Michigan, Minnesota, Mississippi, Missouri, New Hampshire, New Jersey, New York, Ohio, Oklahoma, South Carolina, Virginia, West Virginia).

Notes. Distinct from other North American species with orange elytral marks by its elongate antenna (antennomere 4–9 twice as long as wide), the unusually long male genitalia, and a post-median elytral stripe of whitish pubescence, distinct in both sexes, even in old specimens under side lighting.

Material examined. Canada. Québec: Montréal (Liebeck leg.), (1 ♂, MCZC). **Ontario**: Ottawa, (1 ♂, USNM; 1 ♀, MNCNM); **USA**. **Alabama**: Bibb County, Glades Preserve (TL Schiefer leg.), 5.VI.2003 (1 ♀, MEMC); Lawrence County, Joe Wheeler State Park, Mixed forest, black light (TL Schiefer leg.), 27.V.2004 (1 ♂, MEMC.); deciduous forest, (J MacGown leg.), 25.V.2004 (1 ♀, MEMC.); Monroe County, 2 mi. NNE Tunnel Springs, beating (TL Schiefer leg.), 30.V.1995 (1 ♂, MEMC); Monroe County, Haines Island Park, beating trees and shrubs, (TL Schiefer leg.), 31.V.1995 (2 ♀, MEMC); black light trap, (TL Schiefer leg.), 25.VII.1995 (1 ♂, MEMC.); Monroe County, 1 mi. S Claiborne Dam, beating trees and shrubs (TL Schiefer leg.), 30.V.1995 (1 ♀, MEMC); Monroe County, Holly Mill Creek, sweeping (RL Brown leg.), 27.V.1995 (1 ♀, MEMC); Tallapoosa County, Alexander City (G Nelson leg.) (1 ♀, MCZC); **Arkansas**: (F Blanchard leg.), 1887 (2 ♂, MCZC); Conway County, Petit Jean State Park, pine hardwood forest on ridge, black light (RL Brown leg.), 4.VIII.2008 (1 ♂, MEMC); Garland County, Royal, Camp Clearfork, UV light traps (B Baldwin leg.), 22.VI.2008 (1 ♀, UNHC), 19.VI.2011 (1 ♂, UNHC); Polk County, Mena, UV light traps (B Baldwin leg.), 6.IX.2008 (1 ♀, UNHC); Pulaski County, Little Rock, UV light traps (B Baldwin leg.), 6.VI.1997 (1 sp., UNHC), malaise trap, (B Baldwin leg.) 7.VIII.1999 (1 sp., UNHC), 27.VIII.1999 (1 sp., UNHC), 28. VIII. 2000 (1 sp., UNHC); **Florida**: Leon County,

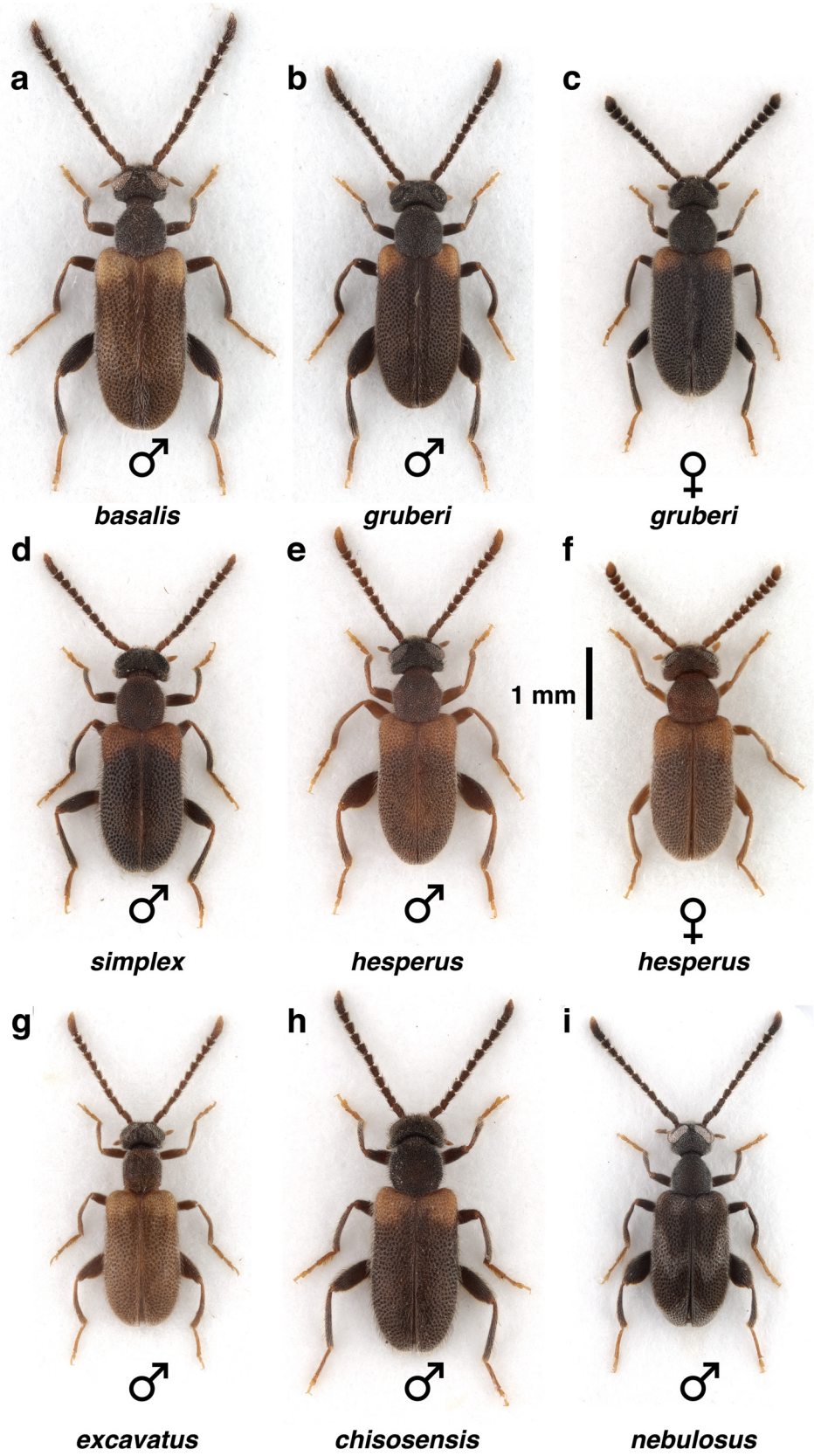

FIGURE 1. Habitus of *Elonus* species in dorsal view. a, *Elonus basalis* (LeConte), ♂, from Wisconsin. b, *Elonus gruberi* **n. sp.**, ♂ holotype, from Wisconsin. c, *Elonus gruberi* **n. sp.**, ♀, from Wisconsin. d, *Elonus simplex* Werner, ♂, from Arizona (paratype). e, *Elonus hesperus* Werner, ♂, from Mississippi. f, *Elonus hesperus* Werner, ♀, from Mississippi. g, *Elonus excavatus* Werner, ♂, from Arizona (holotype). h, *Elonus chisosensis* Werner, ♂, from Arizona (paratype). d, *Elonus nebulosus* (LeConte), ♂, from Texas.

