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Nomenclatural roots of Neuropterida: Linnaeus' era

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Abstract. Linnaeus' *Systema Naturae* [LSN], 10th Edition is deemed to have been published on 1st January 1758, the starting point of zoological nomenclature. This date was arbitrarily set and clearly the publication of the 10th edition of the LSN does not represent a real break away from the past. Even if it is not part of the zoological nomenclature, information, such as descriptions or illustrations, published before that date may be used.

Literature from the pre-Linnean and Linnean period (i.e. the first ten years from the birth of zoological nomenclature closing with the publication of the 12th edition of LSN) was analysed in order to define the state of knowledge about Neuropterida in Linnaeus' time through the exploration of his works, the works of preceding authors to whom he refers, and his most important coeval authors (Poda, Scopoli, Schaffer, Müller).

Key words: History of entomology, 18th century, bibliography, Linnaeus' species, insect classification

Introduction

According to the International Code, Zoological Nomenclature originated about 250 years ago on the 1st January 1758, a date which was arbitrarily set by art. 3 as the starting point: « No name or nomenclatural act published before 1 January 1758 enters zoological nomenclature ». The first work to be recognised by the Code (with the well known exception of *Clerck's Aranei Svecici*) is *Linnaeus' Systema Naturae*, 10th Edition (International Commission on Zoological Nomenclature, 1999).

This date, dutifully defined with great precision by the Code, represents a caesura in time which is so effective that many zoologists see it almost as an impasse beyond which they should not push their studies. Actually, there is obvious continuity between the works which precede and follow 1758 – sanctioned by the same Code: « information (such as descriptions or illustrations) published before that date may be used » (art. 3.2). Every line of the works which appeared in the years immediately following the “starting point” inevitably took their roots from the works of the preceding years. The pre-Linnean volumes are not only interesting for the history of science or the history of philosophy, but also for the same taxonomists.

It is well-known that the order of Neuroptera (now the super-order Neuropterida), at the time of the “starting point” was extremely heterogeneous. The species of Neuroptera listed in *Linnaeus' Systema Naturae*, 10th Edition are now distributed among at least ten different orders. Even within the same genus, such as *Phryganea*, *Hemerobius* and *Panorpa*, species are found which are now attributed to several different orders. A confused situation which made any future detailed analysis of the species described by Linnaeus, and his coeval authors, problematic.

The purpose of this work is to define the state of knowledge about Neuropterida in Linnaeus' time through the exploration of his works, the works of preceding authors to whom he refers, and his most important coeval authors. The time limit of this analysis is the publication of the *Appendix Animalium* in the third tome of Linnaeus' *Systema Naturae*, 12th Edition (1768).

Systematic Entomology in Linnaeus' time

« *Insecta ubique reptant, volitant, natant, & vix ullus est locus adeo absconditus, ut eo non aliquod eorum pertingat. Multitudo horum fecit, ut METHODUM in tanta, ut ipsis videbatur, confusione ne sominare quidem potuerint veteres.* » [Insects crawl, fly and swim everywhere, and it is difficult to find a place so hidden that one cannot be reached by one of them. Their quantity was such that the ancients, or so it seemed to them, could not even dream of a METHOD of study.] With these two short sentences, Bladh (1767) expresses all the hardship that the first cataloguers of nature went through when faced with insects: an excessive number of species, a myriad of forms, many of which belonged to the same species due to metamorphosis. So the caterpillar is a butterfly, the maggot is a fly, the mealworm is a beetle. No one before Linnaeus, as his student Bladh reveals with deference, was able to arrange them into a *systema*. Not Aldrovandi (1602) who wrote the first modern treatise on entomology, nor Swammerdam (1669, 1737) who was the first to group the insects by metamorphosis, nor the few others who dealt with them.

All the *Coleoptera* were called *Scarabaei* by the *veteres* [ancients], all the *Lepidoptera Papiliones* and all the *Gymnoptera Muscae* if they had two wings and *Apes* if they had four. It was not very easy to go beyond this state of affairs.

Linnaeus was the first who dared to systematically reorganise this enormous group of organisms, determining the genera and assigning its distinctive characteristics to each one, organising the natural orders, and determining a huge quantity of species. For each one of these, *incredibili labore* [with an incredible amount of work], he gathered all their bibliographical references [*Synonyma Auctorum*] and he indicated their places of origin as well as giving a brief description.

The number of species known before Linnaeus' work was about 200, still according to Bladh (1767), and with Linnaeus' *Systema Naturae*, 12th Edition, they became nearly three thousand. Naturally the *systema* underwent significant changes over time, as documented in particular in the twelve editions of *Systema Naturae*.

The details of Linnaeus' work, the imprecisions and omissions, the unjustified changes and the obscurities, cannot be entirely understood without considering the context of the period, the enormous amount of work he had to do and how insects, for him, were only one class of one of the three Kingdoms of Nature, and according to ideas at the time, not the most important one.

