Ulisse Aldrovandi and Antonio Vallisneri: the Italian contribution to knowledge of Neuropterous Insects between the 16th and the early 18th centuries*

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The oldest evidence of neuropterous insects in Italian scientific literature dates back at least to the 15th–16th centuries and regards antlions. Documents concerning antlions and green lacewings are present in the outstanding corpus of watercolour illustrations of insects built up in the 16th century by the great naturalist from Bologna, Ulisse Aldrovandi (1522-1605), and then reproduced in his work De animalibus insectis (1602). His illustrations of some adult antlions and a green lacewing are among the earliest to be found in printed works. Between the 16th and the early 18th centuries, other Italian authors mention or deal with lacewings, mainly the outstanding scientist from Reggio, Antonio Vallisneri (1661-1730), who published bionomical and behavioural observations on antlions and green lacewings; he was the first to publish the life cycle of an antlion and to describe and illustrate the stalked eggs of green lacewings.

Key words – entomology, neuropterology, history, Italy, antlions, green lacewings, early authors.

Neuropterans in early literature and Italian scholars who dealt with them before Linné

It is well known that the earliest written references to neuropterous insects concern the most well known since time immemorial, antlions. The term “antlion”, or its equivalents and variants in different languages, occurs in the texts of ancient civilizations even some centuries before Christ; but which animal or animals it referred to, we don’t know with any certainty. The first author who wrote with certainty on “antlions” in the present meaning of the word seems to have been the German Albrecht von Bollstädt, Dominican, bishop of Ratisbon, Saint Albert the Great (ca 1193-1280) (Saitta, 1929); theologian, philosopher, naturalist, “the universal teacher” of the thirteenth century. He spoke of flattened insects, similar to ticks, digging pits in the sand for hunting ants (Aldrovandus, 1602, p. 523; 1623, p. 207; Wheeler, 1930, p. 6; Kevan, 1992). Patron saint of naturalists, for this reason we can also consider him the specific patron of neuropterologists!

Antlions, animals which prey upon ants, and existing somewhere between reality and myth in ancient times, were the subject of early knowledge and beliefs perhaps partly referring to myrmeleontids; this idea survived in European culture over the Middle Ages, gradually freeing itself from uncertainty and legend and fi-
nally referring to well-defined insects.

Traces of these early vague ideas are to be found in Italian authors at least as early as the 15th century. Later, an important representative of 16th-century scientific humanism, Ulisse Aldrovandi, includes some neuropterous insects, not only antlions, in his work on insects, and illustrates them (Aldrovandus, 1602). About a century later, another great Italian scientist, Antonio Vallisneri, studied the life and behaviour of insects and gave an example of his observations describing the life cycle of an antlion (Vallisneri, 1700a) and the stalked eggs of a green lacewing (Vallisneri, 1717). Besides these two protagonists of the history of biological science and entomology, a few other Italian students working in other branches of science left more marginal evidence of an interest in these insects in the same period.

Thus, when we write of the Italian authors before Linne who studied the insects we now call neuropterans, we are referring to a period which lasted over two centuries, during which there was radical evolution in scientific thought and substantial changes in the way the study of nature was approached: from the inheritance of the Middle Ages, dogmatic and pervaded by myth, by way of the encyclopaedism of the late Renaissance, aimed at the complete recovery of classical knowledge and still subject to the authority principle, to the rise of the early scientific academies and the achievement of a new critical spirit and the experimental method, the basis of modern science and a prelude to the season of cataloguing and classifications of the Enlightenment.

This development of methods and concepts forms the background to the illustrations and writings I am going to present. These documents are evidence of centuries of interest in these insects in Italy, and they reflect at least some of the principal driving forces that historically have promoted the development of entomology itself: the simple desire to preserve and hand down forerunners' knowledge; the love of and wish to document the fascinating diversity of living beings, particularly insects with their metamorphoses; a practical and applied interest in nature in relation to man's activities, and possible advantages for him; the speculative desire to classify nature, to reach a systematic knowledge of the physical world; the goal of investigating and understanding structures, functions, behaviours, relations.

