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A new species of the genus *Dendroleon* Brauer from Mexico (Neuroptera: Myrmeleontidae)

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A new species of the genus *Dendroleon* Brauer from Mexico (Neuroptera: Myrmeleontidae)

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Abstract. A new species of *Dendroleon* Brauer is described from Mexico and is included in a key to three species of North America. Diagnoses and distributional data are given for *D. obsoletus* (Say) and *D. speciosus* Banks.

Resumen. Una nueva especie de *Dendroleon* Brauer es descripta de México y está incluída en una clave para las tres especies de *Dendroleon* de Norte America. Se provee una diagnosis para *D. obsoletus* (Say) y *D. speciosus* Banks además de datos sobre distribución geográfica.

Introduction

The genus *Dendroleon* Brauer is represented by many species in the Palearctic Region and in Australia but only two closely related species were known from the Nearctic Region. The discovery of a third species in central Mexico is significant especially because it is not closely related to the species in the U.S.A., from which it differs in wing venation and shape. The two described species, *D. speciosus* Banks and *D. obsoletus* (Say), are closely related and are allopatric.

Materials and Methods

Materials studied are deposited in the following collections: **FSCA** - Florida State Collection of Arthropods, Gainesville, Florida, U.S.A.; **MCZC** - Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, U.S.A.; **NHML** - Natural History Museum, London, England.

Subfamily Myrmeleontinae
Tribe Dendroleontini

Taxonomy. Banks 1927: 6; Markl 1954: 219; Hölzel 1972: 9; Stange 1976: 268; New 1985: 1.

Diagnosis. Adult: Hind femur without sensory hair; tibial spurs usually present; pretarsal claws sometimes can close against ventral surface of distal tarsomere which has well developed ventral setae; radial sector of fore wing originates near or before cubital fork (except *Cymothales* Gerstaecker); radial sector of hind wing originates before medial fork, usually one presectoral crossvein (rarely 2 or 3); vein CuP of fore wing runs in even curve from base to hind margin; abdomen usually shorter than wings, without eversible sacs; male ectoproct without postventral lobe; anterior gonapophysis digitiform (Dendroleontina except *Bankisus* Navás) or plate-like (other subtribes).

Larva: mandible strongly upturned, with 3 equidistant and parallel teeth, rarely with extra teeth borne on raised setal bases (*Bankisus; Gatzara* Navás); labial palpus longer than base of mandible; mesoscutum with median tuft of setae; segment IX longer than wide; scoli present on thorax, rarely on abdomen; sternite VIII with submedian tooth.

Discussion. This tribe is widespread in the Old World, especially diverse in Australia, but is represented in the New World only by three species of *Dendroleon* Brauer in North America. The median tuft of setae on the mesoscutum of the larva appears significant in the definition of the tribe although some other genera of the tribe have the median tuft of setae on a stalk whereas *Dendroleon*, *Tricholeon* Esben-Petersen and *Cymothales* have the hair-like setae separated. So far, the median tuft of hair has been found in seven genera (*Austrogymnocnemia* Esben-Petersen, *Bankisus* Navás, *Cymothales* Gerstaecker,

Dendroleon Brauer*, Glenoleon* Banks *and Tricholeon* Esben-Petersen). The median tuft is absent in the rock dwelling *Gatzara* Navás and *Froggattisca* Esben-Petersen.

Dendroleon Brauer

Dendroleon Brauer 1866: 42. Type species: *Myrmeleon pantherinus* Fabricius, by original designation.
=*Neglurus* Navás 1912: 171 (after Stange 1976: 292). Type species *Neglurus vitripennis* Navás, by original designation and monotypy.
=*Borbon* Navás 1914: 111 (after Stange 1976: 292). Type species: *Borbon regius* Navás, by original designation and monotypy.
=*Pantheroleon* Yang 1986: 431 (after Stange 2004: 83). Type species: *Pantheroleon longicruris* Yang, by original designation.

