The neuropteran family Dilaridae, ‘pleasing lacewings’, is a small family presently composed of 67 valid recent species, with a combined distribution encompassing parts of North and South America, Europe, Asia and Africa. Dilarids form a distinct clade within the order Neuroptera, and are characterized by males with pectinate antennae, females with elongate ovipositors (a feature that they share with raphidiopterans and some mantispids), and distinctive details of the terminalia in both sexes. Dilarids are relatively rare both in the field and in collections and are of no known economic importance. Immatures are associated with soil or dead wood. No fossil dilarids are currently known. The purpose of the present work is to provide a concise bibliographic, nomenclatural and taxonomic foundation for the family that can serve the twin aims of providing an entry point into the scattered dilarid literature and a stimulus for further systematics study of the group.

History

The rarity of dilarids in the field is underscored by the fact that the first known species, Dilar nevadensis, does not appear in the scientific literature until 1838 (Rambur 1838, illustrated), and was not formally described until four years later (Rambur 1842) – a comparatively late date for a genus of insects that possesses several species with an aggregate distribution stretching broadly across southern Europe. Dilar nevadensis was treated at its inception as a new species and genus, and it and its relatives have long been recognized as a distinctive group within the Neuroptera. The genus Dilar was originally placed by Rambur in his ‘Tribu Semblides’, together with several genera now placed in the orders Megaloptera and Raphidioptera. Soon thereafter, Newman (1853), in his reclassification of the Neuroptera sensu lato, provisionally placed the ‘Dilaridae’ as a division of his group Stegoptera, subgroup Corydalina, along with taxa now attributed to the Ithonidae and Megaloptera. Newman’s classification was not widely adopted and his name Dilaridae appears not to have come into general use. By the late 1800’s Dilar was recognized as a neuropteran (planipennian) genus, and was typically included within a broad concept of the family Hemerobiidae. During the first two decades of the twentieth century, the taxonomic concept of the Hemerobiidae was radically altered. Many genera and groups of genera were formally aggregated or reaggregated into family-group taxa during this period, and several of these were widely accorded full family rank. Among these groups was the Dilaridae, which was treated as a tribe (Dilarini, e.g., Navás 1914), subfamily (Dilarinae, e.g., Banks 1913) and full family (Dilaridae, e.g., Handlirsch [1906]) during this time. Current usage accords dilarids family rank, with two subfamilies, the Dilarinae and Nallachiinae.

Navás ([1909a], 1914), in the earliest revisionary studies of the group, synthesized the prior descriptive work of nineteenth century authors and his own early twentieth century work on the fauna of Spain and...
neighbouring regions. In his 1914 review of the family for the Genera Insectorum, Navás recognized seven genera and 26 species. Of these, 21 species, but only 2 genera, are presently considered valid. During the Navásian era heavy emphasis was placed on venational traits as diagnostic characters for the identification and justification of new neuropteran taxa at all ranks. During this period, however, the full extent of venational variation was frequently not well known for taxa established at both the specific and generic levels. Subsequent reevaluation of generic limits, based principally on male terminalic traits, has led to a reduction in the number of accepted dilarid genera, and it is now widely recognized that considerable venational plasticity exists in many dilarid species. Characters of the male terminalia have now come to replace venational traits as the characters of choice for delimiting dilarid taxa, especially species. Although male terminalic characters were figured as early as 1909 (Navás [1909a]), the added effort and difficulties of studying, describing and figuring this complex character system hindered its use and the full recognition of its value during the early twentieth century. As in other neuropterid groups, however, dilarid studies profited from the growing realization throughout the 1930’s that the male terminalia provided a significant new source of novel, stable and reliable species-level characters. Subsequent reviews and revisions of dilarid taxa (e.g., Carpenter 1940, 1947, Nakahara 1955b) made extensive use of male terminalic traits, and modern descriptions and revisions (e.g., Adams 1970, Aspöck et al. 1980, Monserrat 1988b) rely heavily on male terminalic characters to delimit species.

