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## **The Neuropterida of Triveneto (Northern Italy): an updated faunal checklist with some zoogeographical remarks**

**Agostino Letardi<sup>1</sup>, Rinaldo Nicoli Aldini<sup>2</sup> & Roberto A. Pantaleoni<sup>3,4</sup>**

<sup>1</sup>ENEA - C.R. CASACCIA, BIOTEC SIC, S.P. 046, Via Anguillarese 301, 00123 S. Maria di Galeria, Roma, Italy;  
E-mail: agostino.letardi@enea.it

<sup>2</sup>Istituto di Entomologia e Patologia vegetale, Università Cattolica del Sacro Cuore, via Emilia Parmense 84, 29100 Piacenza, Italy; E-mail: rinaldo.nicoli@unicatt.it

<sup>3</sup>Dipartimento di Protezione delle Piante, sezione di Entomologia agraria, Università degli Studi di Sassari, via Enrico De Nicola, 07100 Sassari SS, Italy; E-mail: r.pantaleoni@uniss.it;

<sup>4</sup>Istituto per lo Studio degli Ecosistemi - Consiglio Nazionale delle Ricerche (ISE-CNR), Traversa la Crucca 3, Regione Baldinca, 07100 Li Punti SS, Italy; E-mail: r.pantaleoni@ise.cnr.it

**Abstract.** As far as we know, about two-thirds of the whole Italian Neuropterida fauna (Raphidioptera, Megaloptera, Neuroptera) are present in north-eastern Italy (i.e. in the so-called ‘Triveneto’, corresponding to the administrative regions of Trentino-Alto Adige, Veneto, and Friuli-Venezia Giulia) and almost all the families reported in Italy (with the exception of Dilaridae and Berothidae) are also quoted for this area. In the present work, an updated checklist of the species is provided and faunal notes on certain noteworthy species as well as zoogeographical considerations concerning connections among Triveneto, Central Europe, the Apennine Peninsula and the Balkan Peninsula are presented. As far as Neuropterida are concerned, Triveneto can be considered a well-studied area.

**Key words:** Raphidioptera, Megaloptera, Neuroptera, Trentino-Alto Adige, Veneto, Friuli-Venezia Giulia, fauna

### **Introduction**

The “Triveneto” (also known as “Tre Venezie”) macro-region covers the three Italian administrative regions of Trentino-Alto Adige, Veneto and Friuli-Venezia Giulia, i.e. the north-eastern sector of continental Italy. A large sector of the Alps, the Pianura Padana and the Adriatic coast fall within this area which is therefore subject to different types of climate (Fig. 1).

On the southern edge of Central Europe, between the eastern sector of the Italian peninsula and the western sector of the Balkan peninsula, from a biogeographical point of view Triveneto is part of both the Central-European and Mediterranean subregions within the West Palearctic region (Vigna Taglianti *et al.*, 1992; AA.VV., 2005). It borders on Engadine, North-Tyrol and Carinthia to the north, the Istrian peninsula and Slovenia to the east, the Adriatic Sea and the Po river to the south. The western part of Triveneto also borders on the Insubric area, where the great lakes of glacial origin are located. Starting from Lake Garda, thermophilic Mediterranean faunal elements penetrate Triveneto, including along the Adige Valley, rising to the subalpine and alpine environments. On the other hand, the characteristic springs of the Friuli plain have an opposite effect on local climatic conditions, favouring the presence of Alpine elements in a plain environment. On the whole, because of its geographic location and orographic and hydrographic conditions, Triveneto exhibits a high biodiversity as a result of different affinities: Mediterranean, Balkan, Alpine and also the Danubian basin to the north. This complexity also interests the entomological fauna too and it is not surprising that much of the Italian neuropterofauna is cited for Triveneto.



Fig.1. The Triveneto area.