Key to species. World (Esben-Petersen 1923: 86); Nearctic (Banks 1927: 6); Australia (New 1985: 59); Japan (Kuwayama 1962: 382).

Taxonomy. Steinmann 1963: 213 (*Glenurus* =*Dendroleon*); Stange 1976: 293 (*Mossega* =*Dendroleon*); New 1985: 59 (*Mossega* good genus).

Further description. Hagen 1873: 393; Esben-Petersen 1915: 70; 1923: 86; Banks 1899: 69; 1927: 6; New 1985: 59; Stange and Wang 1998: 218-221, figures 96 (color photo of adult), 97 (color photo of larva).

Distribution. Asia; Australia; Europe; Japan; Java; North America.

Diagnosis. Adult: Distal palpomere of labius weakly swollen; antenna long and slender with inconspicuous setae; vertex not conically produced; pronotum longer than wide; legs long and slender; pretarsal claws well developed, not capable of closing against ventral surface of distal tarsomere; femoral sense hair less than twice as long as femur diameter at point of origin; tibial spurs longer than fore coxa, of equal length on all legs; fore wing costal area narrow to moderately high, greatest height less than height of prefork and posterior areas together, simple or when biareoleate the two series of cellules regular throughout; fore wing not excavated nor with posterior margin sinuate near middle; hind wing with apex not much more acute than that of fore wing; fore wing vein CuP runs short distance before coalescing with 1A; pilula axillaris present; male sternite IX subdivided, paramere plate-like; female terminalia with anterior gonapophysis digitiform, posterior gonapophysis strongly curved.

Larva: Mandible strongly upturned, with three equally distant teeth, middle tooth longer than mandibular width at that point; mesoscutum with patch of elongate setae at middle for holding detritus ball; distal palpomere elongate, much longer than base of mandible; mesothoracic spiracle borne on tubercle; anterior scolus of mesothorax about 3 times longer than diameter; tergum IX longer than median width.

Discussion. This is the only genus of Myrmeleontidae except for the cosmopolitan *Myrmeleon* Linnaeus, which has extant representatives in both the Eastern Hemisphere (all continents) and the Western Hemisphere (North America). Significant plesiomorphic characters of this genus are the basal origins of the radial sector in both the fore wing and hind wing, origin of fore wing CuP at or near the basal cross vein, the relatively unmodified fore wing vein 2A, the female terminalia (anterior gonapophysis lobe-like), and the presence of a pilula axillaris. Structurally the adults are similar to those of *Gatzara* Navás but the larvae are very different in structure and habitat. The larvae of *Gatzara* live on bare rock and live a sessile condition. They lack the specialized patch of setae on the middle of the mesonotum and the mandible has small, secondary teeth in addition to the usual three well-developed teeth. The larva of *Dendroleon* has typical mandibular dentition and the mandible is upturned, elongate tergum IX, elongate labial palps, and lacks dolichogasters. The presence of a patch of elongate setae on the thoracic dorsum for holding a detritus ball is shared by some other members of the tribe and is probably an adaptation for living in tree holes or under rock overhangs. Larvae of the European species, *D. pantherinus*, as well as the two species from the U.S.A. are sometimes found in buildings and appear to be the only "urban" species of antlion. A fossil species, *Dendroleon septemmontanus* Statz 1936, was described from the mid-

Figure 1-3. Adult *Dendroleon* females, full dorsal view. **1)** *D. speciosus*. **2)** *D. obsoletus*. **3)** *D. porteri*, holotype.

Tertiary (about 15 million years ago) from Europe. Esben-Petersen (1923: 86) reviewed the world fauna. There are about 19 extant species in the world with 2 species from North America, 4 species in Australia, 1 species in Europe, 1 species in Madagascar, 1 species in Japan, 1 species in Taiwan, 1 species in Java, and the rest in the Oriental area. Australian species show considerable diversity of structure and need to be re-evaluated generically.