Future Research

The most pressing current need in dilarid systematics is for a comprehensive revision of Old World dilarine species. The last complete revisions covering the Old World are the seriously outdated works of Navás ([1909a], 1914). Since that time, the number of nomenclaturally valid Old World dilarid species has approximately tripled. The European dilarid fauna has recently been the subject of several good revisionary treatments (Aspöck et al. 1980, Monserrat 1988b), but the lack of a synthetic work for the Oriental region and the adjacent parts of central and eastern Asia renders positive identification of material from these areas extremely difficult. The size of such a project (ca. 50 species) would be quite appropriate for a Ph.D.-level dissertation. Questions of interest include:

(i) How variable are male terminalic traits among Old World dilarids?,
(ii) What monophyletic subgroups can be recognized within this fauna?, based on what characters?,
(iii) What is(are) the phylogenetic relationship(s) between Old and New World dilarids?,
(iv) How old is the dilarid clade?,
(v) Why are there no known dilarid fossils?,
(vi) Why are dilarids absent from Australia?

Any study of the higher phylogeny of the family should include representatives of New World Nallachius, Old World Dilar and Berothella and the actual or possible Old World nallachiine taxa Nallachius krooni (southern Africa), Nallachius ponomarenkoi (Vietnam) and Neonallachius annandalei (India).

Biology

Dilarid biology is poorly known. The larvae of only five species are known, only four of which have been described. The best known of these is the Nearctic-Neotropical species Nallachius americanus, whose larvae have been reported from under the bark of both recently- and long-dead broadleaf trees, where they undoubtedly feed on soft-bodied arthropod prey that occur in the same microhabitat (Gurney 1947, MacLeod & Spiegler 1961). Larvae of Dilar turcicus and Dilar septentrionalis have been collected from soil samples, Ghilarov (1962) and Makarkin (pers. comm., larvae not described), respectively. The larvae of two additional species, Nallachius krooni and Dilar pumilus, have been reared from eggs laid by captive females, see Minter (1992) and Monserrat (1988b). Until recently, all known adult dilarids were fully macropterous and presumed to be volant. However, Pantaleoni & Letardi (1996) report the capture of a brachypterous Dilar female that is probably attributable to Dilar parthenopaeus.

Keys

A key is provided below to the two subfamilies of the Dilaridae. The subfamily Nallachiinae currently contains only a single valid genus, Nallachius. The three nomenclaturally valid dalarine genera listed in the following catalogue are widely considered only doubtfully distinct. For this reason, a key to these taxa has not been attempted. The construction of a reliable key to superspecific taxa within the Dilarinae cannot proceed until revisionary studies that identify more rigorously diagnosable subgroups within this taxon have been completed. Bibliographic references to published species-level keys in the genera Dilar and Nallachius are cited below under their respective catalogue entries.
Key to the subfamilies of the Dilaridae


1. Forewing MA branching from R basal to fork R1-Rs (i.e., as a branch from the 'radial stem'; or, rarely, MA entirely free from R); male antenna with more than 3 apical flagellomeres that lack lateral processes [Europe, northern Africa, Asia]...

+ Forewing MA branching from R distal to fork R1-Rs (i.e., as a branch from RS); male antenna never with more than 3 apical flagellomeres that lack lateral processes [North and South America, southern Africa, Asia]...

...Dilarinae

Nallachiinae

Catalogue

Format

All known family-, genus- and species-group names that have been applied to taxa presently placed within the family Dilaridae are treated in the catalogue below. Information on taxon diversity and distribution, important systematics literature and biology and immature stages is summarized for all valid family- and genus-group taxa. Genus-group name records provide, additionally, data on type species, etymology and gender, with appropriate bibliographic references. Species citations provide information on original publication, distribution, type locality and primary type kind (to the extent known). Type locality data is presented in a standardized format using current political subdivision names, with verbatim quotes from the literature provided parenthetically where confusion might arise. Latitude and longitude coordinates are provided for all sites that could be rigorously located. Coordinate data are shown in brackets if they were derived from secondary sources (e.g., maps or gazetteers), but are shown unbracketed if they were cited in the original description of a species. Synonymical citations are given under the subheading 'Synonymy'. Under the subheading 'Status', a recent (where possible) authoritative work is cited that uses the name in the nomenclatural form in which it is treated in the catalogue. The third edition of the International Code of Zoological Nomenclature has been applied to questions of nomenclature, and relevant articles and sections of the Code are referenced throughout the catalogue text.