Late Middle Ages and height of the Renaissance: Decembrio and Cardano

In the works of at least two Italians before Aldrovandi, there is evidence of an interest in antlions: towards the end of the Middle Ages we find mention of them in the “Codex animalium”, a handwritten bestiary by the learned humanist from Pavia, Pier Candido Decembrio (Petrus Candidus Decembrius) (1392-1477). This courtier and diplomat translated classical authors and wrote epigrams and tracts in prose (Viti, 1987). In the fourth volume of his richly illustrated work, dating back to approximately 1460 (the date of the drawings is uncertain), there is an illustration of a possible antlion larva, which the author refers to as the so-called “Formicae Indicae” (Decembrius, ca 1460). This illustration may be the first true image of an antlion larva, referred to with an early Latin name used for denoting the mythical “gold-digging” ants. This picture has undoubtedly something of the chimerical and fanciful: on the whole it resembles the tetrapod larva of an antlion, but the head with palps between the mandibles, and the four legs with strong claws, also recall the morphology of a male stag-beetle. In the codex, to one side of this image there is an illustration representing another meaning of “ant lion” in ancient times: a bigger ant which has another much smaller ant in its mouth (Bodenheimer, 1928-1929; Kevan, 1992).
At the height of the Renaissance, the antlion larva is quoted in the work of another student from Pavia, Gerolamo Cardano (Hieronymus Cardanus) (1501-1576) (Fig. 1), one among the more notable, eccentric and eclectic talents of the 16th century: he was physician, mathematician, physicist, astronomer, musician and philosopher. There are short entomological references mostly in his work De subtilitate libri XXI, published in Paris in 1551. In another work, the seventh book ("De animalium") of his De rerum varietate (1557), he also refers to antlions, following the description by Albert the Great, as being small animals, enemies of ants, like small grubs. They dig round pits in the sand, living in small holes at the bottom, where they catch ants for eating (Cardanus, 1557; see also Aldrovandus, 1602, p. 523; 1623, p. 207; Wheeler, 1930, p. 6). Cardano seems therefore to give a relatively accurate description of antlions, but he added nothing to what Albert the Great had already said three centuries before, as pointed out by Kevan (1992).

When we read certain ancient accounts of undefined insects digging pits in the sand we must remember, however, that they may refer to the larvae of vermileonid dipterans.

**Scientific Humanism in the late Renaissance: Ulisse Aldrovandi**

But it was due mainly to Ulisse Aldrovandi (alias Aldrovando; Ulysses Aldrovandus in his works in Latin) (Fig. 2), who died four hundred years ago, in 1605, that neuropterous insects were introduced into the scientific literature of the Renaissance. This encyclopaedic talent and very renowned naturalist, perhaps the greatest zoologist of the 16th century, was born in 1522 from a ruling family in Bologna – at that time in the Papal States – where he also died. His life was long and adventurous, ruled by his boundless passion for natural history. He studied law, philosophy...
and medicine and he graduated in philosophy and medicine at Bologna in 1553. He was professor for many years – teaching pharmaceutical botany, logic, philosophy, natural history – at Bologna University, and only late in life, when he was seventy-seven years old, he started the publication in Latin of his enormous work, the fruit of a life devoted to the collection of materials gathered together in a natural history museum – one of the first in the world – and to filing the great mass of naturalistic notions found in all his predecessors’ works, from ancient times onwards. The many volumes of Aldrovandi’s manuscripts and watercolour illustrations of animal and plant subjects pertinent to his observations are preserved in the University Library of Bologna (B.U.B.) and are a precious source of reference for deeper analysis of the way of thinking and working of this renowned scholar. Born in the land which had experienced first – in Magna Graecia and Sicily – the development of Greek, and then the flourishing of Latin civilisation, he was under the spell of classical studies, demonstrating this interest by writing in his youth of the monuments of ancient Rome; but what was most fascinating for him was classical scientific knowledge (he was principally a follower of Aristotelianism). The publication of his works was continued posthumously by relatives and pupils; fortunately for entomologists, however, one of his works published when he was still alive, and which therefore reflects faithfully his thought without interference by others, is the work which principally deals with entomology, the *De animalibus insectis libri septem*, published in Bologna in 1602 (Aldrovandus, 1602) (Fig. 3), and followed by several re-editions later (Frankfurt 1618, 1623; Bologna 1620, 1634, 1638-44). This encyclopaedic book summarises knowledge of insects since ancient times, and it is enriched with original observations by the author and with many illustrations; it represents the beginning of a new age for entomology (Berlese, 1909; Aldrovandi, 1929; Conci, 1975; Montalenti, 1978; Simonetta, 1994; Conci & Poggi, 1996; Simili, 2004; Nicoli Aldini, 2005).

