

A new European species of *Nevrorthus* in the Iberian Peninsula (Insecta, Neuropterida)

V. J. MONSERRAT¹ & O. GAVIRA²

¹Departamento de Zoología y Antropología Física, Facultad de Biología. Universidad Complutense. E-28040 Madrid, Spain.
E-mail: artmad@bio.ucm.es

²Camino Castillejos 9, 1ºD. E-29010 Málaga, Spain. E-mail: ogavira@hotmail.com

Abstract

A new species of *Nevrorthus* (Insecta, Neuropterida: Nevorthidae) has been found in the south of the Iberian Peninsula (Spain, Málaga): *N. reconditus* Monserrat & Gavira n. sp. This new species represents the first record of this genus and this family in the Westernmost Mediterranean basin. A key to the known species of this genus is provided.

Key words: Neuroptera, Nevorthidae, Western Mediterranean, Spain, Málaga

Resumen

Se describe una nueva especie de *Nevrorthus* (Insecta, Neuropterida: Nevorthidae) del sur de la Península Ibérica (España, Málaga): *N. reconditus* Monserrat & Gavira n. sp. Esta nueva especie representa la primera cita de este género y de esta familia en el Mediterráneo más occidental. Se aporta una clave de las especies conocidas de este género.

Introduction

The family Nevorthidae Nakahara, 1915 represents one of the most primitive, enigmatic and interesting families from the point of view of phylogeny within the order Neuroptera (Aspöck 1992, 2002; Aspöck *et al.* 1980, 2001; Aspöck & Aspöck 1994, 1999, 2007, 2008a, 2010; Haring & Aspöck 2004; Beutel *et al.* 2010; Liu *et al.* 2012), and is considered to be a real living fossil according to the criterion of Thenius (2000).

The fossil records of Nevorthidae (Map 1) begins in the Lower Cretaceous amber (c. 99–112 Ma) from Myanmar (Burma) with larvae thought to belong to this family (Grimaldi *et al.* 2002). In addition, several genera and species have been found in Baltic and Rovno (Ukraine) amber (Eocene-Oligocene, 34–55 Ma), and Saxonian amber (Lower Miocene, 22 Ma) from Bitterfeld (Germany), with 3 genera and 5 species described (Parfin & Gurney 1956; MacLeod 1970; Nel & Jarzemowski 1997; Jarzemowski 1980; Grimaldi 1996; Wichard & Weitschat 1996; Weitschat & Wichard 1998, 2002; Wichard *et al.* 2002, 2009, 2010; Grimaldi *et al.* 2002; Grimaldi & Engel 2005; Makarkin & Perkovsky 2009; Wichard *et al.* 2010; Liu *et al.* 2012, etc.).

The family Nevorthidae currently has a markedly fragmented and relict distribution, with species isolated from one another (Map 1). It includes 16 species belonging to four genera: *Nevrorthus* Costa, 1863 (central Mediterranean basin), *Nipponeurorthus* Nakahara, 1958 (east Asia), *Austroneurorthus* Nakahara, 1958 (southeastern Australia) and *Sinoneurorthus* Liu, Aspöck & Aspöck, 2012 (China) (Map 1) (Nakahara 1915, 1958; Kuwayama 1962; Monserrat 1977; Aspöck *et al.* 1977, 1978, 1980, 2001; Yang & Gao 2001; Aspöck & Aspöck 1983; Aspöck, 2004; Wichard *et al.* 2010; Liu *et al.* 2012).

In the Mediterranean region, the genus *Nevrorthus* is represented by four species of the central Mediterranean basin: *Nevrorthus fallax* (Rambur, 1842) from Sardinia and Corsica, *Nevrorthus iridipennis* Costa, 1863 from the