Collection Acronyms

The following collection acronyms are used in the catalogue to indicate type repositories:

- Aspock Horst & Ulrike Aspöck, private collection, Wien [=Vienna], Austria;
- BAU Beijing Agricultural University Insect Collection, Beijing, China;
- BMNH Natural History Museum [formerly the British Museum (Natural History)], London, England, United Kingdom;
- INBio Instituto de Biodiversidad, Santo Domingo de Heredia, Costa Rica;
- INPA Instituto Nacional de Pesquisas da Amazônia, Manaus, Brazil;
- ISNB Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium;
- IZASB Institute of Zoology, Academia Sinica, Beijing, China;
- MCN Museo Nacional de Ciencias Naturales, Madrid, Spain;
- MCZ Museum of Comparative Zoology, Cambridge, MA, USA;
- MNHP Museum National d’Histoire Naturelle, Paris, France;
- Monserrat Victor J. Monserrat, private collection, Madrid, Spain;
- MZB Museo Zoología, Barcelona, Spain;
- MZUN Museo di Zoologia, Università di Napoli, Napoli [=Naples], Italy;
- NCIP National Collection of Insects, Pretoria, South Africa;
- NHMB Naturhistorisches Museum Basel, Basel, Switzerland;
- NHMW Naturhistorisches Museum, Wien [=Vienna], Austria;
- NSMT National Science Museum (Natural History), Tokyo, Japan;
- NZSI Zoological Survey of India, National Zoological Collection, Calcutta, West Bengal, India;
- PMY Peabody Museum of Natural History, Yale University, New Haven, CT, USA;
- Real P. Réal, private collection, Aix-en-Provence, France;
- ZMHA Zoologisches Museum für Hamburg, Hamburg, Germany;
- ZMHB Museum für Naturkunde, Humboldt Universität, Berlin, Germany;
- ZMUM Zoological Museum, Moscow State University, Moscow, Russia;
- ZSM Zoologische Staatssammlung, Munich, Germany.

Family Dilaridae Newman, 1853

Dilaridae Newman, 1853 (as a ‘division’ of the Corydalina). Type genus: Dilar Rambur, [1838].

Species and distribution. – 67 species; Eastern United States south to Argentina, including the West Indies (17 spp.), Oriental and southern Palearctic regions (49 spp.), southern Africa (1 sp.). No dilarids
are currently known from tropical Africa, Australia, Oceania or extreme northerly or southerly latitudes. No fossils attributable to the Dilaridae are currently known.

Reviews, revisions and keys. – Navás [1909a] (World, revision, keys); Navás 1914 (World, review, keys); see also Dilar and Nallachius below.

Biological and immature stages. – See Dilar and Nallachius below. The larva described and figured by Takahashi (1942) as a dilarid is probably the larva of a nevrid of the genus Nipponoeworthus, not a dilarid. Tjeder (1937) compared the adult morphology of dilarids and raphidiopterans.

Subfamily Dilarinae Newman, 1853

Dilarinae – Banks 1913: 211 (as a subfamily of the Hemerobiidae). Type genus: Dilar Ramburg, [1838].

Dilarini – Navás, 1914: 5 (as a tribe of the Dilaridae). Type genus: Dilar Ramburg, [1838].

Species and distribution. – 48 species; Oriental and southern Palearctic regions.

Reviews, revisions and keys. – See Dilar below.

Biological and immature stages. – See Dilar below.

Genus Berothella Banks, 1934


Notes: Berothella was originally placed in the family Berothidae; it was transferred to the family Dilaridae by MacLeod and Adams ([1968]: 256).

Species and distribution. – 2 species; China and continental Malaysia. A third species described in this genus, Berothella bannana, belongs to the Berothidae, see ’Taxa removed from the Dilaridae’ below.

Reviews, revisions and keys. – None.

Biological and immature stages. – Unknown.

Berothella phantoma Banks, 1934 [Malaysia]


Notes: Type citation by MacLeod & Adams ([1968]: 256). This species was originally described as a berothid. It was confirmed as a dilarid by Kimmins in MacLeod & Adams ([1968]: 256).

Berothella pretiosa Banks, 1939 [China]


Notes: This species was originally described as a berothid. It was confirmed as a dilarid by MacLeod & Adams ([1968]: 256).