Of the many insects treated in the text and illustrated in woodcuts (e.g. see Figs 4 A-E), a few adult myrmeleontids and one chrysopid are recognisable. Aldrovandi’s woodcuts, which are among the earliest printed illustrations of neuropterous insects (as well as of many other insects), are taken from the outstanding corpus of watercolour or wash drawings, more exact and helpful to us today in subject identification; Aldrovandi had some artists carry out these colour drawings earlier, as documentation of his research and collections; these documents (B.U.B., Ulisse Aldrovandi, Tavole di animali) (e.g. see Figs 5 A-D) date back to the second half of the 16th century; the preparatory writings of the book to be printed later date back to the same epoch. Adult antlions...
Fig. 5 - B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, carte 75, 76, 93, 110 (some of many Aldrovandi's plates with watercolour drawings of insects): A, c. 75; B, c. 76; C, c. 93; D, c. 110.

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Fig. 6 – A, U. Aldrovandi, *De animalibus insectis* (Bologna 1602, p. 305, fig. 8): adult antlion (woodcut); B, adult antlion (watercolour painted before the woodcut in Fig. 6 A) (B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, detail of c. 110); C, U. Aldrovandi, *De animalibus insectis* (Bologna 1602, p. 414, fig. 5): adult antlion, probably of the genus *Palpares* (woodcut); D, adult antlion, probably of the genus *Palpares* (watercolour painted before the woodcut in Fig. 6 C) (B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, detail of c. 93); E, U. Aldrovandi, *De animalibus insectis* (Bologna 1602, p. 304, fig. on the right, without number): adult antlion (woodcut); F, adult antlion (watercolour painted before the woodcut in Fig. 6 E) (B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, detail of c. 76); G, U. Aldrovandi, *De animalibus insectis* (Bologna 1602, p. 303, fig. 3): damselfly, which in the woodcut resembles an adult antlion; H, the corresponding damselfly (watercolour painted before the woodcut in Fig. 6 G) (B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, detail of c. 92). (Figs 6 A, C, E, G: photos R. Nicoli Aldini).
are illustrated and briefly described in the *De animalibus insectis* among the "Perlae" (i.e. together dragonflies and damselflies); the term "perlae" refers to the pearly reflections from their wings. The *perla* is more immediately recognizable as an antlion (possibly of the genus *Myrmeleon*) (Figs 4 C, 6 A) is briefly described in these words: "OCTAVA ALVAM HABET OBTUSAM, AC MINIME BIFURCATAM, TOTU CORPORE FERRUGINEO, ALIS CAN DIDIS, A LATERE FERRUGINEIS." (\[\ldots\] A LATERE FERRUGINEO."

in the 1623 edition) (3) (Aldrovandus, 1602, p. 304 and p. 305, fig. 8; 1623, p. 118 and p. 119 (bottom): *Perlae* fig. 8), and it corresponds to a watercolour, in the University Library of Bologna, of a specimen described as "Perla alis praelongis sine maculis cauda simplici minime bifurcata" (B.U.B., U. Aldrovandi, Tavole di animali, tomo VII, c. 110) (Figs 5 D, 6 B). Another species (Figs 4 E, 6 C) seems to be of the genus *Palpares*; this attribution is easier if we refer to the watercolour drawings (B.U.B., U. Aldrovandi, Tavole di animali, tomo VII, c. 93) (Figs 5 C, 6 D), in which it is defined as "Locustae cognata" (4) - an attribution based perhaps on the head and mouthparts, and other similarities - and in the book is placed in a plate that illustrates grasshoppers and mantids, but the author writes that this insect is portrayed there by error and is to be placed among butterflies or moths: "Papilionis ict est, quam supra dedimus inter papiliones" (4), Aldrovandi writes (Aldrovandus, 1602, p. 414, fig. 5, and p. 415; 1623, p. 162 (on the right): *Locustae* fig. 5, and p. 164); however in the text and plates regarding these insects there is no trace of it. For two other printed illustrations of "Perlae" the watercolour drawings in Aldrovandi’s "Tavole di animali" are enlightening in their interpretation: one insect ("prior alas habet subjflavas, et corpore toto flavo est exceptis zonis, quae sunt ferrugineae.") (5) is represented without antennae (Figs 4 B, 6 E) (Aldrovandus, 1602, p. 304, and figure on the right, without a number, on the same page; 1623, p. 118 and p. 119 (on the right): *Perlae* fig. without number), but is a myrmeleontid (see B.U.B., U. Aldrovandi, Tavole di animali, tomo VII, c. 76, fig. without any caption, in the middle) (Figs 5 B, 6 F); another ("TERTIA ALAS HABET BREVES, AD SUBCOERULEUM INCINANTES, ALVUM LONGISSIMAM \[\ldots\]. Antennas habet, admodum breves subjflavas."
bas concitare. […] Cardanus sic meminit: Insi­diatur Formicis animal Erucae parvae simile, sic interpretor Alberti, qui hoc vidit, verba: in sabulo foveam sibi fingens, haemisphaeri for­ma, in culus apice quasi posulis, foramen existit angustum ex quo improvisus insultat Formicis, easque devorat. hoc Formicaleon ab Alberto appellatur. […]” (8).