References

- Aspöck, H. (1992) The Neuropteroidea of Europe: a review of present knowledge (Insecta). In: Canard, M., Aspöck, A. & Mansell, M.W. (Eds.), *Current Research in Neuropterology. Proceedings of the Fourth International Symposium on Neuropterology*. Toulouse, France, pp. 43–56.
- Aspöck, H., Aspöck, U. & Hözel, H. (1977) *Neurorthus apatelios* n. sp. – eine verkannte europäische Nevrorthiden-Species (Neuroptera: Planipennia). *Entomologische Zeitschrift*, 87 (6), 53–57.
- Aspöck, H., Aspöck, U. & Hözel, H. (1978) Megaloptera et Planipennia. In: Illies, J. (Ed.), *Limnofauna europaea*. Vol. 2. Aufl. G. Fischer Verlag, Stuttgart, pp. 329–332.
- Aspöck, H., Aspöck, U. & Hözel, H. (1980) *Die Neuropteren Europas*. Goecke & Ever, Krefeld, I, 495 pp., II, 355 pp.
- Aspöck, H. & Hözel, H. (1996) The Neuropteroidea of North Africa, Mediterranean Asia and of Europe: a comparative review (Insecta). In: Canard, M., Aspöck, H. & Mansell, M.W. (Eds.), *Pure and Applied Research in Neuropterology. Proceedings of the Fifth International Symposium on Neuropterology*. Toulouse, France, pp. 31–86.
- Aspöck, H., Hözel, H. & Aspöck, U. (2001) Kommentierter Katalog der Neuropterida (Insecta: Raphidioptera, Megaloptera, Neuroptera) der Westpaläarktis. *Denisia*, 2, 1–606.
- Aspöck, U. (1992) Crucial points in the phylogeny of the Neuroptera (Insecta). In: Canard, M. Aspöck, H. & Mansell, M.W. (Eds.), *Current Research in Neuropterology. Proceedings of the Fourth International Symposium on Neuropterology*. Toulouse, France, pp. 63–73.
- Aspöck, U. (2002) Phylogeny of the Neuropterida (Insecta: Holometabola). *Zoologica Scripta*, 31, 51–55.
<http://dx.doi.org/10.1046/j.0300-3256.2001.00087.x>
- Aspöck, U. (2004) *Austroneurorthus horstaspoecki* nov. spec. - eine neue Art der Familie Nevrorthidae aus Australien (Neuroptera: Neuroptera). *Denisia*, 13, 177–182.
- Aspöck, U. & Aspöck, H. (1983) Über das Vorkommen von *Neurorthus* Costa in Nordafrika (Neuropteroidea, Planipennia, Nevrorthidae). *Nachrichtenblatt der Bayerischen Entomologen*, 32 (2), 84–51.
- Aspöck, U. & Aspöck, H. (1994) Paradoxe Verbreitungsbilder von Neuropteroidea (Insecta: Raphidioptera, Neuroptera). *Zeitschrift der Arbeitsgemeinschaft Österreichischer Entomologen*, 46 (1/2), 30–44.
- Aspöck, U. & Aspöck, H. (1999) Kamelhälse, Schlammfliegen, Ameisenlöwen. Wer sind sie? (Insecta: Neuroptera: Raphidioptera, Megaloptera, Neuroptera). *Stapfia*, 60, 1–34.
- Aspöck, U. & Aspöck, H. (2007) Verbliebene Vielfalt vergangener Blüte. Zur Evolution, Phylogenie und Biodiversität der Neuropterida (Insecta: Endopterygota). *Denisia*, 20, 451–516.
- Aspöck, U. & Aspöck, H. (2008a) Phylogenetic relevance of the genital sclerites of Neuropterida (Insecta: Holometabola). *Systematic Entomology*, 33, 97–129.
