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**Systematic revision of the genus *Calligrapha* Chevrolat
(Coleoptera: Chrysomelidae, Chrysomelinae) in Central America:
The group of *Calligrapha argus* Stål**

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Summary

Calligrapha Chevrolat is a large American leaf beetle genus of imprecise taxonomic boundaries. Most species occur in Central and South America where they have not been subject to modern systematic revisions. This work is the first attempt to clarify the systematics of the group by focusing on a relatively diverse species group well characterized from a morphological standpoint: the group of *C. argus* Stål. I provide a pragmatic identification key for major lineages in *Calligrapha*, highlighting a potentially useful character for supra-specific rank systematics within this genus, namely the shape of the distal end of the flagellum in the penis. This key helps recognizing the *C. argus* species group as one with species having a single spot enclosed by humeral lunule and a complete arcuate band, laterally confluent with subsutural stripe (except in *C. elegantula* Jacoby), deep hypomerular furrow and with characteristic ventral carving at apex of flagellum, as major distinguishing features. The species group is subdivided into fourteen species, whereby one previously described taxon, *C. famularis* Stål, is subordinated as subspecies of *C. geographica* Stål **stat. nov.**, and two new species from southern Mexico and Guatemala are described: *C. anabelae* **sp. nov.** and *C. catarinae* **sp. nov.** An identification key for all the species in the group is provided, as well as collection data for the approximately 2,100 specimens determined for this work and distribution maps based on these collection data. The group is centred in the Caribbean Mesoamerican biogeographic domain, with two species reaching the California-Rocky Mountain domain to the north (*C. ancoralis* Stål and *C. diversa* Stål), and three species reaching the Caribbean Northwest-South American domain to the south (*C. argus* Stål, *C. diversa* Stål and *C. simillima* Stål).

Key words: Biogeography; distribution; leaf beetles; Mesoamerica; Mexico; new species; taxonomy

Introduction

Auguste Chevrolat proposed the name “*Calligrapha*” to an assemblage of Chrysomelinae in the collection of Count P. F. M. A. Dejean (Second Catalogue, 1836; Bousquet & Bouchard 2013), mostly from Mexico, and generally characterized by an intricate design on their elytra, surely suggesting him of exquisite (κάλλος) drawings (γραφή). Later, in his account of Chrysomelinae within the third tome of Charles D’Orbigny’s *Dictionnaire universel d’Histoire Naturelle* (1843, p. 656), he indicated *Chrysomela polyspila* Germar, 1821 as the type for the genus and ranked it with most other known Chrysomelinae genera in a crude system based on the morphology of tarsal claws, simple claws in this case. Just before that, Reverend Frederick W. Hope trying to amend Chevrolat’s