Aldrovandi goes on to quote other possible uses of the word antlion and mentions myrmecophagous mammals; but at this point it is interesting to note that, surprisingly, a faithful colour drawing of an antlion larva (probably Myrmeleon or Euroleon) is to be found in Aldrovandi’s Tavole di animali, under the illustration of the adult Palpares, and this larva (B.U.B., U. Aldrovandi, Tavole di animali, tomo VII, c. 93) (Figs 5 C, 7 A) is defined as “Ricino congner” (9), probably with reference to its sucking mouthparts and the bulky, swollen abdomen recalling a tick; a re­semblance already noted by Albert the Great for the antlion. But neither a wood­cut from this picture, nor any reference in the text on ticks, are to be found in the De animalibus insectis for this insect, perhaps enigmatic for Aldrovandi.

Another very interesting neuropterolo­gical aspect of Aldrovandi’s work is that a true green lacewing is briefly described and represented (Figs 4 D, 7 B) in a plate, among some “Culices” (Aldrovandus, 1602, p. 386, fig. 7, and p. 387; 1623, p. 136: Culices fig. 7, and p. 152). The green lacewing is also to be found in the pre­vious papers of painted insects (Figs 5 A, 7 C), where it is defined as “Culex papilio­naceus quadripennis viridis” (10) (B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, c. 75); in this case again, in the text of the printed book Aldrovandi corrected the erroneous location, referring this insect to the group of “Perlæ”. Aldrovandi writes:

“De septimo maxime dubito, num inter Culices sit referendus, nescioque qua incuria hic inter Culices positus. nam Perlis dictis minimis po­tius adscripterim. Culicibus vulgaribus sive lacustribus maior, corpore tenui, gracili, ob­longo, viridi, linea ex luteo pallida medium dor­sum intersecante, quae a capite incipit, et in caudam desinit, antennis mediocribus, absque oris aculeo, alis quaternis argentei splendoris, magnis.” (11).

This is one of the earliest descriptions and illustrations of a green lacewing, possibly of the genus Chrysoperla, preceded only by the illustration published by Hoef­nagel in 1592 (see Aspöck & Aspöck, 2007). If we take the latter lines of this piece, or those describing the adult ant­lions which are quoted above, we find, more than one and an half centuries be­fore Linné (1707-1778), short descriptions of insects, comparable with those of the great Swedish naturalist (who appreciated Aldrovandi’s work, quoted him here and there in his Systema naturae, and em­ployed certain of his scientific names) (Linnaeus, 1758).

![Fig. 7 - A, larva of myrmeleontid, probably of the genus Myrmeleon or Euroleon (watercolour) (B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, detail of c. 93); B, U. Aldrovandi, De animalibus insectis (Bologna 1602, p. 386, fig. 7): green lacewing (woodcut) (photo R. Nicoli Aldini); C, green lacewing (watercolour painted before the woodcut in Fig. 7 B) (B.U.B., Ulisse Aldrovandi, Tavole di animali, tomo VII, detail of c. 75).](image-url)
Aldrovandi’s doubts and afterthoughts on the classification of antsions and green lacewings reflect his changing ideas while he was collecting material, arranging it and later preparing the publication, and the difficulty he had describing these insects and including them in the major insect groups then recognized. We must remember, moreover, that he was working before the invention and diffusion of the microscope. Furthermore his classification of insects, while based on dichotomous method, rather than being an attempt at a systematic arrangement, is somewhat heterogeneous and based on various criteria, not only morphology but also including habitats and so on. We will still have to wait a long time for the systematic arrangements of Ray or Linné, and yet longer before finding the Neuroptera as a unitary-physiognomy group in systematics!