The first neuropterans and the evolution of the concept

The first Neuropterida¹ to be described and illustrated were surely the ant-lions (larvae of the Myrmeleontidae) which, having always intrigued man due to their behaviour, have been cited since ancient times (Kevan, 1992). G. Hoefnagel (1592), a Flemish manuscript illuminator, was the first to reproduce an adult lacewing in a printed volume (H. Aspöck and U. Aspöck, 2007) but it is more the work of an artist than of a scientist. Aldrovandi (1602) was the first author to consider some Neuropterida in a scientific context.² Nicoli Aldini (2007), comparing this monumental volume with some manuscripts kept at the University of Bologna, was able to determine in detail which and how many Neuropterida were present: some Myrmeleontidae and a Chrysopidae included among the dragonflies (or damselflies), locusts and flies.³

¹ So as not to have to repeat every time if the term used is to be considered in a modern sense or not, from here on, Neuroptera will be used only for "Linnaeus' neuropterans", whereas the terms Neuropterida, Raphidioptera, Megaloptera and Planipennia only for "modern neuropterans".

² First by chance: Moufet's volume came out posthumously (1634) but it was probably ready from 1590 (Lee, 1894).

³ In reality in the text all the Neuropterida are referred to the *Perlae* (damselflies), but in the woodcuts which were evidently prepared beforehand, a presumed *Palpares* (Myrmeleontidae) is found among the locusts and the only Chrysopidae among the flies.

Moufet (1634) placed a green lacewing among the flies and was first to use the term *Chrysopa*: « *Musca quadripennis* ... *Chrysopsis dicitur* ». Lister (1685) instead considers the same insect as a dragonfly or damselfly: *Libella*, *Perla* [dragonfly, damselfly]. Grew (1686) simply places it among the « Insects with naked-wings » and translates Moufet's name from Greek into English: « Golden-Eye ». Vallisneri (1700) calls the adult ant-lion *cevettone* [dragonfly]; and the green lacewing « *una spezie di mezzo tra la Farfalla, e il Cevettone* » [a species between the butterfly and the dragonfly] (Vallisneri, 1717). Petiver (1695-1703) calls a lacewing « *Perla minima merda olens* » [small damselfly which smells of crap] and an adult ant-lion (Petiver, 1702-[1704]) « *Libella turcica major, alis Locustae* » [Turkish dragonfly with locust wings]. Ray (1710) considers the same lacewing as a fly with four wings with a yellowish-green body: « *Musca quadripennis corpore luteo-viridi* ». And we are still among flies and damselflies with Albin (1720): « Green-Golden-ey'd Fly »; Frisch (1722):⁴ « Gold-äugigen Stinck-Fliege » [Golden-eye stinking fly]; Réaumur (1737): « Mouches à quatre aîles » [flies with 4 wings] for lacewings; Réaumur (1738): « Demoiselle » [damselfly] for adult ant-lions.

In the midst of such confusion, Linnaeus (1735) did not immediately recognise what was to become his order of Neuroptera in the 1st Edition of his *Systema Naturae*. Besides, he summarises all of the animal kingdom in two pages and the insects (i.e. today's arthropods) in one column. There are only four orders ascribed to the *Insecta*. The only one of these to be reasonably well characterised is the *Coleoptera* inside which there are only two unrelated genera: *Blatta* and *Forficula*. The other three orders are a complete patchwork. *Aptera*, which includes all the arthropods without wings (including crustaceans and myriapods) will stay like this for a long time. Not so for the *Hemiptera* which, in this edition, contains a bit of everything from the real hemipterans (*Cimex*, *Notonecta*, *Nepa*), to the orthopterans (*Gryllus*), from the beetles (*Lampyris*) to the hymenopterans (*Formica*) to the fanciful *Scorpio* with eight legs [*Pedes* 8.] and four wings [*Alae* 4.].⁵ Finally the order *Angioptera* [from the Greek *angêion* « vessel » and *pterón* « wings »] includes insects with wings but without elytra [« *Alae omnibus datae, elytris destitutae* »] i.e. the actual lepidopterans, dipterans, hymenopterans and future Neuroptera. References to Neuropterida are few but certainly interesting. In the genus *Hemerobius*, defined with « *Cauda setosa. Alae 4. Compressae.* », Linnaeus places only *Phryganea*. *Raphidia* is a genus which includes an insect that has never been described before [*non depicta*]. The *Formica-leo* ends up in the genus *Musca*.

Not much changes with the 2nd Edition of the *Systema Naturae* (Linnaeus, 1740a). The *Angioptera* become *Gymnaptera* [from the Greek *gymnós* « naked » and *pterón* « wings »], the genera remain the same, but the *Formicaleo* transmigrates to *Hemerobius* although added to the diagnostic phrase for this genus is: « *Antennae longissimae, fractae* » [very long, articulated antennae].⁶

Only in 1744 with the 4th Edition⁷ of the *Systema Naturae*, Linnaeus creates the order of *Neuroptera*. Here fall the genera which were already present in the 1st Edition, *Libellula*, *Hemerobius*, *Ephemera*, *Raphidia* and *Panorpa*. *Phryganea* e *Formicaleo*, as species, remain in *Hemerobius* and a lacewing appears for the first time, *Musc. merda* [crappy fly].⁸

With the first edition of *Fauna Svecica* Linnaeus (1746)⁹ increases the number of species which had been listed in *Systema Naturae*, 4th Edition. He describes them in more detail and for the first time he supplies some bibliographical references [*Synonyma Auctorum*]. In addition, although he does not give any diagnostic phrases, he separates the genera *Hemerobius* and *Phryganea*. Three of the six species of *Hemerobius* are described for the first time, but only one of these will turn out to be a Neuropterida; for *Hemerobius formicaleonis* he reports what he observed personally during his trip to Holland (Linnaeus, 1745), supplying a description of the larvae and the Dutch name of the same: *Sandpiller*.