FIGURE 2. Male genitalia and antennae of *Elonus* species. a–g, male genitalia in dorsal view. a, *Elonus basalis* (LeConte), from Wisconsin; b, *Elonus gruberi* **n. sp.**, ♂ holotype, from Wisconsin; c, *Elonus hesperus* Werner, from Mississippi; d, *Elonus nebulosus* (LeConte), from Texas; e, *Elonus simplex* Werner, from Arizona (paratype); f, *Elonus excavatus* Werner, from Arizona (holotype); g, *Elonus chisosensis* Werner, ♂, from Arizona (paratype). h–l, n, male right antenna in dorsal view. h, *Elonus basalis* (LeConte), from Wisconsin; i, *Elonus gruberi* **n. sp.**, holotype, from Wisconsin; j, *Elonus hesperus* Werner, from Mississippi; k, *Elonus nebulosus* (LeConte), from Texas; l, *Elonus simplex* Werner, from Arizona (paratype); n, *Elonus chisosensis* Werner, from Arizona (paratype); m, right antenna of *Elonus excavatus* Werner, ♂, from Arizona (holotype); o, left antenna of *Elonus gruberi* **n. sp.**, ♀, from Wisconsin.

Tallahassee, UV trap (CW O'Brien leg.) 19.VI.1976 (1 sp., UNHC); Liberty County, Bristol, Apalachicola Bluffs and Ravines Preserve, UV light traps (SM Clark leg.) 14.IV.1999 (1 sp., UNHC); Volusia County, Enterprise, (FC Bowditch leg.) 16.VI. (1 ♂, MCZC); **Georgia**: Glynn County, Saint Simons Island (CA Frost leg.) 17.VII.1931 (1 ♂, MCZC); Knox County, Galesburg (Liebeck leg.) (1 ♂, MCZC); **Illinois**: (Willcox leg., 1 ♂, holotype; 1 ♀, MCZC); Clark County, Marshall, Rocky Branch, malaise trap (JW Griffiths leg.) 9.VIII.1992 (1 sp., UNHC); Cook County, Chicago, Edgebrook (1 ♂, MCZC); **Indiana**: Gary County, Lake Station (E Liljeblad leg.) 30.VI.1911 (2 ♂, MCZC); **Louisiana**: Bossier County, Bossier Parish, Barksdale A. F. B., beating trees and shrubs (TL Schiefer leg.) 21.V.1996 (1 ♂, MEMC), 26.VI.1996 (DM Pollock leg., MEMC); **Maine**: Kennebec County, Augusta (AE Brower leg.) 6.VII.1940 (1 ♂, UNHC); Oxford County, Paris (CA Frost leg.) 11.VII.1936 (1 ♀, MCZC), 11.VII.1938 (2 ♀, MCZC); York County, Lebanon, West Lebanon, UV light (DW Barry leg.) 30.VI.1991 (1 ♂, UNHC); **Massachusetts**: (Casey leg.), 1925 (2 ♂, 2 ♀, USNM); (3 ♂, 2 ♀, MCZC); Barnstable County, Falmouth, Woods Hole (1 ♂, MCZC); Middlesex County, Dracut (F Blanchard leg.) 15.VII.1988 (2 ♂, MCZC), 26.VII.1888 (1 ♀, MCZC), 2.VIII.1888 (1 ♀, MCZC); Middlesex County, Lowell (HC Fall leg.) 20.VII.1893 (1 ♀, MCZC); Middlesex County, Natick (CA Frost leg.) 14.VII.1947 (1 ♂, MCZC); Middlesex County, Tyngsborough (F Blanchard leg.) (1 ♂, MCZC), 5.VII.1870 (1 ♂, MCZC), 1887 (2 ♂, MCZC), 28.VII.1888 (1 ♂, MCZC), (Fall H.C. leg.) 9.VII.1898 (1 ♂, MCZC); Plymouth County, Ragged Island (R Becker leg.) 19.VII.2006 (8 ♂, 10 ♀, MCZC), (Madden S. leg.) 4.VIII.2006 (2 ♀, MCZC); Plymouth County, Bumkin Island (M Wheat leg.) 5.VII.2006 (2 ♂, 1 ♀, MCZC); Plymouth County, World's End (J Rykken leg.) 27.VI.2006 (1 ♂, MCZC), 20.VII.2006 (2 ♂, MCZC); **Michigan**: Eaton County, 4.5 mi E Olivet (DK Young leg.) 23.VII.1980 (1 ♀, WIRC); Ingham County, Dansville State Game Area (DK Young leg.) 12.VII.1980 (7 ♂, 4 ♀, WIRC), 18.VII.1980 (1 ♂, 1 ♀, WIRC), 5.VIII.1982 (1 ♀, WIRC); Isabella County, Broomfield township, Section 35 (DK Young leg.) 12.VII.1979 (1 ♀, WIRC); Oakland County (W Andrews leg.) 3.VII.1930 (1 ♂, MCZC); **Mississippi**: Attala County, 1 mi. E McCool, Mixed forest, beating trees and shrubs (RJ Jones leg.) 23.V.2005 (1 ♀, MEMC); Jackson County, Belle Fontaine Point, Black light trap (TL Schiefer leg.) 15.VI.2004 (1 ♂, 1 ♀, MEMC); Lafayette County, Oxford, black light trap (PR Miller leg.) 3.VI.1983 (3 ♀, MEMC); Lowndes County, Highway 82 x highway 45A, Oak-hickory forest, alpha pinene baited Lindgren funnel (JG Hill leg.) 29.V.2009 (1 ♂, MEMC); Tishomingo County, Tishomingo State Park, Mixed forest, Beating, (J Lewis leg.,) 13.V.2008 (1 sp., MEMC); Winston County, Noxubee, NW Refuge, upland hardwood forest, alpha pinene baited Lindgren funnel (JG Hill leg.) 29.V.2009 (1 ♂, MEMC); Winston County, Tombigbee National Forest, beating trees and shrubs (TL Schiefer leg.) 17.V.1999 (1 ♂, 1 ♀, MEMC); **Nebraska**: Sarpy County, Bellevue, Fontenelle Forest, malaise trap (MA Goodrich leg.) 28.VI.1997 (1 sp., UNHC), 12.VII.1997 (1 sp., UNHC); **New Hampshire**: Carroll County, North Sandwich, The Bowl, 2.5 mi. N, flight intercept trap (DS Chandler leg.) 17.VII.1985 (1 sp., UNHC); Carroll County, Tamworth, Wonalancet, 1 mi. N, E Pk. Spring, flight intercept trap (DS Chandler leg.) 17.VII.1985 (1 sp., UNHC); Grafton County, Bath, funnel trap (JS Weaver leg.) 17.VIII.2004 (1 ♂, UNHC); Grafton County, Rumney (PJ Darlington leg.) 26.VI.1925 (1 ♂, MCZC), 5.VII.1925 (1 ♀, MCZC), 18.VII.1926 (1 ♂, 1 ♀, MCZC); Rockingham County, Seabrook, Seabrook Back Dunes, flight intercept trap (DS Chandler leg.) 28.VI.1989 (1 sp., UNHC), 25.VII.1989 (1 ♀, UNHC); Strafford County, Dover, Bellamy Road, 2 km S Dover, Sweep, (DS Chandler leg.) 15.VI.2013 (1 ♂, UNHC); Strafford County, Durham, 4 mi. W Durham, malaise trap (RM Reeves leg.) 8.VII.1982 (1 ♂, UNHC); Strafford County, Durham, Spruce Hole, 3 mi. SW Durham, flight intercept trap (DS Chandler leg.) 9.VII.1987 (3 sp., UNHC), 23.VII.1987 (1 sp., UNHC); Strafford County, Durham, 1 mi. SW Durham, flight intercept trap (DS Chandler leg.) 18.VI.1987 (2 sp., UNHC), 23.VII.1987 (1 sp., UNHC); Strafford County, Durham (WJ Morse leg.) 7.VII.1982 (1 sp., UNHC); **New Jersey**: Hilldale (LS Slevin leg.) 26.VI.1932 (1 f., MNCNM), (Quirsfeld leg.) 28.VI.1931 (1 ♀, MCZC); **New York**: (Casey leg.) 1925, (1 ♂, 3 ♀, USNM); Albany County, Albany (CA Frost leg.) 11.VII.1935 (1 ♂, MCZC); **North Carolina**: (1 ♂, MCZC); **South Carolina**: Chesterfield County, Sand Hills State Forest, 6.5 km WNW of Patrick, mixed coniferous/hardwood forest, beaten from branches of *Cornus florida* L., *Carya* sp. and *Quercus* sp., (JP Gruber leg.) 21.VIII.2011 (3 ♂, 1 ♀, WIRC), 22. VIII.2011 (2 ♂, 4 ♀, WIRC; 1 ♂, NGPC), 25.VIII.2011 (1 ♂, NGPC); Chesterfield County, Sand Hills State Forest, 8.1 km ENE of Patrick, mixed coniferous/hardwood forest, beaten from branches of hardwood tree (JP Gruber leg.) 24.VIII.2011 (2 ♂, 2 ♀, WIRC); **Pennsylvania**: Allegheny County (Liebeck leg.) (1 ♂, MCZC); **Virginia**: (Casey leg.), 1925 (1 ♀, USNM); Charters Island County, Norfolk, UV light (CA Springer leg.) 13.VI.2003 (1 sp., UNHC), 18.VI.2003 (1 sp., UNHC); Scotts Island County, Fredericksburg (F Blanchard leg.) 15.VI.1905 (2 ♀, MCZC); **Wisconsin**: Green County, Abraham's Wood SNA, southern mesic hardwood forest, flight intercept trap near several fallen trees (JP