Key to species in the Western Hemisphere

1. Fore wing with anterior margin abruptly swollen near junction of subcostal and radial veins (figure 3); costal area at this point nearly twice as high as at middle of wings; hind wing falcate; Central **Mexico** ..... ***Dendroleon porteri* Stange**
— Fore wing with anterior margin evenly curved, costal area at juncture of subcostal and radial veins somewhat lower or subequal than at middle of wings (figures 2,3); hind wing not falcate **2**

2(2). Mid femur nearly all dark brown; **USA**, east of 100° Meridian ... ***Dendroleon obsoletus* (Say)**
— Mid femur mostly pale yellow, usually with subapical fuscous ring; **USA**, west of 100° Meridian ..... ***Dendroleon speciosus* Banks**

Dendroleon obsoletus (Say)
(Figure 2)

Formicaleo obsoletus (Say) 1839: 44. Types. United States (destroyed).
=*Myrmeleon nigrocinctus* Rambur 1842: 398 (after Hagen 1866: 445). Holotype, no data (not located).

Taxonomy. Burmeister 1839: 995 (in *Myrmecoleon* =*ocellatus* Scriba); Hagen 1866: 405 (in *Glenurus*); Hagen 1888: 185 (*D. ocellatus* not =*D. obsoletus*), 187 (in *Dendroleon*).

Further description. LeConte 1859: 413 (reprint of Say 1839); Gosse 1859: 248 (drawing of adult); Hagen 1861: 225; 1888: 187; Glover 1878: plate v, figure 15; Packard 1885: 159, figure 232 (drawing); Howard 1905: plate 16, figure 9 (photo); Banks 1927: 7, plate 4, figure 101 (hind leg); Smith et al. 1943: 209, figure 139 (drawing); Borror and Delong 1954: 294, figure 21-13 (drawing); Westcott 1972: 60, figure (photo); Gillot 1999: figure 10.5a (adult).

Biology. Hagen 1873: 272; Redtenbacher 1884: 13, figure 2 (larval mandible); Lintner 1892: 319 (climbing larva); Smith 1925: 269 (overwinters in cocoon).

Distribution. Eastern U.S.A. (Banks 1927: 7; Penny et al. 1997: 76); Iowa (Penny et al. 1997: 76); Missouri (Froescher 1947: 128).

Diagnosis. Fore wing with anterior margin evenly curved, costal area at juncture of subcostal and radial veins somewhat less than to its width at middle of wings (Fig. 2); hind wing not falcate; mid femur nearly dark brown; east of 100° Meridian.

Material studied (all east of 100° Meridian). **U.S.A. Florida**: Gainesville, Alachua County, VI.25.1984, L. Stange (1f, FSCA); 8 km. northwest Starke, Bradford County, VI.23.1980, W. Wilkening (1m, FSCA); Juniper Springs, Marion County, VII.29.1954, H. Denmark (1f, FSCA); Fruitville, Sarasota County, IV.22.1978, H. King (1m, FSCA). **Illinois**: Macon County, VII.19.1980, P. Skelley (1f, FSCA); Oregon, IV.3.1928 (l larva, FSCA). **Maryland**: College Park, V.17.1956, E. MacLeod, under bark of *Pinus taeda* (1 larva, FSCA); Silver Springs, Montgomery County, VII.31.1979, A. Menke (1f, FSCA). **Missouri**: 1.5 miles southwest Patterson, Wayne County, IX.20.1989, W. Webber (1f, FSCA); Greenville, IX.1984, A. Webber (1f, FSCA). **Mississippi**: 1 mile northwest Morgan Town, Oktibbeha County, IX.12.1976, L. Lambert (1f, FSCA). **North Carolina**: Asheville, Buncombe County, VIII.1.1978, L. Lampert (1f, FSCA). **Oklahoma**: Fairmont, Garfield County, VII.9.1998, J. Reinert (1m, FSCA); Latimer County, IX.1.1987,