In the year following the publication of *Fauna Svecica*, 1st Edition, Linnaeus (1747a) published a short paper in the *Kongliga Svenska Vetenskaps Akademien Handlingar* [Transaction of Royal Swedish Academy of Sciences]¹⁰ which is very interesting because it contains the first of the only two drawings of *Neuropterida* which can be directly attributed to Linnaeus. Here he describes a very particular *Phryganea* collected in

⁴ Various reprints follow which, as far as we know, are absolutely identical to the first one.

⁵ Only Linnaeus's seven genera are mentioned but among the species are found also *Mantis*, *Cicindela*, *Bruchus*, &c.

⁶ A curiosity: *Scorpio* passes on to the *Aptera* and definitively loses its wings!

⁷ The 3rd Edition (Linnaeus, 1740b) is nothing but a reprint of the first.

⁸ Another curiosity: *Formica* finally moves on to the *Hymenoptera* in this edition.

⁹ In reality, an *Animalia per Sveciam observata* (Linnaeus, 1742) previously appeared in the acts of the *Kungliga Vetenskaps-Societeten i Uppsala* [Royal Society of Sciences at Uppsala]. This was a prodrome to the two editions of the *Fauna Svecica* which unfortunately was not examined.

¹⁰ Reprinted several times (Soulsby, 1933).

Moldavia (a Nemopteridae of the genus *Nemoptera*) (Fig. 1). The same insect, at least according to Linnaeus, will be described in the book by Hasselquist (1757), published posthumously and edited by Linnaeus himself, about the journey he made to Egypt and Palestine between 1749 and 1752.

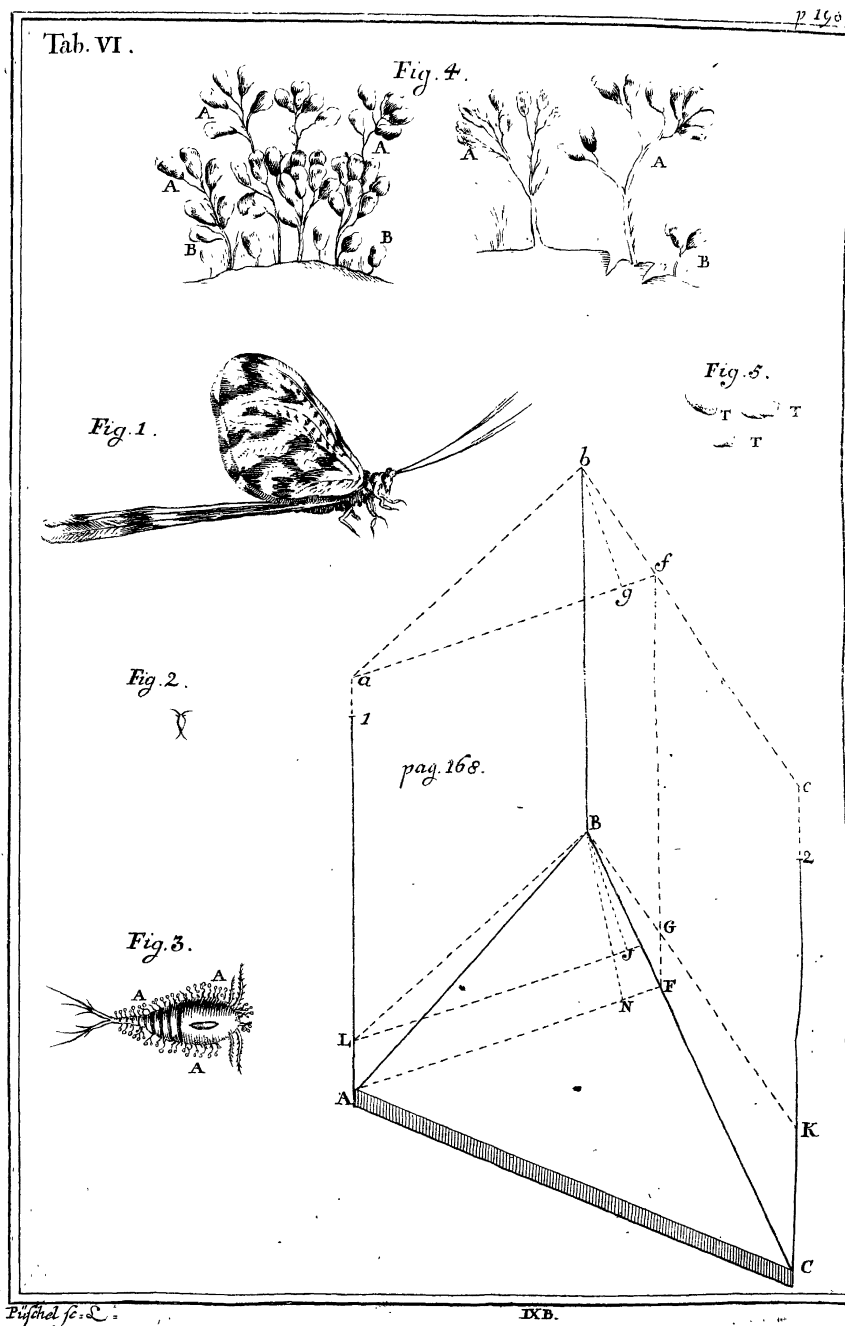


Fig. 1. Plate attached to « Eine seltsame Phryganea, in der Moldau ... » German edition (Linnaeus, 1753), following the first Swedish edition (Linnaeus, 1747a), of the paper in which a Neuropterida Nemopteridae was illustrated for the first time.