Gruber leg.) 11.VII.2001 (1 ♀, BMNH; 1 ♂, 1 ♀, NGPC), 11.VII.2011 (1 ♂, WIRC); Jefferson County, collected from forest floor (W MoNool leg.) 22.VI.1949 (1 ♂, WIRC); Marathon County, Big Eau Pleine Woods SNA, Big Eau Pleine County Park, old-growth northern mesic forest, flight-intercept trap baited with cantharidin (JJ Dorshorst leg.) 22.VII.2004 (1 ♂, WIRC); Marathon County, Big Eau Pleine Woods SNA, Big Eau Pleine County Park, northern mesic forest, beaten from branches of hardwood tree (JP Gruber leg.) 6.VII.2013 (3 ♂, WIRC), 7.VII.2013 (2 ♂, 2 ♀, WIRC); Richland County, LWRSGA Lone Rock Unit, Flight intercept trap (DK Young leg.) 22.VII.2001 (1 ♂, WIRC); Sauk County, Spring Green Preserve SNA, dry-mesic southern forest, beaten from branches of live *Tilia americana* L. (JP Gruber) 31.VII.2009 (1 ♀, WIRC); Sheboygan County, Kohler-Andrae State Park, mixed coniferous/hardwood forest, beaten from branches of hardwood tree (JP Gruber leg.) 21.VII.2013 (2 ♂, WIRC).

Elonus chisosensis Werner, 1992

(Figures 1h; 2g,n; 3g,n,u; 4e; 5)

Elonus chisosensis Werner, 1992: Werner, 1992: 251. ♂ holotype: MCZC [examined]

Type locality. United States, Texas: Brewster County, Big Bend National Park, HQ.

Distribution. United States (Texas).

Material examined: USA. Texas: Brewster County, Big Bend National Park, Chisos Basin, collected at light (Howden & Becker leg.) 29.V.1959 (1 ♂, paratype, BMNH); Brewster County, Big Bend National Park, HQ, (Werner leg.) 9 VII 1948 (1 ♂, holotype, MCZC).

Elonus excavatus Werner, 1992

(Figures 1g; 2f,m; 3f,m,t; 4g; 5)

Elonus excavatus Werner, 1992: Werner, 1992: 252. Holotype: MCZC [examined, dissected]

Type locality. United States, Arizona, Navajo County, 4 Mi. North Whiteriver.

Distribution. United States (Arizona).

Notes. Distinct from other species by its narrow thorax compared to the elytral width, the kink in the mesotibiae of the males (other species have straight or bowed mesotibiae, with no distinct angular shape), and the conformation of the male genitalia, with the penis short and rounded at the tip (by contrast, most species have a protruding, acuminate penis, often with an apical sinuosity).