As regards Neuropterida, the Triveneto should be considered well studied: due to its geographical peculiar location, this area has been positively affected by the historically fervid activity of Central European entomologists (see Aspöck, 1963a, 1963b; Hellrigl & Hölzel, 1996; Hellrigl, 2007). Besides, a satisfactory (sometimes optimal) knowledge of the Neuropterida of most of the surrounding areas (such as lower Engadine, Carinthia, Slovenia, Camonica Valley, Comacchio lowlands) (Hölzel, 1964, 1973; Eglin-Dederding, 1980; Pantaleoni, 1982, 1984, 1986; Devetak, 1984, 1992, 2002; Hölzel & Wieser, 1999; Nicoli Aldini, 1994, 2005) permits useful comparisons.

With this contribution, we intend to focus on current faunal knowledge of Neuropterida in Triveneto.

## Material and methods

Over the last 25 years we have carried out several field investigations in this area, have examined specimens collected by colleagues, and have studied public and private collections: overall, more than 1500 specimens of Neuropterida from Triveneto have been personally examined by us. This work has permitted us to add a huge amount of data to the references published in more than one hundred papers (cfr. Letardi, 2000). Our checklist considers any reliable reference published since the end of 2008, as well as unpublished data from our studies and examinations.

Besides our personal collections (Letardi collection, Nicoli Aldini collection, Pantaleoni collection), the main collections examined are:

- Collection of the Museo di Zoologia dell'Università "La Sapienza", Roma (Letardi & Pantaleoni, 1996);
- Collection of the Istituto di Entomologia agraria dell'Università, Padova (Pantaleoni, 1990);
- Collection of the Istituto di Entomologia "Guido Grandi" dell'Università, Bologna (Pantaleoni & Letardi, 1998);

and the collections of the following Institutions:

- Zoologisch Museum, Instituut voor Taxonomische Zoologie, Universiteit van Amsterdam;
- Museo Civico di Scienze Naturali "Enrico Caffi", Bergamo;
- Museum für Naturkunde der Humboldt-Universität, Berlin;

- Museo di Storia Naturale “La Specola”, Firenze, Sezione di Zoologia;
- Museo Civico di Storia Naturale “Giacomo Doria”, Genova;
- Museo Civico di Storia Naturale, Milano;
- Istituto di Entomologia e Patologia vegetale, Università Cattolica del Sacro Cuore, Piacenza;
- Museo Civico di Zoologia, Roma;
- Dipartimento di Biologia e Protezione delle Piante, Sezione di Entomologia, Università, Udine;
- Museo Friulano di Storia Naturale, Udine;
- Museo Civico di Storia Naturale, Venezia;
- Centro Nazionale per lo Studio e la Conservazione della Biodiversità Forestale "Bosco Fontana", Verona;
- Eidgenössische Technische Hochschule, Zürich.

The material has been determined up to species level following H. Aspöck *et al.* (1980, 1991, 2001) as basic literature, also for systematic list and nomenclature, except for recent updates and some our personal opinions, partially already reported in the checklist of Italian fauna ([Bernardi] Iori *et al.*, 1995). Biogeographical notes refer to chorotypes proposed by Vigna Taglianti *et al.* (1993), considering the general distribution of species as reported in H. Aspöck *et al.* (2001).

As regards the sibling species of *Chrysoperla carnea* complex, the most dated references are actually useless. In order to list these taxa, we use recent contributions by Henry and co-authors (Henry, 1983; Henry *et al.*, 1996, 1999, 2001, 2002, 2003), and Thierry and co-authors (Thierry *et al.*, 1992, 1998; Canard & Thierry, 2007). General chorologic information on these *Chrysoperla* can also be based provisionally on data reported in these studies.

In order to compare our list, and the data relative to Friuli-Venezia Giulia in particular, with the published data on the presence of Neuropterida in Istria, we used the Istrian chorological data reported by H. Aspöck *et al.* (1980), updated with Devetak (2002).

## Checklist

The whole analysis is summarized in Table 1, indicating old and recent data with different colours (we have distinguished specimens collected, respectively, before 1961 and after 1960), on the basis of what we know up to now. Species doubtfully present in the Triveneto area are listed too, but with a question mark; they are not included in the count for each family.