<http://dx.doi.org/10.1111/j.1365-3113.2007.00396.x>
- Aspöck, U. & Aspöck, H. (2008b) *Nipponeurorthus flinti* nov. sp. - eine neue Art der Familie Nevrorthidae von der Insel Okinawa (Neuroptera: Neuroptera). *Linzer Biologische Beiträge*, 40, 817–825.
- Aspöck, U. & Aspöck, H. (2010) Landmarks towards a phylogeny-based classification of the Neuropterida (Insecta: Endopterygota). In: Devetak, D., Lipovsek, S. & Arnett, A.E. (Eds.), *Proceedings of the Tenth International Symposium on Neuropterology*. Maribor Faculty of Natural Sciences and Mathematics, Maribor, Slovenia, pp. 67–74.
- Aspöck, U. & Aspöck, H. (2013) Nevrorthidae, Sisyridae, Coniopterygidae. Der Streit um die niederen Ränge im Stammbaum der Neuroptera. *DGaaE Nachrichten*, 27, 19–20.
- Aspöck, U., Plant, J.D. & Nemeschkal, H.L. (2001) Cladistic analysis of Neuroptera and their systematic position within the Neuropterida (Insecta: Holometabola: Neuroptera: Neuroptera). *Systematic Entomology*, 26, 73–86.
<http://dx.doi.org/10.1046/j.1365-3113.2001.00136.x>
- Bernardi Iori, A., Kathirithamby, J., Letardi, A., Pantaleoni, R.A. & Principi, M.M. (1995) 62. Neuropteroidea (Megaloptera, Raphidioptera, Planipennia), Mecoptera, Siphonaptera, Strepsiptera. In: Minelli, A., Ruffo, S. & La Posta, S. (Eds.), *Checklist delle Specie della Fauna Italiana*. Calderini, Bologna, pp. 1–20.
- Beutel, R.G., Friedrich, V. & Aspöck, U. (2010) The larval head of Nevrorthidae and the phylogeny of Neuroptera (Insecta). *Zoological Journal of the Linnean Society*, 158, 533–562.
<http://dx.doi.org/10.1111/j.1096-3642.2009.00560.x>
- Costa, A. (1860–1870) *Fauna del Regno di Napoli ossia enumerazione di tutti gli animali che abitano le diverse regioni di questo regno e le acque che le bagnano e descrizione de' nuovi o poco esattamente conosciuti con figure ricavate da originali viventi e dipinte al naturale*. Stamperia di Antonio Cons, Napoli, pp. 1–8, pl.13. [For precise edition dates see: Sherborn (1937), Pantaleoni (1999) and/or Oswald (2013)]
- Costa, A. (1863) Nuovi studii sulla entomologia della Calabria ulteriore. *Atti della Reale Accademia delle Scienze Fisiche e Matematiche di Napoli*, 1 (2), 1–80.
- Costa, A. (1884) Nota intorno i Nevrotteri della Sardegna. *Rendiconti dell'Accademia delle Scienze Fisiche e Matematiche di Napoli*, 23 (2), 20–21.
- Esben-Petersen, P. (1913) Addition to the knowledge of the Neuropterous insect fauna of Corsica II. *Entomologiske Meddelelser*, 10, 20–28.
- Gavira, O., Sánchez, S., Carrasco, P., Ripoll, J. & Solís, S. (2012) Presence of the family Nevrorthidae (Insecta: Neuroptera) in the Iberian Peninsula. *Boletín Sociedad Entomológica Aragonesa*, 51, 217–220.
- Grimaldi, D.A. (1996) *Amber: window to the past*. Harry N. Abrams and the American Museum of Natural History, New York,