Material examined: USA. Arizona: Cochise County, Stronghold, Dragoon Mountains, UV trap (D Chandler, RJ Shaw leg.) 24.VII.1970 (1 ♂, paratype, BMNH); Cochise County, Chiricahua Mountains, S. W. Research Station (CP Alexander leg.) VIII.1957 (1 ♂, MCZC); Gila County, Sierra Ancha, Mts. Ari. (HC Fall leg.) 8.IX.1933 (2 ♂, MCZC, NGPC); Navajo County, 4 Mi. North Whiteriver (F Werner & W Nutting leg.) 22.VII.1948 (1 ♂ holotype, MCZC).

Elonus gruberi Gompel, n. sp.

(Figures 1b,c; 2b,i,o; 3c,j,q; 4a,b,j; 5)

*Elonus gruber*i n. sp., male holotype deposited in the Nicolas Gompel private collection

Etymology. The species is named after my friend Jeff Gruber, in appreciation of his tremendous efforts to collect and share Aderidae and other little brown beetles across Northern America.

Type locality. United States, Wisconsin, Madison, Eagle Heights [43°05’06”N 89°26’03"W].

Distribution. United States (Alabama, Arkansas, Delaware, Indiana, Iowa, Massachusetts, Mississippi, New Hampshire, Ohio, Texas, Pennsylvania, Wisconsin).

Notes. (i) Given the presence of several specimens of *Elonus gruberi* **n. sp.** in a series identified as *Elonus*

basalis, I examined the female holotype of *Elonus princeps*, a junior synonym of *Elonus basalis* (Werner, 1990). I have remounted it, and I confirm that it should be assigned to *Elonus basalis*. In particular, its elytra have a post-median band of whitish pubescence characteristic of *Elonus basalis*.

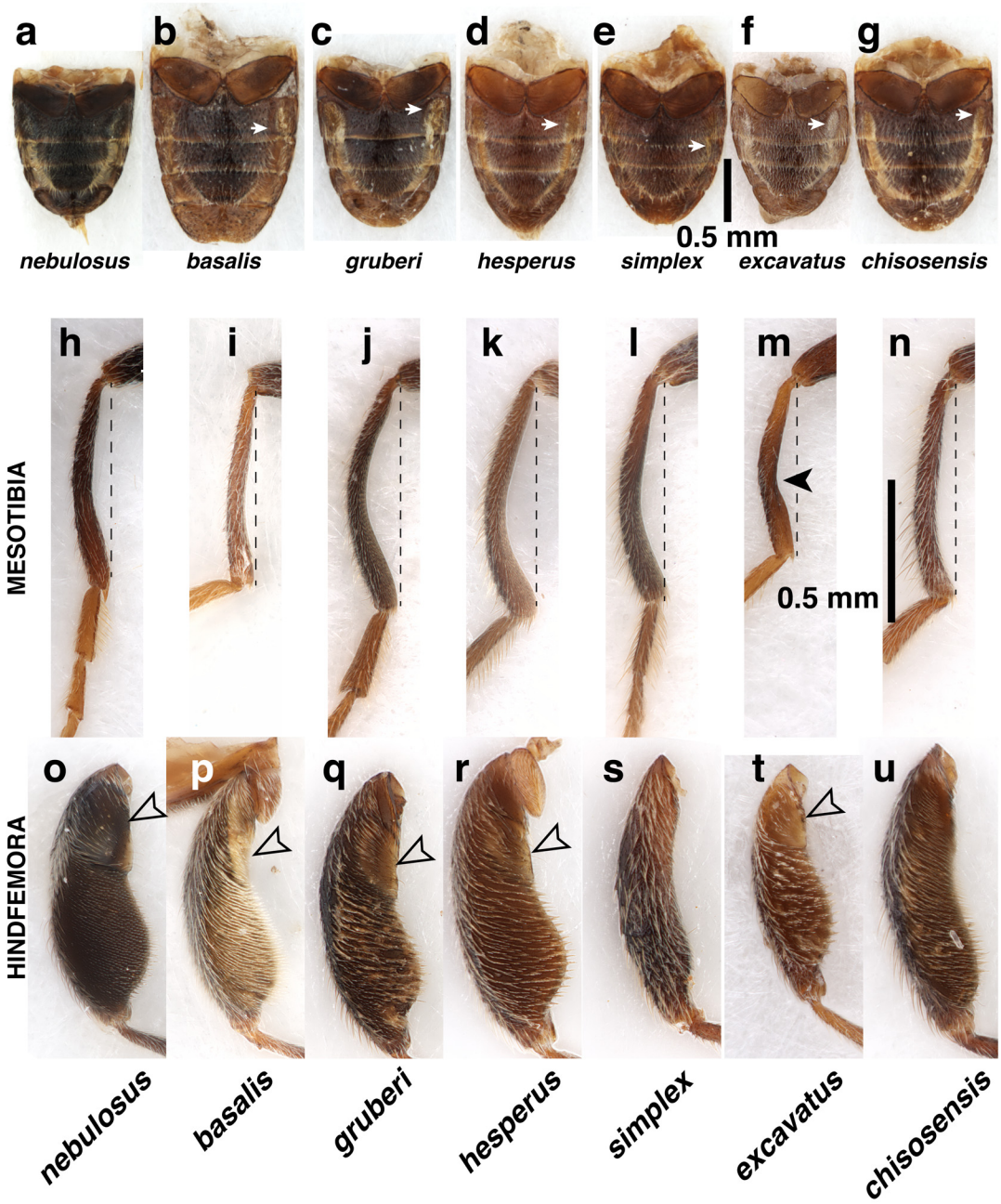

FIGURE 3. Abdominal sternites and leg morphology of male *Elonus* species. Abdominal sternites in ventral view (a–g) (note the variable anterior extension of the golden pubescence (white arrows)), tibiae of mesothoracic legs in dorsal view (h–n) and femora of metathoracic legs in ventral view (o–u) (note the presence of a proximal excavation in some species (empty arrowheads)). a, h, o, *Elonus nebulosus* (LeConte), from Texas; b, i, p, *Elonus basalis* (LeConte), from Wisconsin; c, j, q, *Elonus gruberi* **n. sp.**, ♂ holotype, from Wisconsin; d, k, r, *Elonus hesperus* Werner, from Mississippi; e, l, s, *Elonus simplex* Werner, from Arizona (paratype); f, t, *Elonus excavatus* Werner, from Arizona (holotype); m, *Elonus excavatus* Werner, from Arizona (paratype): note the kink in the mesotibiae (black arrowhead); g, n, u, *Elonus chisosensis* Werner, ♂, from Arizona (paratype).