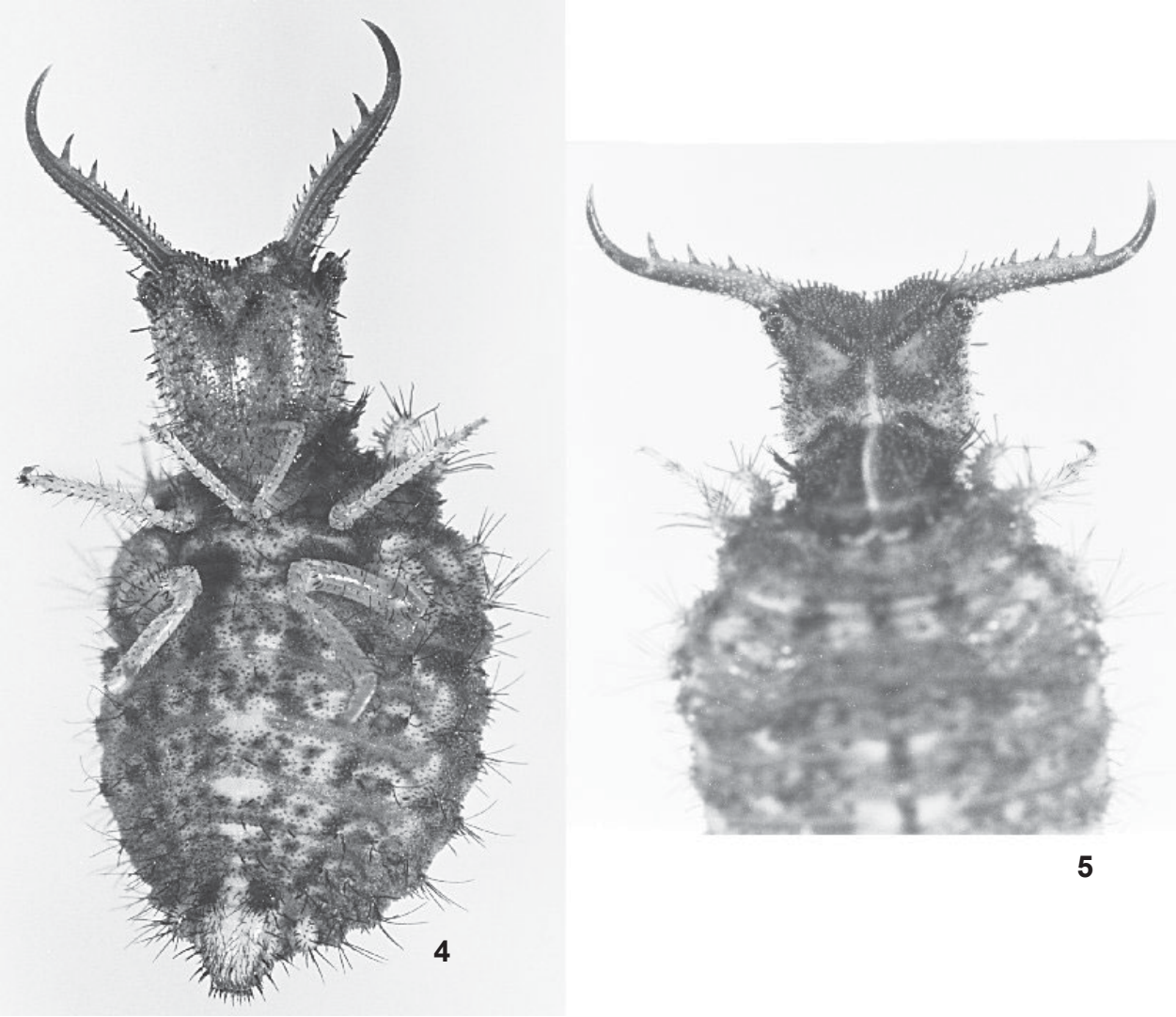

Figure 4-5. *Dendroleon porteri*, 3rd instar larva. **4)** Ventral view. **5)** Dorsal view.