With the 6th Edition of his *Systema Naturae* Linnaeus (1748)¹¹ does not introduce anything new to the *Insecta* orders which remain the seven already listed in the 4th Edition: *Coleoptera*, *Hemiptera*, *Lepidoptera*, *Neuroptera*, *Hymenoptera*, *Diptera* and *Aptera*. Neither does he introduce anything new within *Neuroptera*, in fact the number of species is lower than in *Fauna Svecica*. However, he does introduce the diagnostic phrases for *Hemerobius* and *Phryganea* which appear to be quite inaccurate regarding adult morphology but completely effective in the description of the larvae.

In the year that the 10th Edition of *Systema Naturae* was published, another of Linnaeus' students wrote his dissertation entitled *Pandora Insectorum* (Rydbeck, 1758). This publication has an appendix containing an illustrated table that has no concrete connection with the text but which represents about sixty insects which are catalogued in *Systema Naturae*, 10th Edition. Among these, the second and last illustration of a Neuropterida attributed to Linnaeus¹² can be found. It is the *Hemerobius phalaenoides* (now in the genus *Drepanopteryx*) and can be identified by its unmistakable appearance, as well as by the number which indicates it.¹³

The 10th Edition of *Systema Naturae* (Linnaeus, 1758)¹⁴ is certainly the most important edition. It brings many changes to *Neuroptera*. The diagnoses of all of the orders are not very different from those which already appeared in the 4th Edition. For the *Neuroptera* the principal characteristic remains «*Alae IV, venis reticulate*» [4 wings with lattice venation]. The differences between *Phryganea* and *Hemerobius* are consolidated both by considering the structure of the mouth and by that of the wings (posterior wings folded at rest in *Phryganea*). The species of *Hemerobius* rise to 15 (10 of which belong to Neuropterida). A Neuropterida is included in the genus *Panorpa*: *Panorpa Coa* which is none other than the *Phryganea* described in 1747(a) and redescribed by Hasselquist (1757). Lastly, a single species of *Raphidia* remains. Six species of *Hemerobius* are described for the first time,¹⁵ three of these are Neuropterida: *Hemerobius Phalaenoides*, *H. albus* and *H. cornutus*. This last one from North America is the first known Nearctic Neuropterida.

After the publication of *Systema Naturae*, 10th Edition, Linnaeus would make only three changes to his *Neuroptera*: an increase in the number of species (new or described by others), the broadening of the genus *Raphidia* and the establishment of a new genus.

Linnaeus described new species of *Neuroptera* in the second edition of *Fauna Svecica* (Linnaeus, 1761), in the *Museum S:ae R:ae M:tis Ludovicae Ulricae Reginae* (Linnaeus, 1764),¹⁶ and in the same 12th Edition of *Systema Naturae*; one of his students (Johansson, 1763), who was assigned the task of studying exotic material, described another Nearctic Neuropterida. Finally, in the *Museum*, he named the ant-lion described and illustrated by Petiver (1702-[1704]) and, in the 12th edition, an Ascalaphid described by Schäffer (1766b).¹⁷

In the 12th Edition of *Systema Naturae* Linnaeus (1767) broadened the genus *Raphidia*, which until then had contained only one species, to include *Raphidia Mantispa* previously described by Poda (1761) and Scopoli (1763),¹⁸ and the *Raphidia cornuta*, which he himself described as a *Hemerobius* in the 10th Edition.

¹¹ The 5th Edition (Linnaeus, 1747b) is nothing but a reprint of the second.

¹² Traditionally, dissertations written by Linnaeus' students are attributed to Linnaeus himself (e. g. Rickett, 1955; Stearn, 1957; Nordenstam, 1961). Still, this choice seems to be very questionable and for now is not adopted here. This table however was certainly checked and ratified by Linnaeus himself.

¹³ It is precisely from this number that we can tell that this table was printed before *Systema Naturae*. The number on the table is in fact, 209.3 (genus 209, species 3) which corresponds to *Phryganea grisea* in this volume, whereas *Hemerobius Phalaenoides* corresponds with 210.3. But if we go to check the numeration of genera, we find a mistake: number 206 is missing: from number 205 *Phalaena* it goes on to 207 *Libellula*. The number in the table was therefore correct!

¹⁴ The 7th, 8th and 9th editions are reprints of the 6th (Hulth, 1907). This author rightly numbers the editions of the *Systema Naturae* differently from the traditional numbers, grouping them into five "original editions" corresponding to the 1st, 2nd, 6th, 10th and 12th "traditional editions". In reality, also the 4th "traditional edition" deserves to be considered an "original edition".

¹⁵ Obviously also newly named, but the binomial name was new for everyone.