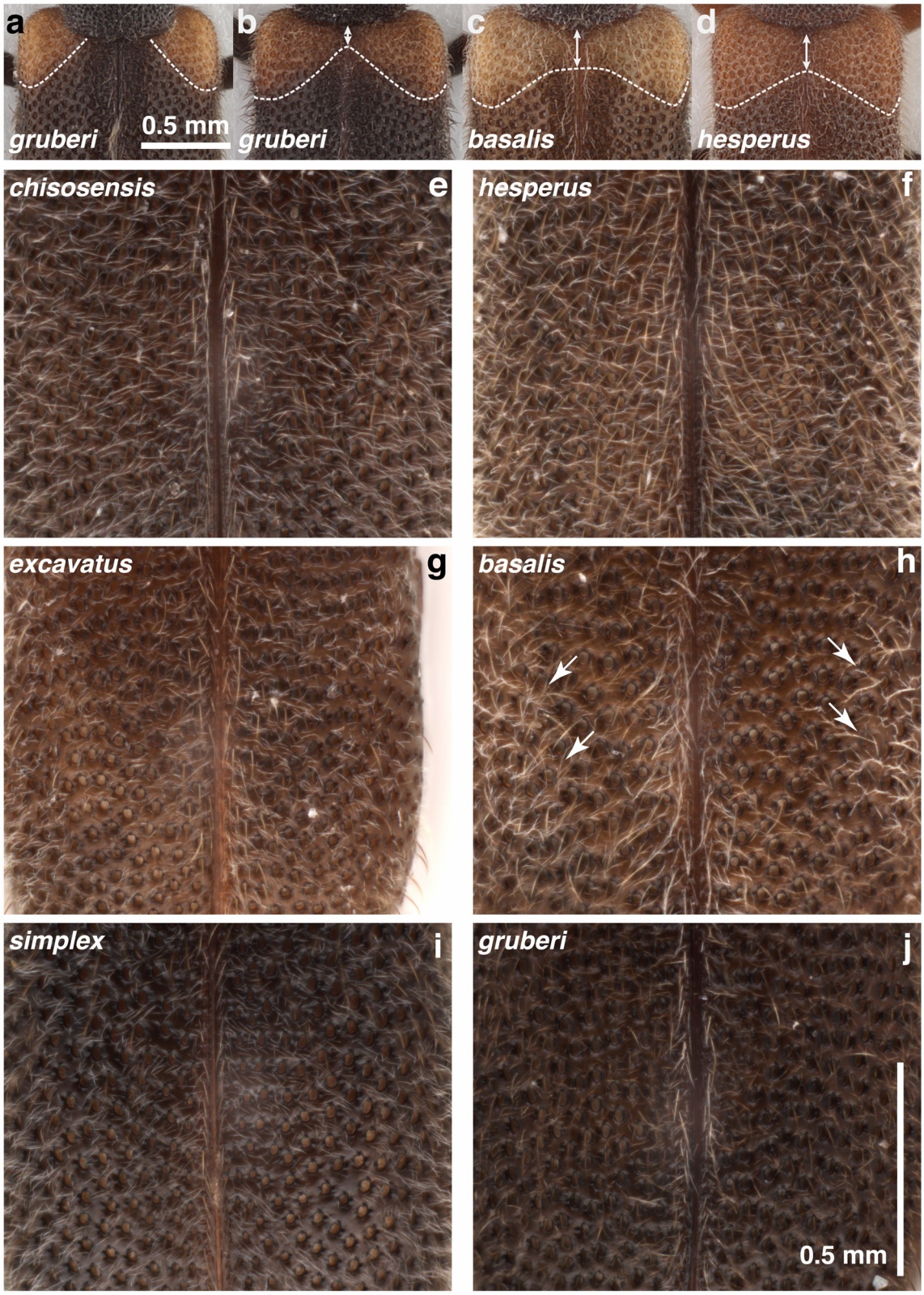

FIGURE 4. Elytral pigmentation and pubescence of *Elonus* species. a–d, basal orange pattern variation. a, *Elonus gruberi* **n. sp.**, ♂ holotype, from Wisconsin; b, *Elonus gruberi* **n. sp.**, ♂ from Texas; c, *Elonus basalis* (LeConte), ♂, from Wisconsin; d, *Elonus hesperus* Werner, ♂, from Mississippi. e–j, elytral pubescence. e, *Elonus chisosensis* Werner, ♂, from Arizona (paratype); f, *Elonus hesperus* Werner, ♂, from Mississippi; g, *Elonus excavatus* Werner, from Arizona (paratype); h, *Elonus basalis* (LeConte), ♂, from Wisconsin; i, *Elonus simplex* Werner, from Arizona (paratype) (note the lateral patches of short white recumbent hairs (white arrows); j, *Elonus gruberi* **n. sp.**, ♂ holotype, from Wisconsin.

(ii) Elytral markings: these marks form a solid basal stripe, without a notch at the scutellum in *Elonus hesperus* Werner, 1990. They also form an uninterrupted basal stripe in most specimens of *Elonus basalis* (LeConte, 1855), which is occasionally attenuated towards the scutellum (but the pubescence and other morphological characters are distinct from *Elonus hesperus* Werner, 1990). The majority of Eastern specimens of *E. gruberi* **n. sp.** have 2 separate blotches of orange pigmentation. In specimens from Texas (San Patricio County population) and one specimen from Delaware the orange pigmentation extends towards the suture in a M-like shape pattern.

(iii) Shape of male sternal plate appears consistent within this species and different from that of other species, but these variations are difficult to describe and the character was not retained for species separation.

(iv) The structure and shape of the male genitalia is stable in *E. gruberi* **n. sp.**, and sufficient to separate it from all other North American species, with the exception of *E. hesperus* Werner, 1990, where external characters should be used.

Description. (Figure 1b,c). Length: 2.6–3.4 mm, body elongate, sides subparallel, overall color matte dark, with orange markings on elytra, covered with dense pubescence. Body pubescence double, with long erect bristles originating from punctures with interspersed short whitish setae.

Head. Transverse, as wide as, or slightly wider than pronotum; covered with dense punctation and erect black pubescence; head tegument entirely black; palpi orange.

Antennae (Figure 2i, o). Black, covered with dense, erect pubescence, pointing towards antennal apex. Antennomeres 2–7 (♀) or 2–10 (♂) quadrate or slightly longer than wide; sexual dimorphism: male antennae longer, slenderer at apex, with apical antennomere subequal in length to antennomeres 8–10 (Figure 2i); female antennomeres progressively increasing in width from base to apex, with apical antennomere subequal to penultimate antennomeres (Figure 2o).

Pronotum. Length 0.5–0.7 mm. Subquadrate, base wider than apex, sides parallel along posterior half, then converging toward apex; maximum width at mid-length between base and apex; densely punctated and pubescent. Width about 60% of elytral width.