## Discussion

One hundred and twenty-three species of Neuropterida are here mentioned for the Triveneto area, two thirds of the entire Italian neuropterofauna ([Bernardi] Iori *et al.*, 1995; Letardi, 2006). All of the three orders of Neuropterida and almost all of the families reported in Italy are represented, except for two rare families of Neuroptera *s. str.*, i.e. Berothidae and Dilaridae. A large number of Italian species of Chrysopidae and Hemerobiidae are reported for Triveneto, nearly 75% and 95% respectively. Most of the species listed here have been collected recently (i.e. after 1960) in this area; in some cases we have no recent data, but presence is to be predicted as very likely. In a few cases, the absence of recent captures could mean a possible situation of local extinction, as for *Palpares libelluloides* (Linnaeus, 1764), an unmistakable antlion quoted for two places in the Lake Garda area, but many years ago. Natural and/or anthropogenic causes and the disappearance of microhabitat in which this Turanian-Mediterranean species lives may have provoked local extinction of this insect, which is widely distributed and well established in central-southern Italy but only present in very small areas within the continental part of our country.

Some of the species listed in Table 1 are here reported for the first time for one or more administrative areas of Triveneto, such as *Nineta impunctata* (Reuter, 1894), *Hemerobius (Hemerobius) schedli* Hölzel, 1970, *Helicoconis (Helicoconis) lutea* (Wallengren, 1871), *Helicoconis (Helicoconis) pseudolutea* Ohm, 1965; worthy of note is the first Italian record for *Nineta carinthiaca* (Hölzel, 1965).

Almost all the species reported are characteristic of Alpine or pre-Alpine environments, although most of them are also present in lowland habitats: only *Creoleon plumbeus* (Olivier, 1811) and *Dichochrysa* sp. *prope picteti* (McLachlan, 1880) seem to be restricted to coastal or lowland habitats. Comparing all the Alpine and pre-Alpine neuropterofauna (about 55 genera and 160 species) with that of Triveneto, up to now 75% (i.e. 50 genera and 121 species) of this peculiar fauna are reported for Triveneto. This is fairly predictable result, due to the fact that most Neuropterida species are very widely distributed.

Table 1. Checklist of the Neuropterida of Triveneto (abbreviations: TA = Trentino-Alto Adige; VE = Veneto; FV = Friuli-Venezia Giulia; beside the name of every family, the total number of the known species for every administrative region is reported; other abbreviations, see footnotes).

N.	Family, species	TA	VE	FV
<b>RAPHIDIIDAE</b>				
		7	5	7
1	<i>Phaeostigma (Phaeostigma) notatum</i> (Fabricius, 1781)	■	■	■
	<i>Phaeostigma (Magnoraphidia) majus</i> (Burmeister, 1839)			?
2	<i>Dichrostigma flavipes</i> (Stein, 1863)	■	■	■
3	<i>Subilla confinis</i> (Stephens, 1836)	■		?
4	<i>Ornatoraphidia flavilabris</i> (Costa, 1855)		!	■
5	<i>Xanthostigma xanthostigma</i> (Schummel, 1832)	■		■
6	<i>Raphidia ophiopsis ophiopsis</i> Linnaeus, 1758	■	?	?
7	<i>Raphidia ulrikae</i> Aspöck, 1964			■
8	<i>Puncha ratzeburgi</i> (Brauer, 1876)	■	■	■
9	<i>Venustoraphidia nigricollis</i> (Albarda, 1891)	■	■	■
<b>INOCELLIIDAE</b>				
		2	1	0
10	<i>Parainocellia bicolor</i> (Costa, 1855)	■	!	
11	<i>Inocellia crassicornis</i> (Schummel, 1832)	■		
<b>SIALIDAE</b>				
		2	3	4
12	<i>Sialis fuliginosa</i> Pictet, 1836	■	■	■
13	<i>Sialis lutaria</i> (Linnaeus, 1758)	■	■	■
14	<i>Sialis morio</i> Klingstedt, 1932		■	■
15	<i>Sialis nigripes</i> Pictet, 1865		■	■
<b>NEVRORTHIDAE</b>				
		0	0	1
16	<i>Nevrorthus apatelios</i> Aspöck, Aspöck & Hölzel, 1977			■
<b>OSMYLIDAE</b>				
		1	1	1
17	<i>Osmylus fulvicephalus</i> (Scopoli, 1763)	■	■	■
<b>CHRYSOPIDAE</b>				
		27	23	23
18	<i>Nothochrysa fulviceps</i> (Stephens, 1836)	■	■	■
19	<i>Hypochrysa elegans</i> (Burmeister, 1839)		!	■
20	<i>Italochrysa italica</i> (Rossi, 1790)	■	■	*
21	<i>Nineta carinthiaca</i> (Hölzel, 1965)			!
22	<i>Nineta flava</i> (Scopoli, 1763)		!	■
23	<i>Nineta inpunctata</i> (Reuter, 1894)	?	?	!
24	<i>Nineta pallida</i> (Schneider, 1845)	■	■	■
25	<i>Nineta vittata</i> (Wesmael, 1841)		!	■
26	<i>Chrysotropia ciliata</i> (Wesmael, 1841)	■	■	■
27	<i>Chrysopa abbreviata</i> Curtis, 1834	■	■	!
28	<i>Chrysopa dorsalis</i> Burmeister, 1839	■	■	■
29	<i>Chrysopa formosa</i> Brauer, 1850	■	■	!
30	<i>Chrysopa nigricostata</i> Brauer, 1850	■	?	■
31	<i>Chrysopa pallens</i> (Rambur, 1838)	■	■	■
32	<i>Chrysopa perla</i> (Linnaeus, 1758) <i>sensu</i> Schneider, 1851	■	■	■
33	<i>Chrysopa phyllochroma</i> Wesmael, 1841	■	■	■
34	<i>Chrysopa viridana</i> Schneider, 1845	■	■	■