216 pp.

- Grimaldi, D.A. & Engel, M.S. (2005) *Evolution of the Insects*. Cambridge University Press, Cambridge, 755 pp.
- Grimaldi, D.A., Engel, M.S. & Nascimbene, P.C. (2002) Fossiliferous Cretaceous amber from Myanmar (Burma): its rediscovery, biotic diversity, and paleontological significance. *American Museum Novitates*, 3361, 1–72.
- Haring, E. & Aspöck, U. (2004) Phylogeny of the Neuropterida: a first molecular approach. *Systematic Entomology*, 29, 415–430.
<http://dx.doi.org/10.1111/j.0307-6970.2004.00263.x>
- Jarzembski, E.A. (1980) Fossil insects from the Bembridge Marls, Paleogene of the Isle of Wight. *Bulletin of the British Museum Natural History (A. Geology)*, 33, 237–293.
- Jones, J.R. & Devetak, D. (2009) First record of Nevorthidae from Slovenia. *Acta Entomologica Slovenica*, 17 (2), 99–106.
- Kimmins, D.E. (1930) A list of the Corsican Ephemeroptera and Neuroptera. *Eos*, 6 (2), 185–190.
- Klapalek, F. (1917) Über die von Prof. A. Hetschko in Korsika gesammelten Neuropteroiden nebst Bemerkungen über einige ungenügend bekannte Arten. *Wiener Entomologische Zeitung*, 36, 193–208.
- Kuwayama, S. (1962) A revisional synopsis of the Neuroptera in Japan. *Pacific Insects*, 4 (2), 325–412.
- Lestage, J.A. (1935) Notes sur les sisyridés (Hemerobiiformes à larve aquatique). *Bulletin et Annales de la Société Royale Entomologique de Belgique*, 75, 387–394.
- Letardi, A. (1994) Dati sulla distribuzione italiana dei Neurotetti s.l. (Neuropteroidea). In: *Atti XVII Congresso nazionale italiano di Entomologia*, Udine, Italy, pp. 203–206.
- Letardi, A. (2002) Banche dati in rete: l'esempio dei Neuroterti (Insecta Neuropterida). In: *Atti XIX Congresso nazionale italiano di Entomologia*, Catania, Italy, pp. 225–229.
- Letardi, A., Aspöck, U., Aspöck, H. & Pantaleoni, R.A. (2006) *Nevrorthus apatelios* H. Aspöck et U. Aspöck et Hölzel, 1977 (Neuroptera Nevorthidae) nelle Prealpi Friulane. *Rivista del Museo Civico di Scienze Naturali "Enrico Caffi"*, 24, 91–92.
- Liu, X., Aspöck, H. & Aspöck, U. (2012) *Sinonevorthus yunnanicus* n. gen. et n. sp.- a spectacular new species and genus of Nevorthidae (Insecta, Neuroptera) from China, with phylogenetic and biogeographical implications. *Aquatic Insects*, 34 (2), 131–141.
<http://dx.doi.org/10.1080/01650424.2012.718086>
- MacLeod, E.G. (1970) The neuroptera of the Baltic Amber. I. Ascalaphidae, Nymphidae, and Psychopsidae. *Psyche*, 77, 147–180.
<http://dx.doi.org/10.1155/1970/45459>
- Makarkin, V.N. & Perkovsky, E.E. (2009) *Rophalis relicta* Hagen (Neuroptera, Nevorthidae) in Late Eocene Rovno amber, with a discussion of the taxonomic status of the genus. *Denisia*, 26, 137–144.
- Malicky, H. (1984) Ein Beitrag zur Autökologie und Bionomie der aquatischen Netzflüglergattung *Neurorthus* (Insecta, Neuroptera, Neurorthidae). *Archiv für Hydrobiologie*, 101, 231–246.