Elytra. Length 1.8–2.2 mm. Width 0.9–1.2 mm. Dark with orange markings in humeral region, rarely continuous in scutellar region (Figure 4a, b). Elytral punctation dense and strong, no different from other North American species. Elytral pubescence uniform. Long bristles arising from punctation yellow, recumbent, inconspicuous. Shorter pubescence sparse, yellowish, only visible at high magnification (Figure 4j). Elytra suture finely lined-up with white pubescence.

Legs. Femorae and tibiae brown, sometimes with ill-defined reddish zones toward base. Tarsi reddish to orange. No notable modifications in females, strongly differentiated in males. Male protibiae slightly bent inwards at apex; male mesotibiae strongly and regularly bowed (as much as in *Elonus hesperus* Werner, 1990) (Figure 3j); male metafemora with ample brush on underside (Figure 3q) and large excavation at base (Figure 3q, arrowhead).

Abdominal sternites. Sexually dimorphic. Evenly convex in females, strongly modified in males with an elevated sternal plate arising from sternites 2–5 and fringed with dense yellow pubescence (Figure 3c).

Male genitalia. Stocky, lateral margins subparallel, only convergent in apical fourth. Aedeagus long, retractile, often everted in killed specimens (Figure 2b), apex asymmetrically acuminate.

Type material: USA. Alabama: Baldwin County, Weeks Bay NER reserve, mixed forest near estuary, black light and MV lamp (JA MacGown leg.) 4.VIII.2000 (1 ♂, MEMC), (TL Schiefer leg.) 25.VI.2001 (1 ♂, MEMC); Lawrence County, Prairie Grove Glade, Cedar glade, beating trees and shrubs (TL Schiefer leg.) 25.V.2004 (1 ♂, 1 ♀, MEMC); Monroe County, 1 mi. S Claiborne Dam, beating trees and shrubs (TL Schiefer leg.) 30.V.1995 (1 ♀, MEMC); **Arkansas**: Garland County, Royal, Camp Clearfork, UV light traps (B Baldwin leg.) 19.VI.2006 (1 ♀, UNHC), 19.VI.2008 (1 ♂, UNHC), 21.VI.2009 (1 ♂, UNHC), 23.VI.2009 (1 ♂, UNHC), 12.VI.2010 (2 ♂, UNHC); Polk County, Mena, UV light traps (B Baldwin leg.) 10.VIII.2006 (1 ♂, UNHC), 12.VI.2009 (1 ♂, UNHC), 8.VI.2010 (1 ♀, UNHC); Pulaski County, Little Rock, malaise trap (B Baldwin leg.) 15.VI.2003 (1 ♀, UNHC), 9.VIII.2003 (1 ♂, UNHC); **Delaware**: Kent County, 0.5 mi. N of Dinahs Corner, at incandescent light (RFC Naczi leg.) 12.VIII.2002 (1 ♂, UNHC); **Illinois**, Mason County, Long Branch Sand Prairie Nature Reserve, Malaise trap #1 to ethanol (K Zeiders and B Fuller leg.) 11.IX.1997 (1 ♂, WIRC); **Indiana**: Tippecanoe County, Lafayette, UV light (NM Downie leg.) 28.VII.1985 (1 ♀, UNHC); **Iowa**: Woodbury County, Southwood Conservation Area (SM Clark leg.) 7.VII.1997 (1 ♀, UNHC); **Massachusetts**: Middlesex County, Framingham (CA Frost leg.) 19.VII.1950 (1 ♂, MCZC); Norfolk County, Grape Island (S Sands & J Novak leg.) 9.VII.2008 (1 ♀, MCZC); Plymouth County, Bumkin Island (M Wheat leg.,) 19.VII.2006 (1 ♀, MCZC), 20.VII.2006 (1 ♂,

MCZC); **Mississippi**: Oktibbeha County, Craig Springs, pitfall trap peripheral to cultivated cotton (GL Snodgrass leg.) 3.X.1979 (1 ♀, MEMC); **New Hampshire**: Strafford County, Dover, Bellamy road, 3.2 km S Dover, sweep red oak (DS Chandler leg.) 16.VII.2011 (1 ♂, UNHC); Strafford County, Durham, 4 mi. W Durham, Malaise trap (RM Reeves leg.) 1.VIII.1982 (1 ♀, UNHC), Window trap (RM Reeves leg.) 29.VIII.1982 (1 ♂, UNHC); Strafford County, Durham (WJ Morse leg.) 25.VII.1985 (1 ♂, UNHC); **Ohio**: Cuyahoga County, Fairview Park, MacBeth Avenue, UV trap (HJ Lee leg.) 25.V.2006 (1 ♂, UNHC); **Texas**: San Patricio County, Welder Wildlife Refuge, adjacent to Arkansas River, Forest/savanna, Beaten from branches of *Ulmus crassifolia* Nutt. (JP Gruber leg.) 17.IV.2014 (10 ♂, 8 ♀, NGPC); **Pennsylvania**: (FC Bowditch leg.) (1 ♂, MCZC); **Wisconsin**: Dane County, Madison, Eagle Heights, attracted by light (N Gompel leg.) 30.VI.2002 (1 ♀, NGPC), 1.VII.2002 (1 ♂, NGPC), 5.VII.2002 (1 ♀, NGPC), 6.VII.2002 (6 ♂, including holotype, NGPC), 7.VII.2002 (1 ♂, 1 ♀, NGPC), 12.VII.2002 (1 ♂, NGPC), 19.VII.2003 (1 ♂, NGPC), 15.VII.2004 (1 ♀, NGPC); Grant County, Cassville Bluffs SNA, mixed hardwood forest, sweeping foliage near path, afternoon, clear (JP Gruber leg.) 18.VII.2003 (1 ♂, 3 ♀, WIRC; 1 ♀, NGPC); La Crosse County, Coulee Experimental State Forest, hardwood dominated forest, hardwood tree, beaten from branches of *Tilia americana* L. or *Carya* sp. (JP Gruber leg.) 18.VII.2014 (3 ♂, 1 ♀, NGPC); Sauk County, Spring Green Preserve SNA, (220 m), dry-mesic southern forest, swept from foliage near path (JP Gruber leg.) 13.VII.2003 (1 ♂, NGPC), 1.VIII.2003 (1 ♂, 1 ♀, WIRC), 19.VIII.2009 (1 ♂, WIRC); Sheboygan County, Kohler-Andrae State Park, mixed coniferous/hardwood forest, beaten from branches of hardwood tree (JP Gruber leg.) 13.VIII.2012 (2 ♂, WIRC). **Imprecise locality**: "Am. Bor" (likely for *America Borealis*) VII.1874 (1 ♂, MNHN).

Elonus hesperus Werner, 1990

(Figures 1e–f; 2c,j; 3d,k,r; 4d,f; 5)

Elonus hesperus Werner, 1990: Werner, 1990: 229, Werner, 1992. ♂ holotype: USNM [examined, dissected, remounted]

Type locality. United States, Oklahoma, Latimer County.