¹⁶ *Museum Ludovicae Ulricae Reginae* « is a catalogue of the insects (and shells) in the extensive collection of the Swedish Queen. ... Unlike most Linnean books this luxurious volume treats only one species per page (with much white space), giving 420 species of insects. » (Usinger, 1964: 12). There are very few *Neuroptera* however in the collection, as Linnaeus himself mentions: «*Hic ordo deficit in Museum*» [this order is lacking in the *Museum*].

¹⁷ Linnaeus himself cites Schäffer (1766b) as a reference, but in reality: A) Schäffer described his species in 1763; B) Schäffer's and Linnaeus' species are surely different.

¹⁸ Poda (1761) described the species as *Raphidia Styriaca*, but Linnaeus adopted Scopoli's name probably because he considered it more descriptive.

Still in the 12th Edition, Linnaeus (1767) established the new genus *Myrmeleon*, distinct from *Hemerobius*, essentially due to the presence in males of a “forceps-like tail” [*Cauda maris forcipe e filamentis duobus rectiusculis*]. Three ant-lions and two Ascalaphids were included in *Myrmeleon*.

A final *Neuroptera* would be described by Linnaeus (1768) in the *Appendix Animalium* of the 12th Edition of *Systema Naturae*, but it is not a Neuropterida! After this, he would not deal with entomology any more, except through a student to describe two strange and particular insects a Coleoptera Paussidae and a Diptera Diopsidae (Dahl, 1775).

Beyond Linnaeus

In the period of time between the establishment of the order of *Neuroptera* in the *Systema Naturae*, 4th Edition (Linnaeus, 1744) and the publication of the *Appendix Animalium* of the *Systema Naturae*, 12th Edition (Linnaeus, 1768), Linnaeus was not the only one to be concerned with entomology and neuropterans. Again Bladh (1767), in his analysis of the entomology of the period, gives an accurate list of the principal authors.¹⁹ Some, such as Sulzer (1761), Gronovius (1764), Seba (1765) and also Schäffer (1766a), provide simple lists of insects, often beautifully drawn, others, such as Réaumur (1734, 1736, 1737, 1738, 1740, 1742) and Rösel (1746, 1749, 1755), describe the biology of some neuropterans, but without tackling any taxonomic problems.

Poda (1761) published a book on the insects of the museum of Graz (Styria, Austria), following, as he explains in the preface, the Linnean “method” but also describing a good number of new species. He is credited with having recognised and described a mantispid for the first time and for correctly attributing it to *Neuroptera*. Not so trivial if we consider that for many later authors (like for example Fabricius) mantispids were mantids (H. Aspöck, 1999).

The following year, Geoffroy published a much greater work, in two volumes and in French, about the insects in the Paris area ([Geoffroy], 1762). This Author did not follow Linnaeus, despite citing him often, and he did not even use a clearly binomial nomenclature. His “system” had the class of insects divided into sections, and each section into articles, orders and genera. He did not use names either for articles or orders, indicating only some differential characteristics. He defined only six sections of insects, against Linnaeus’ 7 orders, actually reuniting neuropterans and hymenopterans in his « *Insectes à quatre ailes nues* or *Tetraptera alis nudis* » [Insects with 4 bare wings].²⁰ Geoffroy’s number of genera is much higher than Linnaeus’. He was the first author to taxonomically separate stone-flies, by establishing the genus *Perla* and ant-lions, by creating the genus *Formicaleo*.

Another important volume dedicated to regional entomological fauna was published by Scopoli (1763) which uses Linnaeus’ *Systema Naturae* as a point of reference but proposes many considerable nomenclatorial changes, especially in the orders which do not seem to him to be well defined.²¹ Among *Neuroptera*, he re-describes and names for the first time an osmylid (H. Aspöck, 2002), as well as describing a new species of green lacewing and an ascalaphid, but the latter is not recognised as a neuropteran and it is included in *Lepidoptera* with the name *Papilio macaronius*.

A third regional fauna published by O. F. Müller (1764) did not have the fortune or circulation of the latter two volumes. He knew both Linnaeus’ work (of which he expressly quotes the second edition of *Fauna Svecica*) and Geoffroy’s work, so much so that he inserted a table at the beginning of the volume in which the systems of the two authors are compared. However, in the text he follows Linnaeus. He describes four new species of *Hemerobius* of which at least three are not interpretable nowadays (the fourth is a psocid).

¹⁹ Among the “minors” not quoted by Bladh (1767) we can mention Uddman (1753) with a dissertation in which he describes two new *Hemerobius*, and Allioni (1766) with a list of two *Hemerobius* from Turin, Italy. And later we can remember: Scelga’s attempt (1767) to propose a different “system” from Linnaeus’ with the orders *Vaginata*, *Semivaginata*, *Farinacea*, *Venosa* (among which the genera *Raphidia*, *Hemerobius*, *Formicaleo*), *Bialata*, *Nuda*; the encyclopedia and mammoth Dutch work by Houttuyn (1768); the uncertain work by Berkenhout (1769), a British faunal list with names based on Linnaeus but with frequently modified descriptions, including four neuropterans.

²⁰ The other sections correspond to Linnaeus’ orders even by name with the exclusion of *Lepidoptera* which are instead called « *Tetraptera alis farinaceis* » [*Tetraptera* with mealy wings].