- Monserrat, V.J. (1977) A systematic and alphabetic list of Neurorthidae and Sisyridae (Neuroptera). *Nouvelle Revue d'Entomologie*, 7, 91–96.
- Monserrat, V.J. (1986) Los Neurópteros Acuáticos de la Península Ibérica (Insecta, Neuroptera). *Limnetica*, 1 (1984), 321–335.
- Monserrat, V.J. (1996) Lista de los neurópteros de Aragón (Megaloptera, Raphidioptera, Planipennia). *Catalogus entomofauna Aragonesa*, 11, 11–17.
- Monserrat, V.J. (2005a) Nuevos datos sobre algunas pequeñas familias de neurópteros (Insecta: Neuroptera: Nevorthidae, Osmylidae, Sisyridae, Dilaridae). *Heteropterus Revista de Entomología*, 5, 1–26.
- Monserrat, V.J. (2005b) Catálogo de los Neurópteros de Baleares con nuevos datos sobre su fauna (Insecta, Neuroptera). *Bulleti de la Societat d'Història Natural de les Balears*, 48, 71–85.
- Monserrat, V.J. & Triviño, V. (2013) Atlas de los neurópteros de la Península Ibérica e Islas Baleares (Insecta, Neuroptera: Megaloptera, Raphidioptera, Planipennia) / Atlas of the Iberian and Balearic lacewings (Insecta, Neuroptera: Megaloptera, Raphidioptera, Planipennia). *Monografías de la Sociedad Entomológica Aragonesa*, 13, 1–154.
- Morton, K.J. (1934) Notes on some Odonata, Trichoptera and Neuroptera collected in Corsica. *Entomologist's Monthly Magazine*, 70, 1–7.
- Mosely, M.E. (1932) Corsican Trichoptera and Neuroptera (s.l.) 1931. *Eos*, 8, 165–184.
- Nakahara, W. (1915) On the Hemerobiinae of Japan. *Annotationes Zoologicae Japonenses*, 9, 11–48.
- Nakahara, W. (1958) The Neurorthinae, a new subfamily of the Sisyridae (Neuroptera). *Mushi*, 32, 19–31.
- Navás, L. (1934) La colección de Sisíridos (Neurópteros) del Museo de Barcelona. *Boletín de la Sociedad Entomológica de España*, 18, 82–83.
- Navás, L. (1935) Monografía de la familia de los Sisíridos (Insectos, Neurópteros). *Memorias de la Real Academia de Ciencias Exactas, Físico-Químicas y Naturales de Zaragoza*, 4, 1–87.
- Nel, A. & Jarzembski, E. (1997) New fossil Sisyridae and Nevorthidae (Insecta: Neuroptera) from Eocene Baltic amber and Upper Miocene of France. *European Journal of Entomology*, 94, 287–294.
- New, T.R. (1978) Note on the habitat of the presumed larva of *Austronevorthus* (Neuroptera, Neurorthidae). *Australian Entomological Magazine*, 5, 9.
- New, T.R. (1986) A review of the Biology of Neuroptera Planipennia. *Neuroptera International Supplemental*, 1, 1–58.
- Nicoli Aldini, R., Letardi, A. & Pantaleoni, R.A. (2012) State of the art on Neuropterida of Sicily and Malta. *Biodiversity Journal*, 3 (4), 445–458.
- Oswald, J.D. (2013) Neuropterida Species of the World. A Catalogue of the Species-Group Names of the Extant and Fossil Neuroptera, Megaloptera, Raphidioptera and Glosselytrodea (Insecta: Neuropterida) of the World, Version 3.0. Available