Distribution. Mexico, United States (Arizona, Missouri, Oklahoma).

Notes. This species shows morphological affinities with *E. gruberi* **n. sp.**, from which it is best separated by the dense whitish pubescence covering the elytra (absent in *E. gruberi* **n. sp.**), by its lighter color (brown vs. dark in *E. gruberi* **n. sp.**), and by the shape and size of the orange elytral marking (broad in *E. hesperus*, but notched or most often interrupted in *E. gruberi* **n. sp.**).

Material examined. Mexico. San Luis Potosí: Rio Verde, Media Luna (MA Ivie leg.) 20.VI.1982 (1 ♂, UNHC); **Sinaloa**: Concordia (DS Chandler leg.) VII.1974 (1 ♂, paratype, USNM); **Tamaulipas**: La Pesca, UV trap (WH Cross leg.) 19.IX.1981 (1 ♂, UNHC). **USA. Alabama**: Baldwin County, Weeks Bay NER reserve, mixed forest near estuary, black light and MV lamp (JA MacGown leg.) 4.VIII.2000 (1 ♂, MEMC); Lawrence County, Prairie Grove Glade, Cedar glade, black light (TL Schiefer leg.) 26.V.2004 (1 ♂, MEMC); **Arkansas**: Pulaski County, Little Rock, black light trap (B Baldwin leg.) 20.VI.2003 (1 ♂, UNHC), 4.VIII.2003 (1 ♂, UNHC); **Mississippi**: Oktibbeha County, 3 mi. W of Adaton, black light trap (TL Schiefer leg.) 1.IX.1995 (1 ♂, MEMC); Oktibbeha County, Starkville, White pan trap under black light (WH Cross leg.) 23.VII.1981 (1 ♀, MEMC), (CM Felland leg.) 3.VI.1985 (1 ♂, MEMC), (M Ledlow leg.) 24.VII.1987 (1 ♂, MEMC); Oktibbeha County, Starkville, Agricultural College Mississippi (EC Crockett leg.) 4.VIII.1911 (1 ♂, MEMC); **Oklahoma**: Latimer County, blacklight trap (K Stephan leg.) .VIII.1983 (1 ♂, holotype, USNM; 1 ♂, paratype, BMNH); **Texas**: Cameron County, Brownsville, (DW Crafk leg.) 29.VI.1938 (1 ♂, UNHC); San Patricio County, Corpus Christi, Lake Corpus Christi, 3 mi. S Swinney Switch, UV trap (CW O'Brien leg.) 22.VIII.1974 (1 ♂, UNHC); Willacy County, 11 mi. E Raymondville (AJ Gilbert leg.) 4.V.1989 (1 ♂, UNHC).

Elonus nebulosus (LeConte, 1875)

(Figures 1i; 2d,k; 3a,h,o; 5)

Xylophilus nebulosus LeConte, 1875:175; LeConte, 1878: 426; Champion, 1890: 176; Pic, 1894: 430. ♂ holotype: MCZC [examined, dissected, remounted].

Elonus nebulosus LeConte; Casey, 1895: 776; Pic, 1896: 50; Werner, 1990: 230; Werner, 1992: 257
Hylophilus (Elonus) nebulosus LeConte; Pic, 1902: 9; Pic, 1905: 237, 273; Pic, 1910: 12

Type locality. United States, Pennsylvania.

Distribution. Canada (Quebec), United States (Florida to Texas, north to Michigan) (Werner, 1992).

Notes. Easily separated from all other North American species by its coloration pattern and the enormous size of the male femora. The banding pattern of the elytra tends to fade on very old museum specimens and older specimens should be examined closely to avoid confusion.

Material examined. USA. Massachusetts: Middlesex County, Tyngsborough (Blanchard F. leg.) 28.VII.1888 (1 ♂, MCZC), (Liebeck leg.) VII.1900 (1 ♂, MCZC); **New Hampshire**: Grafton County, Rumney (PJ Darlington leg.) 26.VI.1925 (1 ♂, MCZC); **New York**: Onondaga County, Elbridge (NM Downie leg.) 27.VI.1940 (1 ♀, MCZC); **Pennsylvania**: (1 ♂, holotype, 4 ♂, MCZC); **South Carolina**: Chesterfield County, Sand Hills State Forest, 10.6 km east of Patrick, mixed coniferous/hardwood forest, beaten from branches (JP Gruber leg.) 24.VIII.2011 (1m, NGPC); **Texas**: Fort Bend County, Brazos Bend State Park, Whiteoak Trail, hardwood forest, beaten from small-leaved shrubs or hardwood trees (JP Gruber leg.) 18.IV.2014 (1 ♂, 1 ♀, NGPC); San Jacinto County, Sam Houston National Forest, Creek Scenic Area, mixed hardwood/coniferous forest, beaten from branches of *Quercus* sp. and *Carya* sp. (JP Gruber leg.) 11.III.2013 (3 sp. NGPC); **Virginia:** Scotts Island County, Fredericksburg (HC Fall leg.) 2.VIII.1900 (1 ♂, MCZC); **Wisconsin**: Green County, Abraham's wood SNA, southern mesic hardwood forest, near several fallen tree, flight intercept trap (JP Gruber leg.) 11.VII.2001 (1 sp., NGPC).