Table 1. *Continued.*

35	<i>Chrysopa walkeri</i> McLachlan, 1893			!	
36	<i>Dichochrysa abdominalis</i> (Brauer, 1856)			!	
37	<i>Dichochrysa clathrata</i> (Schneider, 1845)		?		
38	<i>Dichochrysa flavifrons</i> (Brauer, 1850)			!	
39	<i>Dichochrysa mariana</i> (Navás, 105)				
40	<i>Dichochrysa picteti</i> (McLachlan, 1880)			!	
41	<i>Dichochrysa prasina</i> (Burmeister, 1839)				
42	<i>Dichochrysa ventralis</i> (Curtis, 1834)				
43	<i>Dichochrysa zelleri</i> (Schneider, 1851)			*	
44	<i>Cunctochrysa albolineata</i> (Killington, 1935)				
45	<i>Cunctochrysa baetica</i> (Hölzel, 1972)				
46	<i>Cunctochrysa bellifontensis</i> Leraut, 1988				
47	<i>Peyerimhoffina gracilis</i> (Schneider, 1851)				
	<i>Chrysoperla carnea</i> (Stephens, 1836) <i>sensu lato</i>				
48	<i>Chrysoperla carnea</i> (Stephens, 1836)	!		?	
49	<i>Chrysoperla lucasina</i> (Lacroix, 1912)	!	?	!	
50	<i>Chrysoperla pallida</i> Henry, Brooks, Duelli & Johnson, 2002			!	
	<i>Chrysoperla agilis</i> Henry, Brooks, Duelli & Johnson, 2003			?	
	<i>Chrysoperla mediterranea</i> (Hölzel, 1972)			?	
	<b>HEMEROBIIDAE</b>		39	33	31
51	<i>Hemerobius atrifrons</i> McLachlan, 1868				!
52	<i>Hemerobius contumax</i> Tjeder, 1932				!
53	<i>Hemerobius fenestratus</i> Tjeder, 1932	!			!
54	<i>Hemerobius gilvus</i> Stein, 1863				? *
55	<i>Hemerobius handschini</i> Tjeder, 1957				!
56	<i>Hemerobius humulinus</i> Linnaeus, 1758				!
57	<i>Hemerobius lutescens</i> Fabricius, 1793				
58	<i>Hemerobius marginatus</i> Stephens, 1836				
59	<i>Hemerobius micans</i> Olivier, 1792				
60	<i>Hemerobius nitidulus</i> Fabricius, 1777			!	!
61	<i>Hemerobius perelegans</i> Stephens, 1836		?		?
62	<i>Hemerobius pini</i> Stephens, 1836				
63	<i>Hemerobius schedli</i> Hölzel, 1970	!			
64	<i>Hemerobius simulans</i> Walker, 1853	!			
65	<i>Hemerobius stigma</i> Stephens, 1836				
66	<i>Wesmaelius (Wesmaelius) concinnus</i> (Stephens, 1836)				!
67	<i>Wesmaelius (Wesmaelius) quadrifasciatus</i> (Reuter, 1894)				
68	<i>Wesmaelius (Kimminsia) cunctatus</i> (Ohm, 1967)				!
69	<i>Wesmaelius (Kimminsia) fassnidgei</i> (Killington, 1933)				?
70	<i>Wesmaelius (Kimminsia) helveticus</i> (Aspöck & Aspöck, 1964)				!
71	<i>Wesmaelius (Kimminsia) malladai</i> (Navás, 1925)				
72	<i>Wesmaelius (Kimminsia) mortoni</i> (McLachlan, 1899)				
73	<i>Wesmaelius (Kimminsia) nervosus</i> (Fabricius, 1793)				!
74	<i>Wesmaelius (Kimminsia) ravus</i> (Withycombe, 1923)				
75	<i>Wesmaelius (Kimminsia) subnebulosus</i> (Stephens, 1836)				
76	<i>Wesmaelius (Kimminsia) tjederi</i> (Kimmins, 1963)				
77	<i>Psectra diptera</i> (Burmeister, 1839)				