²¹ Of the names of Linnaeus’ seven orders, only three remain unchanged (*Coleoptera*, *Lepidoptera* and *Neuroptera*), for the other four, he proposes alternatives which are certainly not trivial: *Proboscidea* for *Hemiptera*; *Aculeata* for *Hymenoptera*; *Halterata* for *Diptera*; *Pedestria* for *Aptera*.

Table 1. Bibliographical abbreviations used for species of Neuropterida by Linnaeus in: Fauna Svecica Editio Prima, 1746 (FnSv); Systema Naturae Editio Sexta, 1748 (SN6); Systema Naturae Editio Decima, 1758 (SN10); Fauna Svecica Editio Altera, 1761 (FnSv2), Systema Naturae Editio Duodecima (T. I, p. II), 1767 (SN12).

	<i>FnSv</i>	<i>SN6</i>	<i>SN10</i>	<i>FnSv2</i>	<i>SN12</i>	
<i>Act. Stockh. 1747</i>			•		•	Linnaeus, 1747a
<i>Act. ups. 1736</i>	•			•		Linnaeus, 1742
<i>Alb. Ins.</i>	•		•	•	•	Albin, 1720
<i>Amoen. Acad.</i>					•	Linnaeus (ed.), 1749-1769
<i>Faun. Svec.</i> (or <i>Fn.</i> or <i>Fn. Svec.</i>)		•	•	•	•	Linnaeus, 1746 or 1761
<i>Frisch. Germ.</i> (or <i>Frisch. ins.</i>)	•		•	•	•	Frisch, 1720-1738
<i>Geoffr. Paris.</i>					•	[Geoffroy], 1762
<i>Gæd. belg.</i> (or <i>Gæd. ins.</i>)	•		•	•	•	Goedart 1662, 1667, 1669
<i>Grew. Mus.</i>	•			•		Grew, 1686
<i>Hasselqv. iter.</i>			•		•	Hasselquist, 1657
<i>Hoffn. ins.</i> (or <i>Hoffn. pict.</i>)	•		•	•	•	Hoefnagel, 1592
<i>Hoffn. ins. edit. altera</i>	•			•		Hoefnagel, 1630
<i>It. Œl.</i>	•	•	•	•		Linnaeus, 1745
<i>List. Gæd.</i>	•			•		Lister, 1685
<i>M. L. U.</i>					•	Linnaeus, 1764
<i>Merian. eur.</i> (or <i>Merr. europ.</i>)	•		•	•	•	Merian, [1717]
<i>Merr. Gallice</i>	•			•		Merian, 1730
<i>Mouff. Angl.</i>	•			•		Mouffet, 1658
<i>Mouff. ins.</i> (or <i>Mouff. lat.</i>)	•		•	•	•	Moufet, 1634
<i>Mus. Petr.</i>	•			•		[Anonymous], 1742
<i>Pet. Gaz.</i>					•	Petiver, 1702-[1704]
<i>Pet. Mus.</i>	•		•	•	•	Petiver, 1695-1703
<i>Poda ins.</i>					•	Poda, 1761
<i>Raj. Ins.</i>	•		•	•	•	Raj, 1710
<i>Reaum. gall.</i> (or <i>Reaum. ins.</i>)	•		•	•	•	Réaumur, 1734-42
<i>Roes. Ins.</i>			•		•	Rösel, 1746-55
<i>Schæff. Elem.</i>					•	Schäffer, 1766b
<i>Schæff. Ins.</i>					•	Schäffer, 1766a
<i>Scop. Carn.</i>					•	Scopoli, 1763
<i>Sultz. Ins.</i>					•	Sultzer, 1761
<i>Syst. nat. 10</i>					•	Linnaeus, 1758
<i>Vallisn. oper</i> (or <i>Vallisn. nat.</i>)			•		•	Vallisneri, 1733

Table 2. List names of Neuropterida published between 1758 and 1769.