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References

- Achard, J. (1923) Étude sur le genre *Zygogramma* Chev. *Fragments Entomologiques*, 4, 51–65.
- Bechyné, J. (1952) Nachträge zu den Katalogen von Blackwelder und Junk-Schenkling der neotropischen echten Chrysomeliden (Col. Phytophaga). *Entomologische Arbeiten aus dem Museum Gg. Frey*, 3, 1–62.
- Bechyné, J. (1997) Evaluación de los datos sobre los Phytophaga dañinos en Venezuela (Coleoptera). *Boletín de Entomología Venezolana, Serie Monografías*, 1, 1–459.
- Bechyné, J. & Springlová de Bechyné, B. (1965) Notes sur les Chrysomelidae s. str. de Venezuela et des pays limitrophes. *Revista de la Facultad de Agronomía de Maracay*, 3, 44–110.
- Blackwelder, R.E. (1944–1957) Checklist of the coleopterous insects of Mexico, Central America, the West Indies and South America. Parts 1–6. *Bulletin of the United States National Museum*, 185, i–xii, 1–1492.
- Bousquet, Y. & Bouchard, P. (2013) The genera in the second catalogue (1833–1836) of Dejean's Coleoptera collection. *ZooKeys*, 282, 1–219.
<http://dx.doi.org/10.3897/zookeys.282.4401>
- Brown, W.J. (1945) Food-plants and distribution of the species of *Calligrapha* in Canada, with descriptions of new species (Coleoptera, Chrysomelidae). *Canadian Entomologist*, 77, 117–133.
<http://dx.doi.org/10.4039/Ent77117-7>
- Burgos-Solorio, A. & Anaya-Rosales, S. (2004) Los crisomelinos (Coleoptera: Chrysomelidae: Chrysomelinae) del estado de Morelos. *Acta Zoológica Mexicana, New Series*, 20, 39–66.
- Chapuis, F. (1874) *Genera des Coléoptères ou exposé méthodique et critique de tous les genres proposés jusqu'ici dans cet ordre d'insectes. Tome Dixième. Famille des Phytophages*. Librairie Encyclopédique de Roret, Paris, 455 pp.
- Chevrolat, A. (1836) *Calligrapha*. In: Dejean, P.F.M.A. (Ed), *Catalogue des Coléoptères de la collection de M. le Comte Dejean. [Livraison 5]*. Méquignon-Marvis, Paris, pp. 398.
- Chevrolat, A. (1844) Chrysomélines. In: D'Orbigny, C. (Ed), *Dictionnaire universel d'Histoire Naturelle. Tome Troisième*. Langlois et Leclercq, Paris, pp. 654–657.
- Crotch, G.R. (1873) Materials for the study of the Phytophaga of the United States. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1873, 19–83.
- Dugés, E.R.D. (1901) *Catálogo de la colección de coleópteros mexicanos del Museo Nacional*. Imprenta del Museo Nacional, México, 125 pp.