Genus Dilar Ramburg, [1838]


Notes: ’Cladocera marmorata Hoffm. Mus. Berol.’ was cited by Hagen (1860: 56) without description, definition or indication, and is therefore unavailable, Art. 12a. The binomen Cladocera marmorata apparently originated as a manuscript name that was recorded by Hagen from the identification label of a specimen in the Hoffmannsegg Collection of the Museum für Naturkunde, Humboldt Universität, Berlin. Hagen subsequently (1866b: 399) synonymized Cladocera with Dilar, and C. marmorata with Dilar nevadensis Ramburg, without either name ever having been made available.


Notes: Revaxius was synonymized with Dilar without explicit comment by Kuwayama (1962: 376). Kuwayama’s synonymy was presumably based on his placement of the species japonicus in the genus Dilar, rather than in Revaxius, where it had been placed by Navás (1909a: 665) as one of the two species originally included in Revaxius. The type species of Revaxius has also been transferred back to Dilar from Revaxius by H. Aspöck & U. Aspöck (1968: 3). Two additional species, grandis and marmoratus, also nominally exist in the genus Revaxius. Both are here transferred to Dilar. I have examined syntypical ma-
and of both *grandis* and *marmoratus* from the MCZ, and both species clearly fall within the broad concept of *Dilar* adopted in this catalogue.

**Nepal** Navás, [1909a]: 661. **syn. n.** Type species: *Nepal harmandi* Navás, [1909a]: 661, by original designation. Etymology: From Nepal, a region (later country) of the Indian subcontinent that contains, or lies near, the type localities of the two species originally included in this genus, see Navás ([1909a]: 661). Gender: Masculine, no originally attributed or implied gender, here considered masculine, Art. 30d.

Notes: All four species that have at one time or another been placed in this genus have subsequently been removed to *Dilar, formosanus* and *kanoi* by Nakahara (1955b) and *hornei* and *harmandi* by H. Aspöck & U. Aspöck (1968). Thus, although it has not previously been listed as such, *Nepal* is currently a junior subjective synonym of *Dilar*.

Species and distribution. – 45 species; Oriental and southern Palearctic regions.

Reviews, revisions and keys. – Navás 1903a (Spain, review); Kuwayama 1921 (Japan, review, key); Nakahara 1955b (Japan & Taiwan, revision); Kuwayama 1962 (Japan, review, key); Aspöck et al. 1980 (Europe, review, key); Minter 1986 (Africa, review); Dorokhova 1987 (European USSR, key); Monserrat 1988a (Navás species, revision); Monserrat 1988b (Iberian Peninsula, revision, keys); Zakharenko 1988 (USSR, review); Makarkin 1995 (Far Eastern Russia, key).

Biology and immature stages. – Ghilarov 1962 (*torticulus*: biology, larva, figs); Popov 1973 (*torticulus*: egg, larva); Gepp 1984 (*torticulus*: larva, fig); Monserrat 1988b (*pumilus*: larva, figs); Gepp 1990 (*torticulus*: egg, fig). The larva of *Dilar septentrionalis* is known (Makarkin, pers. comm.), but undescribed.

**Dilar algericus** Navás, 1909 [Algeria] Nomen dubium

*Dilar algericus* Navás, [1909a]: 638. Holotype, male, MNHP. Type locality: Algeria: Alger [36°50′N 0°00′E, =Algiers, =Argel (Spanish)] (as: ‘Argel’). Status: H. Aspöck et al. 1980: 188. Notes: See Legrand & Lachaise (1994: 89) for a detailed account of the holotype; earlier type citations by Navás (1925: 188) and Monserrat (1988a: 189).
Dilar dochneri H. Aspöck & U. Aspöck, 1968
[Afghanistan]

Dilar dongchuanus C. Yang, 1986 [China]

Dilar duelli U. Aspöck & H. Aspöck, 1995 [France]

Dilar formosanus (Okamoto & Kuwayama, 1920) [Taiwan]


Dilar grandis (Banks, 1931) [Malaysia (Sabah)]
Rexavius grandis Banks, 1931a: 413. Syntypes, male, MZB. Type locality: Malaysia: Sabah: Borneo, Mt. Kinabalu, Kamborangah. Notes: See discussion under Rexavius above.