K. Stephan (1m, FSCA). **South Carolina**: Pickens County, IX.10.1968, L. Roche (1f, FSCA). **Texas**: Laredo, Webb County, VI.15.1968 (1f, FSCA). **West Virginia**: Charleston, Kanawha County, VIII.11.1970, A. Miller (1f, FSCA)

Biology. Larvae live in dry tree holes of *Quercus virginiana* and probably other trees.

Discussion. This species differs from *D. speciosus* not only in wing maculation as detailed in the key but also in male genitalia. The most conspicuous difference in male genitalia is the lack of membrane spicules in *D. obsoletus*. Specimens of *D. obsoletus* have been found principally in wooded areas roughly east of the 100º meridian (see Bohart and Menke 1963:124 for a discussion of the significance of this situation). The closest known contact between *D. speciosus* and *D. obsoletus* is in Yankton County, South Dakota (*D. obsoletus*) and Goshen County, Wyoming (*D. speciosus*), a distance of about 360 miles. The Missouri River may be a natural boundary between the two species.

***Dendroleon porteri* Stange, new species**
(Figure 3-5)

Holotype female. Colorines, Mexico, Mexico, 17.VII. 1978, C. Porter, porch light (FSCA). One additional female specimen, Cuernavaca, Morelos, Mexico, VI. H.H.S. (NHML).

Measurements. Length from head to tip of abdomen 23 mm, fore wing and hind wing 29 mm.

Coloration. Face pale brown, lateral dark spot on clypeus, interantennal mark dark brown band below antennae, extending onto epicranial area as a shiny dash above each antenna; vertex predominately pale brown with small, irregular dark brown areas; palpi mostly dark brown; antenna dark brown basally and apically, flagellomeres ix-xxii pale brown; pronotum pale brown with small dark brown spots at setal bases; mesonotum mostly pale brown with dark brown predominating median area; mesoscutellum and postnotum dark brown along middle; metanotum nearly all pale brown with small dark brown submedian area anterior on prescutum; pleural area with broad pale band dorsally, dark brown band ventrally; coxae mostly dark brown except medially; femur and tibia pale brown with numerous dark brown spots at setal bases, streaked with dark brown along closing face of fore femur and toward base of femur, apical dark brown ring on tibia; tarsus pale brown, small dark brown apical mark on distal tarsomere; abdomen mostly dark brown except for pale tergite I and anterior margin of tergite II; wings with many areas suffused with light brown depicted in figure 3; wings mostly pale brown.

Chaetotaxy. Fore femoral sense hair about twice as long as width of femur at point of hair origin, longer than that of mid femur.

Structure. Antenna with 36 flagellomeres; fore femur and fore tibia shorter and somewhat more swollen than those of mid leg; fore tarsus and mid tarsus about equal in proportional lengths of tarsomeres, spurs and claws; tarsomere I a little more than twice as long as middle diameter in lateral view, subequal in length to distal tarsomere; tibial spurs extending to about apex of second tarsomere, about 3.5 times longer than pretarsal claws; fore wing and hind wing falcate (figure 3); fore wing with abrupt widening of costal area at stigma; fore wing costal cells above radial sector somewhat higher than wide.

Biology. One third instar larva was found near Colorines, Mexico, living in a small crevice near the top of a 1.2 m high rock wall. The habitat was dry and rain protected with relatively fine organic material. The larva was "anchored" on the substrate.

Discussion. This species differs from the two closely related U.S. species in the shape of the wings. The falcate wings of *D. porteri* (Fig. 3) with the costal area abruptly broadened at the stigma are characteristic of this species and very different from the wings of *D. obsoletus* and *D. speciosus*. A *Dendroleon* larva was found near the type locality and is tentatively identified as this species. It died before pupation from a disease that left it unfit for description; however photographs were taken of the third instar before death (Fig. 4, 5). The distribution of this species borders the Neotropics although the two known localities are in pine forested highland Mexico which is temperate Nearctic. There are species of *Dendroleon* in the Old World Tropics that have falcate wings such as *D. vitripennis* Navás (Malay Peninsula). This species is named in honor of Dr. Charles C. Porter, noted hymenopterist, who collected the holotype.