- Erichson, G.F. (1847) *Conspectus Insectorum Coleopterorum, quae in Republica Peruana observata sunt. Archiv für Naturgeschichte*, 13, 67–185.
- Escalante, T., Morrone, J.J. & Rodríguez-Tapia, G. (2013) Biogeographic regions of North American mammals based on endemism. *Biological Journal of the Linnean Society*, 110, 485–499.
<http://dx.doi.org/10.1111/bij.12142>
- Escalante, T., Rodríguez-Tapia, G., Szumik, C., Morrone, J.J. & Rivas, M. (2010) Delimitation of the Nearctic region according to mammalian distributional patterns. *Journal of Mammalogy*, 91, 1381–1388.
<http://dx.doi.org/10.1644/10-MAMM-A-136.1>
- Flowers, R.W. (2004) The genera of Chrysomelinae (Coleoptera: Chrysomelidae) in Costa Rica. *Revista de Biología Tropical*, 52, 77–83.
<http://dx.doi.org/10.15517/rbt.v52i1.14754>
- Gemminger, M. & Harold, B. de (1874) *Catalogus Coleopterorum hucusque descriptorum synonymicus et systematicus. Tom XI. Chrysomelidae (Pars I.)*. Suptu G. Beck, Monachii. p. 3233–3478.
- Germar, E. (1821) Neue exotische Käfer beschrieben von C. R. W. Wiedemann u. E. F. Germar. *Magazin der Entomologie*, 4, 107–183.
- Gómez-Zurita, J. (2005) New distribution records and biogeography of *Calligrapha* species (Leaf beetles), in North America (Coleoptera : Chrysomelidae, Chrysomelinae). *The Canadian Field-Naturalist*, 119, 88–100.
- Gómez-Zurita, J., Vogler, A.P. & Funk, D.J. (2004) Diagnosing an overlooked North American taxon: biological observations and mitochondrial insights on *Calligrapha suturella* Schaeffer, 1933 new status (Coleoptera, Chrysomelidae). *Annals of the Entomological Society of America*, 97, 28–36.
[http://dx.doi.org/10.1603/0013-8746\(2004\)097\[0028:DAONAT\]2.0.CO;2](http://dx.doi.org/10.1603/0013-8746(2004)097[0028:DAONAT]2.0.CO;2)
- Gómez-Zurita, J., Funk, D.J. & Vogler, A.P. (2006) The evolution of unisexuality in *Calligrapha* leaf beetles: molecular and ecological insights on multiple origins via interspecific hybridization. *Evolution*, 60, 328–347.
<http://dx.doi.org/10.1111/j.0014-3820.2006.tb01110.x>
- Gómez-Zurita, J., Hunt, T. & Vogler, A.P. (2008) Multilocus ribosomal RNA phylogeny of the leaf beetles (Chrysomelidae). *Cladistics*, 24, 34–50.
<http://dx.doi.org/10.1111/j.1096-0031.2007.00167.x>
- Guérin-Ménéville, F.E. (1844) *Iconographie du Règne Animal de G. Cuvier ou Représentation d'après nature de l'une des espèces les plus remarquables, et souvent non encore figurées, de chaque genre d'animaux*. Chez J.B. Baillièere, Paris, 576 pp.
- Guérin-Ménéville, F.E. (1855) Catalogue des insectes coléoptères, recueillis par M. Gaetano Osculati, pendant son exploration de la région équatoriale, sur les bords du Napo et de l'Amazone. *Verhandlungen des Zoologisch-botanischen Vereins in Wien*, 5, 573–612.
- Hope, F.W. (1840) *The Coleopterist's Manual, part the third, containing various families, genera, and species, of beetles, recorded by Linneus and Fabricius. Also, descriptions of newly discovered and unpublished insects*. J.C. Bridgewater, and Bowdery & Kerby, London, 191 pp.
- Jacoby, M. (1877) Descriptions of new species of phytophagous Coleoptera. *Proceedings of the Zoological Society of London*, 1877, 510–520.
- Jacoby, M. (1880–1892) Insecta. Coleoptera. Phytophaga (part). Vol. VI. Part 1 and Suppl. In: Godman, F.D. & Salvin, O. (Eds.), *Biologia Centrali-Americana*. R. H. Porter, London, pp. iii–xx, 1–625, 1–374.
- Jacoby, M. (1896) Remarks on the system of coloration and punctuation in the beetles of the genus *Calligrapha*. *Proceedings of the Zoological Society of London*, 1896, 224–225.
- Le Conte, J.L. (1859) Additions to the coleopterous fauna of Northern California and Oregon. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 11, 281–292.
- Leng, C.W. (1920) *Catalogue of the Coleoptera of America, North of Mexico*. John D. Serman, Jr., Mont Vernon, N.Y., 470 pp.
- Linell, M.L. (1896) A short review of the Chrysomelae of North America. *Journal of the New York Entomological Society*, 4, 195–200.
- Maes, J.-M. (1998) *Insectos de Nicaragua. Vol. 2*. Secretaría Técnica BOSAWAS, MARENA, Managua, 683 pp. [pp. 487–1169]
- Maes, J.-M. & Staines, C. (1991) Catálogo de los Chrysomelidae (Coleoptera) de Nicaragua. *Revista Nicaragüense de Entomología*, 18, 1–53.
- Monrós, F. (1955) On some new genera of Nearctic Chrysomelinae (Chrysomelidae). *The Coleopterists' Bulletin*, 9, 53–60.
- Montelongo, T. & Gómez-Zurita, J. (2013) Morphological and molecular characterization of a new Nearctic species of *Calligrapha* Chevrolat, 1836 (Coleoptera: Chrysomelidae, Chrysomelinae) from Central Mexico. *Proceedings of the Entomological Society of Washington*, 115, 369–391.
<http://dx.doi.org/10.4289/0013-8797.115.4.369>
- Montelongo, T. & Gómez-Zurita, J. (2014) Multilocus molecular systematics and evolution in time and space of *Calligrapha* (Coleoptera: Chrysomelidae, Chrysomelinae). *Zoologica Scripta*, 43, 605–628.
<http://dx.doi.org/10.1111/zsc.12073>
- Morrone, J.J. (2006) Biogeographic areas and transition zones of Latin America and the Caribbean islands based on panbiogeographic and cladistic analyses of the entomofauna. *Annual Review of Entomology*, 51, 467–494.