Name	Author	Book	
<u>Raphidioptera</u>			
1 <i>Raphidia ophiopsis</i>	Linnaeus, 1758	Syst. Nat. X – p. 552 n. 212.1	(1)
<u>Megaloptera</u>			
1 <i>Hemerobius lutarius</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.11	(2)
2 <i>Hemerobius cornutus</i>	Linnaeus, 1758	Syst. Nat. X – p. 551 n. 210.14	(3)
= <i>Raphidia cornuta</i>	Linnaeus, 1767	Syst. Nat. XII – p. 916 n. 240.3	
3 <i>Hemerobius pectinicornis</i>	Johansson, 1763	Centuria ins. – p. 29 n. 87	(4)
<u>Planipennia</u>			
Osmylidae			
1 <i>Hemerobius Fulvicephalus</i>	Scopoli, 1763	EntomolCarniol – p. 270 n. 706	(5)
Mantispidae			
1 <i>Raphidia Styriaca</i>	Poda, 1761	InsectMusGraec – p. 101	(6)
2 <i>Raphidia Mantispa</i>	Scopoli, 1763	EntomolCarniol – p. 272 n. 712	(7)
Hemerobiidae			
1 <i>Hemerobius Phalaenoides</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.3	(8)
2 <i>Hemerobius Humulinus</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.8	(9)
= <i>Hemerobius Humuli</i>	Linnaeus, 1761	Faun. Svec. – p. 383 n. 1510	
3 <i>Hemerobius hirtus</i>	Linnaeus, 1761	Faun. Svec. – p. 382 n. 1507	(10)
4 <i>Hemerobius paganus</i>	Linnaeus, 1767	Syst. Nat. XII – p. 912 n. 237.11	(11)
Chrysopidae			
1 <i>Hemerobius Perla</i>	Linnaeus, 1758	Syst. Nat. X – p. 549 n. 210.1	(12)
2 <i>Hemerobius Chrysops</i>	Linnaeus, 1758	Syst. Nat. X – p. 549 n. 210.2	(13)
3 <i>Hemerobius Flavus</i>	Scopoli, 1763	EntomolCarniol – p. 270 n. 707	(14)
4 <i>Hemerobius albus</i>	Linnaeus, 1758	Syst. Nat. X – p. 551 n. 210.13	(15)
Nemopteridae			
1 <i>Panorpa Coa</i>	Linnaeus, 1758	Syst. Nat. X – p. 552 n. 211.3	(16)
Myrmeleontidae			
1 <i>Hemerobius Formicaleo</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.4	(17)
= <i>Myrmeleon Formicarium</i>	Linnaeus, 1767	Syst. Nat. XII – p. 914 n. 238.3	
2 <i>Hemerobius Formicalynx</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.5	(18)
= <i>Myrmeleon Formicalyn</i>	Linnaeus, 1767	Syst. Nat. XII – p. 914 n. 238.4	
3 <i>Hemerobius speciosus</i>	Linnaeus, 1758	Syst. Nat. X – p. 551 n. 210.12	(19)
- <i>Formicaleo</i>	[Geoffroy], 1762	InsectesParis – p. 256	
4 <i>Hemerobius Libelloides</i>	Linnaeus, 1764	MLU – p. 401 n. 1	(20)
= <i>Myrmeleon Libelluloides</i>	Linnaeus, 1767	Syst. Nat. XII – p. 913 n. 238.1	
Ascalaphidae			
1 <i>Papilio Macaronius</i>	Scopoli, 1763	EntomolCarniol – p. 168 n. 446	(21)
- <i>Libelloides</i>	Scheaffer, 1763	Zwiefalter	
2 <i>Libellula spuria</i>	Scheaffer, 1763	Zwiefalter	(22)
3 <i>Hemerobius longicornis</i>	Linnaeus, 1764	MLU – p. 402 n. 2	(23)
= <i>Myrmeleon longicorne</i>	Linnaeus, 1767	Syst. Nat. XII – p. 914 n. 238.2	
4 <i>Myrmeleon barbarum</i>	Linnaeus, 1767	Syst. Nat. XII – p. 914 n. 238.5	(24)

Schäffer (1763, 1764) published, first separately and then bound in a volume together with other written work, a short essay on *Afterjüngferchen* [pseudo-dragonfly] or *Libelloides seu Libellula spuria*. This is one of the first species of Ascalaphid to be described and the first name for a genus of this family. The same author (Schäffer, 1766b) later published a volume of *Elementa Entomologica* in which he describes his own “system” which, despite partly going back to Geoffroy’s, shows some interesting curiosities. Insects are divided into classes according to their dichotomy: winged, wingless; four-winged, two-winged &c. So 7 classes are defined which roughly correspond with Geoffroy’s 6 with an extra subdivision in *Coleoptera*. The use of a rigidly dichotomous structure, however, leads to the creation of two super-classes, *Coleoptera* and *Hymenoptera*, which group some classes together. Instead, the subdivision of the classes is made, according to a unique scheme based on the number of tarsi, always into 6 orders. The number of genera is only slightly inferior to Geoffroy’s (and therefore far superior to Linnaeus’ genera). Each genus is accurately described and illustrated. The group of *Neuroptera* does not exist but there are 9 genera which can be ascribed to it, the highest number found in this historical period, including as well as Linnaeus’ genera, Geoffroy’s *Perla* and *Formicaleo* and also *Libelloides*. Schäffer’s *Elementa Entomologica* does not consider the level of species.

Linnaeus’ reaction to these “heretical” opinions is again described by his faithful student Bladh (1767) in a passage which borders on ferocity. « *D. Scopoli, Geoffroa [sic!] & Schaeffer soli sunt, qui genera ejus modi formarunt, hisque nova addiderunt nomina* » [Misters Scopoli, Geoffroy e Schäffer are the only ones who formed some genera in their own way, and who added new names]. An accurate list follows of the genera which Linnaeus considers²² as synonyms, and a list of new names of genera. For *Neuroptera*, Bladh gives *Formicaleo* as a synonym of *Myrmeleon* and considers *Libelloides* to be a simple *Myrmeleon antennis capitatis* [antennae with a “large head”]. Finally, he defends the limited number of genera established by “his Dean Linnaeus” both with reasonable arguments and with some offensive judgements which nowadays seem quite ungenerous.