***Dendroleon speciosus* Banks**
(Figure 1)

Dendroleon speciosus Banks 1905: 7. Holotype female, Boulder, Colorado, U.S.A. (MCZC).

Further description. Banks 1927: 8, figure 41 (base fore wing); Stange 1970: 37, figure 15 (female terminalia); 1980: 3, figure 13 (female terminalia).

Diagnosis. Fore wing with anterior margin evenly curved, costal area at point of coalescing of subcostal and radial veins somewhat lower or subequal than at middle of wings (Fig. 1); hind wing not falcate; mid femur mostly pale yellow, usually with subapical fuscous ring.

Material studied (all west of 100° Meridian). **U.S.A. Arizona**: Box Canyon, Pima County, III.23.1985, REARED, R. Miller and L. Stange (1f, FSCA); 25 miles southeast Flagstaff, VII.28.1975, Menke and Pulawski (1f, FSCA); Madera Canyon Santa Rita Mts., VII.25.1957, A. Lewis (1f, FSCA); Portal, IX.2.1974, H. Townes (1m, 2ff, FSCA). **California**: Barton Flats, San Bernardino Mts., VIII.12.1958, C. Henne (1f, FSCA); Julian, San Diego County, VII.22.1961, F. Williams (1f, FSCA); Quincy, Plumas County, VIII.7.1962, N. Pini (1m, FSCA); Pinnacles National Monument, San Benito County, A. Menke (1f, FSCA); 3 miles south Railroad Flat, Calaveras County, 2900', VIII.5.1968, E. Linsley (1f, FSCA); Redding, Shasta County, IX.15.1983, REARED, R. Miller (5 larvae, FSCA); Sagehen Creek, Nevada County, VII.12.1972, Goodpasture (1f, FSCA); Strawberry, Tuolumne County VIII.13.1960, T. Gantenbein (1m, 1f, FSCA). **Idaho:** Stanley, VIII.5.1978, H.Townes (1f, FSCA). **Nevada**: Topaz Lake, Douglas County, VIII.17.1950. D. Palmquist (1f, FSCA). **Oregon**: Green Springs, Jackson County, VIII.27.1961, J. Buckett (1f, FSCA).

Biology. The larvae have been found in northern California living in tree holes of pine or oak below 600 m elevation and on small rain and snow protected rock shelves at higher elevations. In both habitats they are in fine organic matter with their legs holding onto a solid substrate. Larvae have also been found in houses near the forest. In one case larvae were found living on top of a basement refrigerator covered with dust. Adult females use substrate testing with the end of their abdomen to determine suitability of egg deposition sites before coating eggs with fine material and leaving them on the surface. The females of this species appear to be unique in the family studied so far in that they die shortly after laying their eggs instead of continuing to feed and developing more eggs (Miller 1990).

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Literature cited

Banks, N. 1899. A classification of the North American Myrmeleonidae. Canadian Entomologist 31: 67-71.

Banks, N. 1905. Descriptions of new Nearctic neuropteroid insects. Transactions of the American Entomological Society 32: 1-20, pl. 1-11 (27 fig.).

Banks, N. 1927. A revision of the Nearctic Myrmeleonidae. Bulletin of the Museum of Comparative Zoology 68: 1-84.

Bohart, R. M., and A. E. Menke. 1963. A reclassification of the Sphecinae with a revision of the Nearctic species of the tribes Sceliphronini and Sphecini. University of California Publications in Entomology 30: 91-181.

Borror, D. J., and D. M. Delong 1954. An introduction to the study of insects. Rinehart and Co.; New York. 1030 p. (Revised 1976, 1981).