The analysis carried out here of Aldrovandi’s neuropterological work aims to, partially, fill the gap it has sometimes recently been claimed exists in the progress of knowledge of these insects between the first half of the 16th century and the early 18th century (see Kevan, 1992; Letardi, 2004), especially in the light of the attention now being paid to the history of this knowledge.

17th and early 18th century: Antonio Vallisneri

A watercolour illustration of a neuropteran is also to be found in Lincei’s naturalistic manuscripts and drawings up to the first decades of the 17th century, as Letardi (2004) has recently shown, publishing a figure of an antlion, perhaps Megistopust flavicornis (Rossi, 1790). The aims of the “Accademia dei Lincei”, founded in Rome in 1603, shortly before Aldrovandi’s death, by the young Roman prince Federico Cesi (1585-1630), were to gather students who would devote themselves to the study of nature with sagacity, rigour of method, a new critical approach, and enthusiasm for seeking the truth. Collecting ample documentation of animals, plants and minerals, as Aldrovandi himself had done, was an indispensable step in the realisation of subsequent printed illustrations. This document also testifies therefore to the interest for insects developed under the aegis of the Academy created by Cesi, precursor of modern botany and promoter of the Theatrum totius naturae, an encyclopaedic work which was never published, of which Cesi’s famous Apium, together with Stelluti’s Melissography, was an early fruit. This work, finished in 1625, was also the first essay on insects (honeybees) described and illustrated using a microscope (Baccetti, 1993; Nicoli Aldini, 2002).

Another Italian scientist, Antonio Vallisneri (alias Vallisnieri, Valsinieri) (1661-1730) (Fig. 8), a physician and naturalist, is no less important than Aldrovandi in the history of biology and entomology. Born into a noble family in the fortress of Tresilico (now Trassilico), in the Garfagnana area, citizen of Reggio (now Reggio nell’Emilia) and subject of the Dukedom of the Family of Este, he started his university studies in Bologna, where he was a disciple of Marcello Malpighi (1628-1694), who left an indelible mark on his pupil. Vallisneri then graduated in Medicine at Reggio University, and practised medicine in Venice, Padua and Parma. During this period he devoted himself to intense naturalistic research, quickly achieving international scientific notoriety, and was soon called to teaching first practical medicine and then theoretical medicine at Padua University. He held the chair for thirty years (1700-1730), during which time he had to apply himself mainly to medical studies (Montalenti, 1937; Conci, 1975; Simonetta, 1994; Conci & Poggi, 1996). Of his scientific investigations, conducted with the benefit of a subtle mind and informed by Bacon’s and Galilei’s experimental dictates, many were entomological. His studies of insect generation are particularly worthy of mention: Dialoghi sopra la curio-
Fig. 8 – Portrait of Antonio Vallisneri (1661-1730) (after Conci & Poggi, 1996).

As regards neuropterans, the value of Vallisneri’s research on the antlion did not fade over time (Rеаumur, 1742; Linnaeus, 1758; Wheeler, 1930; Insom et al., 1979; Letardi, 1998; and others); this is also the proper place to recall his early annotations concerning a chrysopid, quoted also by Linnaeus (1758, p. 549, under Hemerobius perla), despite an inaccurate reference. His notes were published in the Venetian magazine “La Galleria di Minerva” (Fig. 9): “Maniera rara, e curiosa d’un insetto Anonimo nel collocare le sue uova” (Vallisneri, 1717, p. 152). This short text is here entirely reported, with the original typing:

“Fu portato li 25 Maggio al Vallisneri un galan­tissimo insetto volante, ch’egli ripone in una spezie di mezzo fra la Farfalla, e il Cevettone. Questi era tutto d’un elegantissimo color verde, eccettuati gli occhi tints di color d’oro. Era cor­redato di quattro ali membranacee lucide e smeraldine, grandi a proporzione, le quali cop­rivano tutto il corpo. Quando si posa, sta coll’ali chiuse nel margine superiore, e aperte nell’inferiore, aguisa del tetto d’una Casa, dalle quali tutto viene difeso, e coperto, eccettuato il capo, e il collo, ed un’angolo nel principio del dorso. Piedi, ventre, Torace, dorso, colo, capo tutto tinto di verde. Gli occhi soli colorati d’oro. Porta il rostro in cima la bocca, e le antenne sul capo rivoltate in dietro, e interrotte da spessi nodi. Ecco la figura. Tav. j. Fig. 3. (c) Rinchiuso in una scatola, vide la matina se­guente cinquanta uova anch’esse verdi appic­cate tutte al volto della medesima, e ne’ dintor­ni delle parti, nel modo, che rappresenta la Fig. 4. T. j. (d) Il filo, sul quale cadauna posava era duretto fatto d’una colla, o gelatina viscosa, che resi­steva all’urto piegandosi, e poi tornando al suo luogo. Erano di figura alquanto ovata, e ras­semmravano tanti piccoli aghi col loro capo. Dopo ne trovò sopra foglie delle Rose, e sopra altre erbe, e ne darà un giorno ulteriore notizia. (c) Tav. l. Fig. 3. (d) Tav. l. Fig. 4.” (15).

The drawing of the green lacewing provided by Vallisneri (Figs 10 A-C) is really rather rough in comparison with those to be found in previous or contem­porary works by other authors (see Aspöck & Aspöck, 2007). His observations
on this chrysopid were afterwards republished in the posthumous edition of the *Opere fisico-mediche* (Vallisneri, 1733, tomo III, p. 211), and we can also read a version of them in the first of the *Quaderni di osservazioni*, a manuscript dating back to the last years of the 17th century, and recently published (Pennuto, 2004, p. 62); in the manuscript the chrysopid is indicated as "insetto in forma di cevittone piccolo" and there is also a sketch of its pedunculate eggs. As regards the word "cevittone" or "cevettone", this is a vernacular and augmentative term derived from "ci­vetta" (owlet), and used by Vallisneri to name the dragonflies, damselflies and other similar insects (corresponding therefore to Aldrovandi’s *Perlae*; see also Conci & Nielsen, 1956, pp. 40-43). Like Aldrovandi, Vallisneri also saw a similarity or relationship between green lacewings, antlions, dragonflies and damselflies, even though he expressed some doubt regarding their affinities.

As far as myrmeleontids are concerned, Vallisneri’s observations are to be found in his *Secondo dialogo* between Pliny and Malpighi, also published in the “Galleria di Minerva” (Vallisneri, 1700a, pp. 302-305), without illustrations. One of the aims of this “dialogue” – a literary genre common in scientific literature of the 17th and 18th centuries – was to refute the theory of spontaneous generation with evidence, as we can see in the contraposition between an ancient author (Pliny) and a modern one (Malpighi, teacher of Vallisneri himself). Through Malpighi, Vallisneri reports his own observations on the life cycle of the antlion and accurately describes the larva – which digs pits in dusty soils and has the characteristic forceps (“tanaglie”), whose functions are pointed out –, pupa, cocoon, adult and its emerging, the meconium produced by the adult, and erroneously interpreted as an egg; he provides other observations on the behaviour and the environment of this insect, whose surprising life is at first subterranean, then aerial. The person who sees an adult emerging from the soil, he says, could be mistaken, like the Ancients, and think that it is generated by the soil! His observations started from some larval pits found at the foot of an oak and in the bank of a ditch. He also reports larval movements backwards, the way it can dig an initial pit, its resistance to fasting, the castings. As regards larval feeding, he thinks it consists exclusively or principally in sucking prey’s “linfa” (lymph, of ants or other small arthropods), and he supposes a correlation between the morphology of the forceps and ability to grasp victims of different shape and size. He also notes the location of the pits in relation to the cardinal points. By rearing larvae he experiments with the pupating in an artificial environment without dusty soil, in order to
better observe silk reeling and metamorphosis. Furthermore, he dissects larvae and adults. He also writes that he has more than once observed adults laying eggs in dusty soils. He names the larva "verme formicario" (worm of ants), the pupa "ninfa", the adult "cevettone", a regional word whose meaning is reported above. The accurate description of the adult's colouring, together with the biomet- 
ological data provided and the asserted larval place of origin, at least partially, in the surroundings of Bologna, suggest that his antlion could be identified today as a Myrmeleon, almost certainly M. formicarius Linnaeus, 1767.