Table 1. *Continued.*

78	<i>Symphorobius (Symphorobius) elegans</i> (Stephens, 1836)			
79	<i>Symphorobius (Symphorobius) pygmaeus</i> (Rambur, 1842)			
80	<i>Symphorobius (Niremberge) fuscescens</i> (Wallengren, 1863)			!
81	<i>Symphorobius (Niremberge) klapaleki</i> Zeleny, 1963			
82	<i>Symphorobius (Niremberge) pellucidus</i> (Walker, 1853)		?	
83	<i>Megalomus hirtus</i> (Linnaeus, 1761)			!
84	<i>Megalomus pyraloides</i> Rambur, 1842			!
85	<i>Megalomus tineoides</i> Rambur, 1842			?
86	<i>Megalomus tortricoides</i> Rambur, 1842			
87	<i>Drepanopteryx algida</i> (Erichson, 1851)			
88	<i>Drepanopteryx phalaenoides</i> (Linnaeus, 1758)			
89	<i>Micromus angulatus</i> (Stephens, 1836)			
90	<i>Micromus lanosus</i> (Zeleny, 1962)		?	!
91	<i>Micromus paganus</i> (Linnaeus, 1767)		!	!
92	<i>Micromus variegatus</i> (Fabricius, 1793)			
<b>SISYRIDAE</b>				
		1	2	0
93	<i>Sisyra nigra</i> (Retzius, 1783)			
94	<i>Sisyra terminalis</i> Curtis, 1854		!	
<b>CONIOPTERYGIDAE</b>				
		8	7	2
95	<i>Aleuropteryx loewii</i> Klapalek, 1894			
96	<i>Helicoconis (Helicoconis) lutea</i> (Wallengren, 1871)	?	?	!
97	<i>Helicoconis (Ohmopteryx) pseudolutea</i> Ohm, 1965	!	?	
98	<i>Coniopteryx (Coniopteryx) borealis</i> Tjeder, 1930	?		
99	<i>Coniopteryx (Coniopteryx) pygmaea</i> Enderlein, 1906			*
100	<i>Coniopteryx (Holoconiopteryx) haematica</i> McLachlan, 1868			*
101	<i>Coniopteryx (Metaconiopteryx) arcuata</i> Kis, 1965			
102	<i>Coniopteryx (Metaconiopteryx) esbenpeterseni</i> Tjeder, 1930	?		*
103	<i>Conwentzia pineticola</i> Enderlein, 1905			
104	<i>Conwentzia psociformis</i> (Curtis, 1834)			
105	<i>Semidalis aleyrodiformis</i> Stephens, 1836			!
	<i>Semidalis pseudouncinata</i> Meinander, 1963	?	?	*
<b>MANTISPIDAE</b>				
		1	1	1
106	<i>Mantispa styriaca</i> (Poda, 1761)			
<b>MYRMELEONTIDAE</b>				
		10	12	8
107	<i>Palpares libelluloides</i> (Linnaeus, 1764)			*
108	<i>Acanthaclisis occitanica</i> (Villiers, 1789)			
109	<i>Synclisis baetica</i> (Rambur, 1842)			
110	<i>Myrmeleon bore</i> (Tjeder, 1941)			
111	<i>Myrmeleon formicarius</i> Linnaeus, 1767			
112	<i>Myrmeleon inconspicuus</i> Rambur, 1842			
113	<i>Euroleon nostras</i> (Geoffroy in Fourcroy, 1765)			!
114	<i>Dendroleon pantherinus</i> (Fabricius, 1787)			
115	<i>Macronemurus appendiculatus</i> (Latreille, 1807)			*
116	<i>Neuroleon microstenus</i> (McLachlan, 1898)			*
117	<i>Distoleon tetragrammicus</i> (Fabricius, 1798)			
118	<i>Creoleon plumbeus</i> (Olivier, 1811)			!
119	<i>Megistopus flavicornis</i> (Rossi, 1790)			!
120	<i>Gymnocnemia variegata</i> (Schneider, 1845)			