Brauer, F. M. 1866. Neuropteren. *In*: Reise der Österreichischen Fregatte Novara um die Erde, in den Jahren 1857, 1858, 1859, unter den befehlen des Commodore B. von Wüllerstorf-Urbair H. K. von Scherzer, ed. Academie d. Wissenschaften Wien. Karl Gerold's Sohn; Vienna (1864-75). Zoologische Theil. Bd. 2, No. 4, 1(A): 1-104, 2 pl., 3 p. of plate explanations.

Burmeister, H. C. C. 1839. Handbuch der Entomologie. Band 2, Abt. (Gymnognatha). Enslin; Berlin. p. 757-1050.

Esben-Petersen, P. 1915. Australian Neuroptera. Part ii. Proceedings of the Linnean Society of New South Wales 40(15): 56-74, 2 fig. + 8 pl (27 fig.).

Esben-Petersen, P. 1923. Über das genus *Dendroleon* Brauer. Konowia 2: 86-92, fig. 1-4.

Froeschner, R. C. 1947. Notes and keys to the Neuroptera of Missouri. Annals of the Entomological Society of America 40: 123-136, 2 pl. (20 fig.).

Gillot, C. 1999. Entomology. Second Edition. Plenum Press; New York. v-viii+798 p.

Glover, T. 1878. Illustrations of North American entomology in the orders of Coleoptera, Orthoptera, Neuroptera, Hymenoptera, Lepidoptera, Homoptera and Diptera. Washington. p. 1-23, pl. i-vii (Neuroptera), many irregularly numbered plates.

Gosse, P. H. 1859. Letters from Alabama (US) chiefly relating to Natural History. Morgan and Chase; London. 306 p. (antlions on page 248)

Hagen, H. 1861. Synopsis of the Neuroptera of North America, with a list of the South American species, prepared for the Smithsonian Institution. Smithsonian Miscellaneous Collection 4(1): I-XX, + 1-347.

Hagen, H. 1866. Hemerobidarum synopsis synonymica. Stettiner Entomologische Zeitung 27: 369-462.

Hagen, H. 1873. Die Larven von *Myrmeleon*. Stettiner Entomologische Zeitung 34: 249-295, 377-398.

Hagen, H. 1888. Stray notes on Myrmeleonidae. Part 4 - 5. Canadian Entomologist 20: 34-38, 185-191, 204-211.

Hölzel, H. 1972. Die Neuropteren Vorderasiens. IV. Myrmeleonidae. Beiträge zur Naturkundlichen Forschung in Südwestdeutschland, Beiheft 1: 3-103, fig. 1-197.

Howard, L. O. 1905. The insect book. A popular account of the bees, wasps, ants, grasshoppers, flies and other North American insects, exclusive of the butterflies, moths, and beetles, with full life histories, tables and bibliographies. Doubleday, Page and Company; New York. xxviii+429 p., 47 pl., 264 fig.

Kuwayama, S. 1962. A revisional synopsis of the Neuroptera in Japan. Pacific Insects 4(2): 325-412, 27 fig.

LeConte, J. L 1859. The complete writings of Thomas Say on the entomology of North America edited by John L. LeConte with a memoir of the author by George Ord. Bailliere; New York. Vol. 2: 4-814, 1 pl.

Lintner, J. A. 1892. *Dendroleon obsoletum*, a climbing ant lion. James B. Lyon, State printer; Albany. 319 p. (also as 44th Annual Report of the State Entomologist, 1890, New York Museum, p. 197-405, fig. 1-40).

Markl, W. 1954. Vergleichend-morphologische Studien zur Systematik und Klassifikation der Myrmeleoniden. Verhandlungen der Naturforschenden Gesellschaft in Basel 65: 178-263.

Navás, L. 1912. Insectos neurópteros nuevos ó poco conocidos. Memorias de la Real Academia de Ciencias y Artes de Barcelona (3)10: 135-202, 29 fig.