Re-editions of this subject are to be found in Vallisneri's works. A typographically unfortunate reprinting of the Secondo dialogo was published, indeed, in the same year (Vallisneri, 1700b), and the same is obviously comprised in the posthumous edition of the Opere fisico-mediche (Vallisneri, 1733, tomo I, pp. 32-75). In the first of his Quaderni di osservazioni (Pennuto, 2004, pp. 18-28) we can also read the detailed handwritten annotations which were of use for drafting the dialogue on the antlion.

It is needless to underline the importance, for the history of neuropterology, of the above findings of Vallisneri, the first author to the best of our knowledge to describe and illustrate the stalked eggs of chrysopids and to publish the life cycle of a myrmeleontid (and also the first to describe the holometabolous development of a neuropteran): he was conscious of this and he did not neglect defending the originality of his observations on antlions from supposed plagiarism – quarrels not rare between men of science – by the French anatomist François Poupart (1661-1709). In 1704, some years after the publication of Vallisneri's text, Poupart presented a work on the antlion to the Science Academy of Paris, published in the same year (Poupart, 1704; Hagen, 1862-1863; Horn & Schenkling, 1928-1929), containing observations similar to Vallisneri's together with a plate illustrating the antlion stages, and written seemingly in ignorance of the previous Italian work. Vallisneri did not fail to censure politely the presumed misdeed.

The matter is reported by Réaumur (1683-1757) in his Mémoires, at the begin-

ning of his very ample and valuable work on the antlion (Réaumur, 1742: "Dixième Mémoire. Histoire des formi-
caleo"; see also Wheeler, 1930, p. 7, note 1; Albouy, 2001, p. 277 and subs.). Reaumur not only asserted convincingly that his compatriot had made his observations independently, but also reported that two other Frenchmen had anticipated Vallisneri in their observations on the insect, without publishing them. Quoting the forerunners in his memoirs, Réaumur correctly drew attention to their earlier contribution on the subject, pointing out that Poupart’s observations differ from Vallisneri’s because the former are more detailed and exact on certain aspects, less accurate as regards others. Poupart probably published first-hand data; in addition his notes and plate enable us to identify as *Euroleon nostras* (Geoffroy in Fourcroy, 1785) the species studied by him. For the posthumous edition of the *Opere fisico-mediche* (Vallisneri, 1733), Poupart’s plate was then copied and published to illustrate the text by Vallisneri, even though the figures do not fully correspond to the species described by him (at least with regard to the adult, which could be a *Myrmeleon*, see above).

It seems worthwhile to reproduce here both the plate (Fig. 11) added to the “Secondo dialogo” in the posthumous edition of Vallisneri’s work (Vallisneri, 1733), and that from the work of Poupart; the latter (Fig. 12) is taken from an Italian posthumous translation published in Venice (Poupart, 1750) of the Frenchman’s *Histoire du formica-leo* of 1704; both plates also illustrate nymphs of dragonflies, which Poupart briefly mentions, and which also interested Vallisneri.

Two centuries later, ignoring any polemics, we can today recognise both authors as being almost simultaneously the first to disclose and reveal to the scientific community the basic features of the life cycle

Fig. 11 – A. Vallisneri (*Opere fisico-mediche*..., Venice 1733, Tomo I, Tav. II): life stages and pit-trap of an ant-lion; the plate also illustrates some early stages of dragonflies and their details (numbers 12-16) (by courtesy of Prof. D. Generali); this plate was taken from that of Poupart, 1704.
Fig. 12 – F. Poupart (Memorie appartenenti alla storia naturale..., Venice 1750, Tomo VI, Cl. II, Tav. LI): life stages and pit-trap of an antlion (Euroleon nostras) (the plate also illustrates some early stages of dragonflies and their details; numbers 12-16) in a posthumous Italian re-edition of his Histoire du formica-leo (Paris 1704); the original plate dating back to 1704 served as a model for that in the posthumous edition (1733) of Vallisneri’s scientific work. (Private library, Bologna; photo R. Nicoli Aldini).
and the ethology of the most renowned insect among neuropterans.