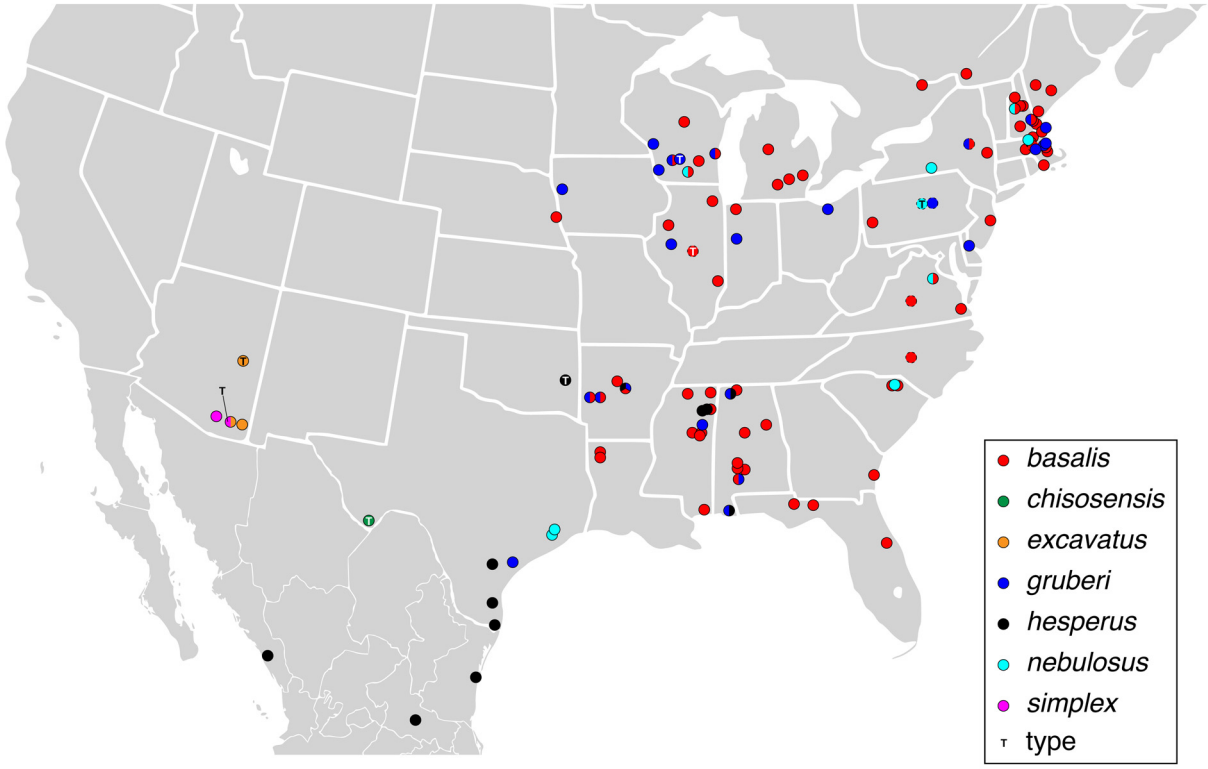

FIGURE 5. Geographical distribution of *Elonus* specimens examined in this study. The conspicuous absence of Western localities may reflect a sampling bias, as representative regional collections from Western states were not examined for the present work; It may, however, indicate that the genus is confined to the east and south of the Rocky Mountains.

Elonus simplex Werner, 1992

(Figures 1d; 2e,l; 3e,l,s; 4i; 5)

Elonus simplex Werner, 1992: Werner, 1992: 260. Holotype: MCZC [examined]

Type locality. United States, Arizona: Cochise County, Cochise Stronghold: Dragoon Mountains.

Distribution. United States (Arizona).

Material examined. USA. Arizona: Cochise County, Cochise Stronghold: Dragoon Mountains, (RJ Shaw leg.) 27 VII 1970 (1 ♂,holotype, MCZC); Pima County, Santa Rita Range Reserve: IBP site, Sta. Rita, UV trap (D Chandler, WL Nutting leg.) 15.VII.1973 (1 ♂, paratype, BMNH); Pima County, Santa Rita Experimental Range, Florida Canyon, mountain canyon riparian habitat, at side of dirt road next to actively flowing wash, at blacklight, night, (JP Gruber leg.) 4.VIII.2013 (1 ♀, NGPC).

Acknowledgements

I am very grateful to Jeff Gruber (Madison, Wisconsin) who prompted me to initiate this work and generously collected large series of Aderidae for me. I want to thank Traci Grzymala (University of California, Berkeley) for sharing her bibliographical library, and providing advice and feedback throughout this work. I am also grateful to all who have facilitated the study of *Elonus* specimens used in this study: Steve Krauth and Dan Young (WIRC), Don Chandler (UNHC), Max Barclay (BMNH), Antoine Mantilleri (MNHN), Charyn Micheli (Smithsonian Institution, Washington, DC), Philip Perkins (MCZC, Harvard), Gene Hall and Wendy Moore (Tucson, Arizona), Terry Schiefer (MEMC), Mercedes Paris (MNCNM). Finally, I want to thank all three reviewers of this work for greatly improving the text.

References

Casey, T.L. (1895) Coleopterological Notices VI. *Annals of the New York Academy of Sciences*, 8, 435–838.

Champion, G.C. (1890) Fam. Xylophilidae. In: *Biologia Centrali–Americana. Insecta, Coleoptera Heteromera (part). Vol. 4 (2) (1889–1893)*. R.H. Porter, London, pp. 166–190, pl. 8.
https://doi.org/10.1111/j.1749-6632.1894.tb55429.x

Chandler, D.S. (2002) 118. Aderidae Winkler, 1927. *In*: Arnett, American Beetles. Vol. 2. *In*: Arnett Jr., R. H., Thomas, M.C., Skelley, P.E. & Frank, J.H. (Eds.), *American Beetles. Vol. II. Polyphaga: Scarabaeoidea through Curculionoidea*. CRC Press LLC, Boca Raton, FL, pp. 559–563.

LeConte, J.L. (1855) Synopsis of the Pyrochroides of the United States. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 7, 270–277.

LeConte, J.L. (1875) Descriptions of new Coleoptera of the United States with notes on geographical distribution. *Transactions of the American Entomoloigcal Society*, 5, 169–176.

LeConte, J.L. (1878) Additional descriptions of new species. *Proceedings of the American Philosophical Society*, 17, 353–472 (373–434).

Pic, M. (1894) Liste complète des Xylophilides décrits jusqu'en 1894, avec descriptions d'espèces nouvelles. *Mémoires de la Societé Zoologique de France*, 7, 427–436.

Pic, M. (1896) Notes et renseignements sur les Xylophilides (Coléoptéres Hétéroméres). *Bulletin de la Société Zoologique de France*, 1896, 49–53.

Pic, M. (1902) Coleoptera Heteromera Fam. Hylophilidae. *In*: Wytsman, P. (Ed.), *Genera Insectorum*, L. Desmet-Verteneuil, Bruxelles, pp. 1–14, 11 pls.

Pic, M. (1905) Contribution à l'étude générale des Hylophilidae. Deuxième partie. *Annales de la Société Entomologique de France*, 74, 181–286, pl. 187, fig. 181–112.

Pic, M. (1910) Hylophilidae. *In*: Schenkling, S. (Ed.), *Coleopterorum Catalogus. Vol. 17 (1910–1934) pars 14*. W. Junk, Berlin, pp. 1–15

Steedman, H.F. (1958) Dimethyl Hydantoin Formaldehyde: A new water-soluble resin for use as a mounting medium. *Journal of Cell Science*, 99, 451–452.

Werner, F.G. (1990) Revision of the Aderidae of eastern North America. *Journal of the New York Entomological Society*, 98, 187–232.

Werner, F.G. (1992) The Nearctic species of *Elonus*(Coleoptera: Aderidae). *Psyche*, 99, 245–264.
https://doi.org/10.1155/1992/97483