Dilar harmandi (Navás, 1909) [India]

Dilar hikosanus Nakahara, 1955 [Japan]
Dilar hikosanus Nakahara, 1955b: 137. Holotype, male, probably in the NSMT. Type locality: Japan: Fukuoka / Oita: Kyushu (island), Hiko-san (mountain) [33°29’N 130°58’E] (as: ‘Hikosan, Kyushu’). Status: Kuwayama 1962: 376.

Dilar horneti McLachlan, 1869 [India]

Dilar indicus Monserratt, 1989 [India]

Dilar japonicus McLachlan, 1883 [Japan]


Dilar juniperi Monserratt, 1988 [Spain]

Dilar kanoi (Nakahara, 1955) [Taiwan]

Dilar kirgisus H. Aspöck & U. Aspöck, 1967
[Kirgizia]

Dilar lineolatus Navás, 1909 [Turkey] Nomen dubium

Dilar marmoratus (Banks, 1931) [Thailand] comb. n.

Dilar megalopterus C. Yang, 1986 [China]

Dilar meridionalis Hagen, 1866 [Andorra, France, Spain]
Dilar meridionalis Hagen, 1866a: 295. Holotype, sex unknown, repository unknown. Type locality: Spain: probably from the Sierra Nevada (mountains) near Granada.

Notes: Subsequently incorrectly cited as a new name by Navás ([1909a]: 652).


Notes: See Legrand & Lachaise (1994: 90) for a detailed account of the holotype; earlier type citations by Navás (1925: 188) and Monserrat (1988b: 195).


Notes: An objective replacement name for Dilar pusillus C. Yang, 1992.


Notes: The original type series was formerly in the Navás collection. The specimens of this series are not present in the remnants of the Navás collection in the mzb (Monserrat 1985), and are now presumed lost or destroyed. See also Legrand & Lachaise (1994: 90) for a detailed account of the holotype; earlier type citations by Navás (1925: 188) and Monserrat (1988b: 187).


Notes: Type in poor condition and missing its abdomen. This species was considered to be a nomen dubium by
Monserrat (1988b: 188), but he accepted Navás’ ((1924): 232) synonymy of *lausitanicus* with *campestris*.

**Dilar septentrionalis** Navás, 1912 [China, Korea, Russia]


**Dilar sinicus** Nakahara, 1957 [China]


**Dilar subdolus** Navás, 1932 [China] Nomen dubium

*Dilar subdolus* Navás, 1932: 921. Holotype, male, repository unknown (see Notes). Type locality: China: Kangsu: Chinkiang [32º03’N 119º26’E; =Chen-chiang, =Chen-kiang, =Zhenjiang]. Status: Monserrat 1988a: 22. Notes: Holotype formerly in the Navás collection, now presumed lost or destroyed. Type not listed by Monserrat (1985) as being in the remnants of the Navás collection in the mzb.

**Dilar syriacus** Navás, 1909 [Syria] Nomen dubium


**Dilar taiwanensis** Banks, 1937 [Taiwan]


**Dilar tibetanus** C. Yang, 1987 [China]


**Dilar turcicus** Hagen, 1858 [Southern Europe from Yugoslavia east to Dagestan (Russia)]


**Dilar varitianorum** H. Aspöck & U. Aspöck, 1967 [Afghanistan]


**Dilar vietnensis** Zakharenko, 1991 [Vietnam]


**Dilar wangi** C. Yang, 1992 [China]


**Dilar yunnanus** C. Yang, 1986 [China]


**Genus Neonallachius** Nakahara, 1963


Species and distribution. – 1 species; India, Sri Lanka; see Hynd (1992), Nakahara (1963). Reviews, revisions and keys. – None. Biology and immature stages. – Unknown.

**Neonallachius annandalei** Nakahara, 1963 [India]


**Subfamily Nallachiinae** Navás, 1914


Species and distribution. – See *Nallachius* below. Reviews, revisions and keys. – See *Nallachius* below. Biology and immature stages. – See *Nallachius* below.