Linnaeus’ bibliographical references or *Synonyma Auctorum*

Linnaeus describes his species briefly, he is extremely concise, particularly in the editions of his *Systema Naturae*. From these descriptions, it is very difficult to identify the species and to discriminate one from another. Fortunately, for each one of them, he provides a whole series of bibliographical references which lead us to descriptions and drawings by other authors. In this way, the amount of information increases enormously although unfortunately it is contradictory in some cases. Linnaeus uses abbreviations for his bibliographical references which can be reasonably deciphered and are in most cases sufficient enough to locate the passages and figures reported. All the abbreviations used by Linnaeus for Neuropterida in the two editions of *Fauna Svecica* and the 6th, 10th and 12th editions of *Systema Naturae* are listed and explained in Table 1.

Linnaeus often provides bibliographical references which refer to his own works. They can therefore be followed back in time providing further information which is useful for understanding the evolution of the species interpretation and the origin of some mistakes present in the same references. Probably the transcription from one edition to the next (or from one volume to the next) was not particularly accurate and ended up being subject to the phenomenon of error dragging.

In some cases, he cites authors and texts which describe and illustrate the biological cycle of the insects in detail. Often the cited figures do not make a great contribution to the interpretation of the species, and in some cases we can also find misleading information.

How many species and which species?

The creation of a “system” in which to insert all the insects known at the time could not exclude the patient job of cataloguing each single species. These were identified, described and above all named according to the new (for that time) binomial method. Good correspondence between the first names and a single species was found only in the case of more striking and showy insects such as some of the diurnal butterflies or some large beetles. In the other cases, a name indicated a group of very similar species which were almost indistinguishable in the eyes of those who dealt with all three kingdoms of nature (or at least all the animals or, at best, all the arthropods or all the insects): a problem for the rigorous application of the International Code of Zoological Nomenclature.

²² Even if the real author of the dissertation is Bladh, he clearly writes under Linnaeus’ authority.

In this study no nomenclatorial act will be committed, but more simply a list of names attributable to Neuropterida will be supplied (Tables 2 and 3).

Table 3. List of names published between 1758 and 1769 mistakenly attributed to Neuropterida.

Name	Author	Book	
<u>Isoptera</u>			
1 <i>Hemerobius testaceus</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.6	(1)
2 <i>Hemerobius marginalis</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.7	(2)
<u>Psocoptera</u>			
1 <i>Hemerobius sexpunctatus</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.9	(3)
2 <i>Hemerobius flavicans</i>	Linnaeus, 1758	Syst. Nat. X – p. 550 n. 210.10	(4)
3 <i>Hemerobius Pedicularius</i>	Linnaeus, 1758	Syst. Nat. X – p. 551 n. 210.15	(5)
4 <i>Hemerobius bipunctatus</i>	Linnaeus, 1761	Faun. Svec. – p. 384 n. 1514	(6)
5 <i>Hemerobius unipunctatus</i>	Müller, 1764	FaunInsectFridrich – p. 66 n. 580	(7)
6 <i>Hemerobius cruciatus</i>	Linnaeus, 1768	Syst. Nat. XII app Anim	(8)
<u>Nomina dubia</u>			
1 <i>Phryganea flavilatera</i>	Linnaeus, 1758	Syst. Nat. X – p. 548 n. 209.7	(9)
2 <i>Hemerobius nemoralis</i>	Müller, 1764	FaunInsectFridrich – p. 66 n. 577	(10)
3 <i>Hemerobius obscurus</i>	Müller, 1764	FaunInsectFridrich – p. 66 n. 578	(11)
4 <i>Hemerobius parvulus</i>	Müller, 1764	FaunInsectFridrich – p. 66 n. 579	(12)

Conclusions

Linnaeus carried out the titanic task of ordering the three kingdoms of nature into a system, sub-dividing them into the main taxonomic categories and identifying all the species known at the time. The *Insecta*, in particular, were divided into seven orders from 1744 onwards. Another four authors attempted alternative classifications: [Geoffroy] (1762) and Schäffer (1766b) organised the class in a completely different way, Scopoli (1763) and Schluga (1767) with differences even linked to a different denomination of the orders. A fifth “system” would be elaborated some years later by another entomological giant of the 18th century, Johan Christian Fabricius (1775), but Linnaeus’ system would last over time and continue its influence to this day.

Among Linnaeus’ orders, the *Neuroptera* was formed by assembling a large number of very different *taxa* which were also very phylogenetically distant from each other. Their common characteristic was represented as having “naked” wings full of veins. Naturally, today’s Neuropterida did have a place among Linnaeus’ neuropterans.

Although, on one hand, the few Raphidioptera were identified and named with the genus *Raphidia* from the 1st Edition of the *Systema Naturae* (Linnaeus, 1735), the other groups of Neuropterida had a much more troublesome systemization. Nearly all of them (with the one exception of *Panorpa Coa*) had a place in the genus *Hemerobius* (but together with psocopterans and termites) and were only later moved to *Myrmeleon* and *Raphidia* (Linnaeus, 1767). Only two other genera were founded by other authors: *Formicaleo* ([Geoffroy], 1762) and *Libelloides* (Schäffer, 1763).

There are 24 species of Neuropterida identified and named by Linnaeus and his coeval authors up to 1769, another 4 are *Nomina dubia* and there are no reasons to consider them with any probability as members of the Neuropterida. Another 8 species of *Hemerobius* surely belong to different orders.

Although the analysis and interpretation of Linnaeus’ neuropteran species has not been carried out in this paper, we can predict that there are many open questions about them and many problems which are unsolved or not solved satisfactorily.

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