<http://dx.doi.org/10.1146/annurev.ento.50.071803.130447>

- Motschulsky, V. de (1860) Coléoptères rapportés de la Sibérie orientale et notamment des pays situés sur les bords du fleuve Amour. In: Schrenck's, L.v. (Ed.), *Reisen und Forschungen im Amur-Lande. Band II. Coleopteren*. Commissionäre der Kaiserlichen Akademie der Wissenschaften, St. Petersburg, pp. 79–246.
- Pallister, J.C. (1953) The leaf beetles of north central Mexico collected on the David Rockefeller Mexican Expedition (Coleoptera, Chrysomelidae). *American Museum Novitates*, 1623, 1–95.
- Quicke, D.L.J. (1993) *Principles and Techniques of Contemporary Taxonomy*. Chapman & Hall, London, 311 pp.
- Reid, C.A.M. (2002) A new genus of Chrysomelinae from Australia (Coleoptera: Chrysomelidae). *The Coleopterist's Bulletin*, 56, 589–596.
[http://dx.doi.org/10.1649/0010-065X\(2002\)056\[0589:ANGOCF\]2.0.CO;2](http://dx.doi.org/10.1649/0010-065X(2002)056[0589:ANGOCF]2.0.CO;2)
- Rogers, W.F. (1856) Synopsis of the species of *Chrysomela* and allied genera inhabiting the United States. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 8, 29–39.
- Scherer, G. (1959) Chrysomelidenausbeute der Reise von Herrn Dr. h. c. Georg Frey nach Nord- und Mittelamerika (Col. Chrysomelidae). *Entomologische Arbeiten aus dem Museum Frey*, 10, 605–612.
- Schilthuisen, M. (2003) Shape matters: the evolution of insect genitalia. *Proceedings of the Section Applied and Experimental Entomology, Netherlands Entomological Society*, 14, 9–15.
- Selander, R.B. & Vaurie, P. (1962) A gazetteer to accompany the “Insecta” volumes of the “Biologia Centrali Americana”. *American Museum Novitates*, 2099, 1–70.
- Shapiro, A.M. & Porter, A.H. (1989) The lock-and-key hypothesis: evolutionary and biosystematic interpretation of insect genitalia. *Annual Review of Entomology*, 34, 231–245.
<http://dx.doi.org/10.1146/annurev.en.34.010189.001311>
- Sharp, D. & Muir, F. (1912) The comparative anatomy of the male genital tube in Coleoptera. *Transactions of the Entomological Society of London*, Dec. 1912, 477–642.
- Stål, C. (1859) Bidrag till kännedomen om Amerikas Chrysomeliner. *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar*, 16, 305–326.
- Stål, C. (1860) Till kännedomen om Chrysomelidae. *Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar*, 17, 455–470.
- Stål, C. (1862–1865) *Monographie des Chrysomélides de l'Amérique*. C. A. Leffler, Uppsala, 365 pp.
- Steinheil, E. (1877) Die columbischen Chrysomelinen der Coleopteren-Sammlung. *Mittheilungen des Münchener Entomologischen Vereins*, 1, 31–48.
- Tower, W.L. (1906) *An investigation of evolution in chrysomelid beetles of the genus Leptinotarsa*. Carnegie Institution of Washington, Washington D.C., 320 pp.
- Townsend, C.H.T. (1895) On the Coleoptera of New Mexico and Arizona, including biologic and other notes. *The Canadian Entomologist*, 27, 39–51.
<http://dx.doi.org/10.4039/Ent2739-2>
- Weise, J. (1916) *Coleopterorum Catalogus. Pars 68. Chrysomelidae: 12. Chrysomelinae*. W. Junk, Berlin, 255 pp.
- Wilcox, J.A. (1972) A review of the North American Chrysomeline leaf beetles (Coleoptera: Chrysomelidae). *New York State Museum Science Service Bulletin*, 421, 1–37.
- Wilcox, J.A. (1975) *Checklist of the beetles of Canada, United States, Mexico, Central America and the West Indies. Vol. 1. pt. 7. The leaf beetles* Biological Research Institute of America, New York, 166 pp. [red version]