- from: <http://lacewing.tamu.edu/Species-Catalogue/index.html/> (accessed 3 October 2013)
- Pantaleoni, R.A. (1994) Neurotteri della Sardegna. In: *Atti XVII Congresso nazionale italiano di Entomologia*, Udine, Italy, pp. 207–210.
- Pantaleoni, R.A. (1999) Neuropterida described by A. Costa with type designation. *Deutsche Entomologische Zeitschrift, Berlin*, (N.F.), 46, 249–261.
<http://dx.doi.org/10.1002/mmnd.4800460211>
- Parfin, S.I. & Gurney, A.B. (1956) The Spongilla - flies, with special reference to those of the Western Hemisphere (Sisyridae, Neuroptera). *Proceedings of the United States National Museum*, 105 (3360), 421–529.
<http://dx.doi.org/10.5479/si.00963801.105-3360.421>
- Pongrácz, S. (1923) Recésszárnyúak. Neuropteroiden. In: Csiki, E. (Ed.), *Állattani Kutatásai Albániában (Explorationes zoologicae ab E. Csiki in Albania peractae)*. XI. Vol. I. Magyar Tudományos Akadémia, Balkán-Kutatásainak Tudományos Eredményei, Budapest, pp. 143–166.
- Popov, A. (1990) Prinos kum izuchavaneto na mrezhokrilite nasekomi (Neuroptera) na Vitosha. *Fauna na Iugozapadna Bulgaria*, 3, 78–87.
- Popov, A. (1991) Baum- und strauchbewohnende Neuropteren in Bulgarien. *Acta Zoologica Bulgarica*, 41, 26–36.
- Popov, A. (1993) Raphidiopteren und Neuropteren aus Bulgarien in den Sammlungen des Nationalmuseums in Prag. *Historia Naturalis Bulgarica*, 4, 16–28.
- Popov, A. (1998) Insects of Bulgaria, Part 2: Blattodea, Mantodea, Isoptera, Orthoptera, Dermaptera, Embioptera, Megaloptera, Raphidioptera, Neuroptera, Mecoptera. In: Meine, C. (Ed.), *Bulgaria's biological diversity: conservation status and needs assessment. Vols. I. & II.* Biodiversity Support Program, Washington, D.C. pp. 214, 218, 223–227, 248–250.
- Popov, A. (2002a) Entomofaunistic diversity of the Central Balkan National Park. Orthopteroidea, Neuropteroidea, Mecoptera. In: Sakalian, M (Ed.), *Biological diversity of the central Balkan National Park*, Pensoft, Sofia, pp. 540–542, 571–573.
- Popov, A. (2002b) Zoogeographical analysis of Neuroptera in Bulgaria. *Acta Zoologica Academiae Scientiarum Hungaricae*, 48 (suppl. 2), 271–280.
- Principi, M.M. (1966) Neurotteri della Basilicata, della Calabria e della Sicilia. *Memorie del Museo Civico di Storia Naturale di Verona*, 14, 363–388.
- Rambur, M.P. (1842) *Histoire Naturelle des Insectes, Névroptères*. Librairie encyclopédique de Roret Fain et Thunot, Paris, [xviii] + 534 pp., 12 pl.
- Riek, E.F. (1967) Structures of unknown, possibly stridulatory, function on the wings and body of Neuroptera; with an appendix on other endopterygote orders. *Australian Journal of Zoology*, 15, 337–348.
- Saure, C. (1989) Beitrag zur Kenntnis der Neuropterenfauna Jugoslawiens und Griechenlands (Insecta, Planipennia). *Entomofauna*, 10, 33–43.
- Sherborn, C.D. (1937) On the dates of publication of Costa (O. G.) and (A.) Fauna del Regno di Napoli, 1829–1886. *Journal of the Society for the Bibliography of Natural History*, 1, 35–47.
- Sziráki, G. (2008) A Nevrorthidae Nakahara, 1915 (Insecta: Neuroptera) Család előfordulása a Cserna-Hegységben. *Acta Siculica*, 2008, 87–90.
- Takahashi, R. (1942) Uncommon neuropterous larva. *Dobutsugakkai Zasshi*, 54, 439–441. [in Japanese]
- Thenius, E. (2000) *Lebende Fossilien. Oldtimer der Tier- und Pflanzenwelt – Zeugen der Vorzeit*. Friedrich Pfeil Verlag, München, 228 pp.
- Tjeder, B. (1979) Presence of pleuritocavae in the genus *Neurorthus* Costa (Neuroptera: Nevrorthidae). *Entomologica Scandinavica*, 10, 109–111.
<http://dx.doi.org/10.1163/187631279X00240>
- Weitschat, W. & Wichard, W. (1998) *Atlas der Pflanzen und Tiere im Baltischen Bernstein*. Friedrich Pfeil Verlag, München, 256 pp.
- Weitschat, W. & Wichard, W. (2002) *Atlas of Plants and Animals in Baltic amber*. Friedrich Pfeil Verlag, München, 256 pp.
- Wichard, W., Arens, W. & Eisenbeis, G. (2002) *Biological Atlas of Aquatic Insects*. Apollo Books, Stenstrup, 339 pp.
- Wichard, W., Buder, T. & Caruso, C. (2010) Aquatic lacewings of family Nevrorthidae (Neuroptera) in Baltic amber. *Denisia*, 29, 445–457.
- Wichard, W., Gröhn, C. & Seredszus, F. (2009) *Aquatic insects in Baltic amber*. Wasserinsekten im Baltischen Bernstein, Remagen, Verlag Kessel, 336 pp.
- Wichard, W. & Weitschat, W. (1996) Wasserinsekten im Bernstein. *Entomologische Mitteilungen aus dem Löbbecke-Museum und Aquazoo*, 4, 1–122.
- Yang, C.K. & Gao, M. (2001) Neuroptera: Nevrorthidae. In: Wu, H. & Pan, C.W. (Eds.), *Tianmushan Kun Chong (= Insects of Tianmushan National Nature Reserve)*. Science Press, Beijing, China, pp. 307–309.
- Zelený, J. (1964) Ergebnisse der Albanien-Expedition 1961 des Deutschen Entomologischen Instituts. 24. Beitrag: Neuroptera. *Beitrag zur Entomologie*, 14, 323–336.
- Zelený, J. (1971) Neuroptera, Megaloptera und Mecoptera aus Bulgarien. *Acta Faunistica Entomologica Museum Pragae*, 14, 153–163.
- Zwick, P. (1967) Beschreibung der aquatischen Larve von *Neurorthus fallax* (Rambur) und Errichtung der neuen Planipennierfamilie Nevrorthidae fam. nov. *Gewässer und Abwässer*, 44/45, 65–86.