Before Linné, Aldrovandi’s and Vallisneri’s work contributed therefore to the advance of knowledge on Neuroptera, and even in this minute part of their ample scope in the field of biological sciences, we can perceive interests, methodological approaches and objectives which marked and directed the development of science over national and historical boundaries.

A very important general contribution if we consider the impulse given by Aldrovandi to the applied and systematic studies of insects and his importance as a landmark for insect nomenclature, or by Vallisneri to the knowledge of insect morphology, bionomy, behaviour, environmental relations, and to the definitive refuting of the theory of spontaneous generation.

A contribution largely preceeding the great season of systematics of the 18th and 19th centuries, when in Italian countries, following in the wake of Linné, some outstanding zoologists and university professors such as Giovanni Antonio Scopoli (1723-1788) from Trentino at Idrija and Pavia, Pietro Rossi (1738-1804) from Tuscany at Pisa, and later Achille Costa (1823-1898) from Apulia at Naples, will also be working on neuropterous insects.

A contribution which deserves to be fully recognised.

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Notes

(*) “The eighth [perla] has a blunt abdomen without bifurcation, all the body being iron-coloured and the wings white, iron-coloured on the edge”.

(?) “Perla with very long, spotless wings and simplex abdomen [or “tail”] without bifurcation”.

(*) “Relative of the locust”.

(*) “It is a figure of a butterfly or moth, which we gave above among them”.

(*) “The first has yellowish wings and it is of completely yellow body, with exception of some iron-coloured areas”.

(*) “The third has short wings tending to be bluish, very long abdomen […] It has extremely short, yellowish antennae”.

(*) “Yellowish and iron coloured perla, with spotless and bluish wings”.

(*) “Μυρηκόλέιον, or Formicoleo, according to Albert the Great is the name of an insect which is like a lion among ants, at the same time both ant and lion, a small animal but so dangerous for the ants which, hiding itself in the dust and constructing a kind of round rampart forming a trench, attacks the ants while they are carrying grains of wheat and kills them insidiously. Other authors write that it is of the same
family as ants, but much bigger, and while it is still young and weak, it simulates peace and mildness; but when it has taken strength, it disdains its former companions and rushes forward against bigger masses. [..] Cardano recalls it as follows: an animal which resembles a small grub lays traps for ants, so I interpret the words of Albert, who saw it: it digs a round pit in the sand, at the bottom of which, as a pole, a narrow hole exists, from which it suddenly assails the ants and devours them. This is called *Formicaeleon* by Albert. [..].

(*) “Of the same genus as the tick”.

(“) “Green mosquito similar to a butterfly, with four wings”.

(“) “As to the seventh [insect] I have the greatest doubts that it is referable to mosquitoes, and I do not know what carelessness led to it being placed here among them. In fact I should have referred rather to the smallest of the above-mentioned *perlæ*. It is larger than the common or lake mosquitoes, with a delicate, long, thin, green body, with a dorsal median pale-yellow line that goes dorsally from the head to the abdomen, with modest antennæ, without mouth sting, with four large and silvery shining wings”.

(“) “On May 25 a very graceful insect was brought to Vallisneri, who considered it a mid-way species between the butterfly and the “cevettone”. This insect was completely coloured in a very elegant green, with exception of the eyes, which were gold-coloured. It was provided with four shining and emerald, proportionate membranous wings, which covered all its body. When the insect settles, it rests with wings close at their upper edge, and open at their lower edge, like the roof of house: the insect is completely protected and covered by these wings, with exception of the head, the neck, and an angle at the beginning of the back. Feet, abdomen, thorax, back, neck, head, are all green-coloured. Only the eyes are gold-coloured. It has the mouth on the tip of the snout, and the antennæ turned backwards on the head, and interrupted with frequent nodes. Here is the figure. Plate I. Fig. 3. (c).

After closing it in a box, the morning after he saw fifty eggs, also green, all stuck to the reverse side of the same, and in the proximity of the sides, in the manner illustrated in the fig. 4, pl. j (d). The thread on which each egg rested was rather hard, made of a glue, or viscous gelatin, which resisted to a blow by bending, and then returning to its place. They were quite ovate in shape, resembling many small pins with their head. Later he found similar eggs on the leaves of the roses, and on other plants, and one day he will report on them. (c) Plate I. Fig. 3. (d) Plate I. Fig. 4.”.

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