Table 1. *Continued.*

<b>ASCALAPHIDAE</b>		2	2	2
121	<i>Libelloides coccajus</i> (Denis & Schiffermüller, 1775)	■	■	
122	<i>Libelloides longicornis</i> (Linnaeus, 1764)	■	■	■
123	<i>Libelloides macaronius</i> (Scopoli, 1763)			■
	<i>Libelloides latinus</i> (Lefebvre, 1842)	?		?
 <b>LEGEND</b>				
	validated data after 1960	■		
	validated data preceding 1961	■		
	doubtful data (presence which needs confirmation)	?		
	new data (species quoted in this area for the first time)	!		
	species which have not been cited for FVG till now but reported for Istria	*		

The Triveneto area is located between the eastern sector of the Italian peninsula and the western sector of the Balkan peninsula, and borders with Central Europe: thus it is a transitional area between different faunas (Central European vs. Mediterranean; Apennine peninsula vs. Balkan peninsula), representing an area of great interest from a biogeographical point of view. Several species have their western distributional limits in this area, for example the Siberian-European alderfly *Sialis morio* Klingstedt, 1932, the Central-European snakefly *Raphidia ulrikae* H. Aspöck, 1964, the Asian-European inocelliid *Inocellia crassicornis* (Schummel, 1832), the Balkan sub-endemic lacewing *Nevrorthus apatelios* Aspöck & Aspöck & Hölzel, 1977, recently reported in a limited area of the Friulan pre-Alps (Letardi *et al.*, 2006), the Central-European green lacewing *Nineta carinthiaca* (Hölzel), the Turanian-European owlfly *Libelloides macaronius* (Scopoli, 1763), widespread throughout the Balkan peninsula and reaching the Karst area of Venezia Giulia; otherwise, the distribution of the west-European owlfly *Libelloides longicornis* (Linnaeus, 1764) has its eastern limit in Friuli region.

A comprehensive zoogeographical analysis of the Neuropterida present in this area emphasizes a quite obvious prevalence of species with a large distributional area in the Holarctic region (about 55%, with Holarctic, Palearctic, Asian-European, Siberian-European, Turanian-European and Turanian-European-Mediterranean elements). Again obviously, species with a wide European distribution area are well-represented (about 35%, with European, Central-European and S-European elements). Species with a wide distribution but limited to the Mediterranean basin make up 9% of species. Only *Parainocellia bicolor* (Costa) among the Neuropterida of the Triveneto may be considered an endemic (or a sub-endemic) Italian species.

Finally, the state of the faunal knowledge of Neuropterida in the Triveneto area can be considered satisfactory, although further study regarding the precise distribution of each species in the different environments of this area could be worthy of interest. Further studies could better clarify the biodiversity of the family Coniopterygidae, which has probably been underestimated till now.

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