Navás, L. 1914. Neurópteros nuevos o poco conocidos (Segunda serie). Memorias de la Real Academia de Ciencias y Artes de Barcelona (3)11(8): 105-119, fig. 1-6.

New, T. R. 1985. A revision of the Australian Myrmeleontidae. II. Dendroleontini; Australian Journal of Zoology Supplementary Series 105: 1-170.

Packard, A. S. 1885. Neuroptera. *In*: J. S. Kingsley. The Riverside Natural History. Houghton, Mifflin and Co.; New York. Vol. 2., 569 p.

Penny, N., P. A. Adams, and L. A. Stange. 1997. Species catalog of the Neuroptera, Megaloptera, and Raphidioptera of America north of Mexico. Proceedings of the California Academy of Sciences 50(3): 9-114.

Rambur, J. P. 1842. Historie Naturelle des Insectes. Névroptères. Librairie encyclopédique de Roret. Fain et Thunot; Paris. 534 p., 12 pl.

Redtenbacher, J. 1884. Die Lebensweise der Ameisen-löwen. Eesti NSV Teaduste Akadeemia, Loodusuurijate Selts, Faunistilisi Märkmeid (=The Naturalists Society attached to the Academy of Sciences of the Estonian Faunistic Notes). 1884: 1-27, l pl., 2 tab.

Say, T. 1839. Descriptions of new North American neuropterous insects, and observations on some already described. Journal of the Academy of Natural Sciences of Philadelphia 8: 9-46.

Smith, R. C. 1925. The Neuroptera and Mecoptera of Kansas. Bulletin of the Brooklyn Entomological Society 20: 165-171.

Smith, R. C., E. G. Kelley, G. A. Dean, A. R. Bryson, and R. L. Parker. 1943. Common insects of Kansas. Kansas State Board of Agriculture 62 (No.255): 3-440, fig. A-I, I-464, pl. 1-5 + unnumbered.

Stange, L. A. 1970. Revision of the ant-lion tribe Brachynemurini of North America. University of California Publications in Entomology 55: 1-192.

Stange, L. A. 1976. Clasificación y catálogo mundial de la tribu Dendroleontini con la redescripción del género Voltor Navás. Acta Zoologica Lilloana 31: 261-320, 9 fig.

Stange, L. A. 1980. The ant-lions of Florida. I. Genera . Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Entomology Circular 215: 1-4, 21 fig.

Stange, L.A. 2004. A systematic catalog, bibliography and classification of the world antlions (Insecta: Neuroptera: Myrmeleontidae). Memoirs of the American Entomological Institute 74: 1-565.

Stange, L. A., and H. Wang. 1998. Guide book to insects in Taiwan (18). Neuroptera.Megaloptera. Raphidioptera - Lacewings, antlions, owlflies, dobsonflies, snakeflies, mantispids. Hsu-Hsing Book Co; Taipei. p. 1-278, 108 fig.

Statz, G. 1936. Über neue Funde von Neuropterem, Panorpaten und Tricopteren aus der Tertiäen Schiefern von Rott am Siebengebirge. Decheniana: Verhandlungen des Naturhistorischen Vereins des Rheinlande und Westfalens (Bonn) 93: 208-255, 28 fig.

Steinmann, H. 1963. Magyarország hangyalesól (Myrmeleontidae of Hungary). Folia Entomologica Hungarica (N.S.)16: 211-226, 8 fig.

Westcott, C. 1972. Gallery of insect friends. *In*: C. Westcott and P. K. Nelson. Handbook on biological control of plant pests (3rd printing). Plants and Gardens 16(3): 54-68.

Yang, Chi-kum. 1986. Thirty new species and four new genera of Neuroptera from Yunnan, and the family Nemopteridae new to China (in Chinese with English translation). Acta Agriculturae Universitatis Pekinensis 12: 153-166, 423-434, fig. 16-30.

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