**Genus Nallachius** Navás, 1909

*Nallachius* Navás, [1909a]: 666. Type species: *Dilar prestoni* McLachlan, 1880: 39, by subsequent designation by


Species and distribution. – 19 species; Eastern United States south to Argentina, including the West Indies (17 spp.), southern Africa (1 sp.) and Vietnam (1 sp.); see Adams (1970), Hoffman (1990), Maes & Flit (1994), Penny ([1978], [1982]), Penny et al. (1997). Reviews, revisions and keys. – Carpenter 1940 (Nearctic, review); Carpenter 1947 (New World, review); Adams 1970 (New World, revision, key); Penny [1982] (Amazon Basin, review, key).

Biological and immature stages. – Steyskal 1944 (americanus biology); Gurney 1947 (americanus biology, egg, larva, pupa, figs); Peterson 1967 (americanus larva, fig); MacLeod & Spieghler 1961 (americanus biology, egg, larva); Tauber 1991 (americanus larva, fig); MacLeod 1964 (americanus larva, figs); Gepp 1984 (americanus larva, fig); Minter 1992 (krooni: egg, larva, figs).

Nallachius adamsi Penny, 1982 [Brazil]
Nallachius adamsi Penny, [1982]: 385. Holotype, male, inpa. Type locality: Brazil: Amazonas: Manaus [3º06'S 59º57'W], 26 km N of Manaus [3º07'S 60º02'W]. Status: Penny [1982]: 386.

Nallachius americanus (McLachlan, 1881) [Eastern USA south to Venezuela, West Indies]

Nallachius bruchi Navás, 1923 [Argentina]

Nallachius championi (Navás, 1914) [Guatemala]

Nallachius dicolor Adams, 1970 [Argentina, Brazil]

Nallachius hermosa (Banks, 1913) [Colombia]

Nallachius infuscatus Penny, 1982 [Brazil]
Nallachius infuscatus Penny, [1982]: 386. Holotype, male, inpa. Type locality: Brazil: Amazonas: Reserva Ducke [2º54'S 59º57'W], 26 km N of Manaus [3º07'S 60º02'W]. Status: Penny [1982]: 386.

Nallachius krooni Minter, 1986 [Malawi, Namibia, South Africa]

Nallachius limai Adams, 1970 [Brazil]

Nallachius loxanus Navás, 1911 [Ecuador]

Nallachius maculatus Penny, 1982 [Brazil]

Nallachius ovalis Adams, 1970 [Brazil]

Nallachius parkeri Penny, 1994 [Costa Rica]

Nallachius phantomellus Adams, 1970 [Brazil]

Nallachius ponomarenkoi Zakharenko, 1991 [Vietnam]

Nallachius prestoni (McLachlan, 1880) [Brazil]
Notes: Type citation by Adams (1970: 17).

**Nallachius pulchellus** (Banks, 1938) [Southwestern USA, Cuba, Costa Rica]
Notes: Type citation by Adams (1970: 14).

**Nallachius pupillus** (Navás, 1930) [Paraguay]
Notes: Type citation by Adams (1970: 29). Type preserved destroyed in the Hamburg Museum during WWII.

**Nallachius reductus** Carpenter, 1947 [Paraguay]
Notes: Type citation by Adams (1970: 15).

**TAXA REMOVED FROM THE DILARIDAE**

**Berotha bannana** (C. Yang, 1986) [China] *comb. n.*
*Berotha bannana* C. Yang, 1986: 156. Holotype, female, baI. Type locality: China: Yunnan: Xishuangbanna Dai [=Hsi-shuang-pan-na Thai] Autonomous District, Menghai [21°59'N 100°35'E; = Meng-hai].
Notes: Yang's figure clearly shows that this species belongs in the Berothidae, where it appears to be a species of the genus *Berotha* (U. Aspöck, pers. comm.). The species is here transferred to the Berothidae under the new combination *Berotha bannana*.

**ACKNOWLEDGMENTS**

I thank Ulrike Aspöck, Vladimir Makarkin, Victor Monserrat and Roberto Pantaleoni for answering my queries to a variety of questions, as attributed in the text above. Horst Aspöck, Ulrike Aspöck, Vladimir Makarkin, Victor Monserrat and Norm Penny kindly reviewed an earlier draft of the manuscript.

**INDICES**

(valid names italicized)

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**Species-group name**

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