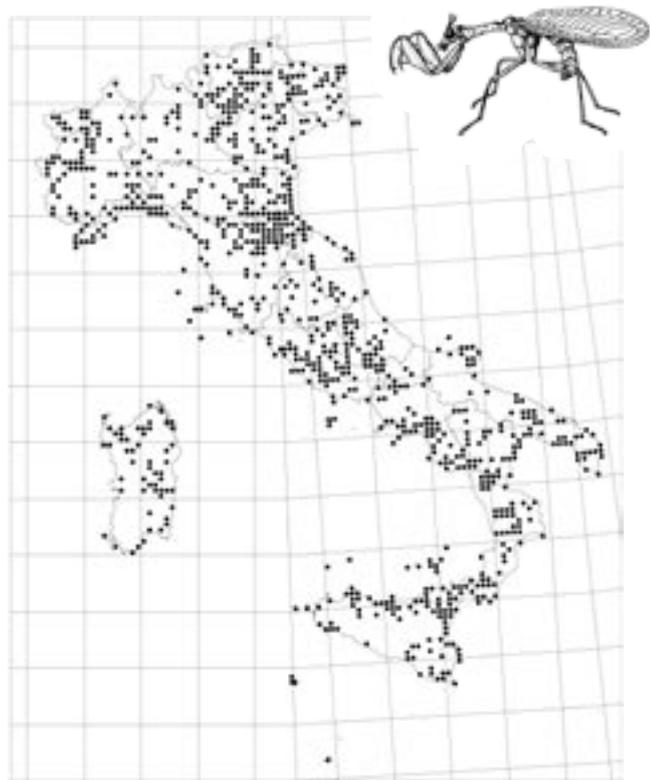




Insecta Neuroptera, Megaloptera e Raphidioptera

Agostino Letardi



Neuroptera are holometabolous insects of small to medium size (in few cases large); they are over 6,500 estimated species worldwide, belonging to 37 orders (or suborders, according to the views of various authors): Megaloptera, Raphidioptera and Neuroptera sensu stricto. The Italian fauna is relatively well known thanks to works specifically aimed at this group, particularly following the revision of the European fauna that was published in 1980.

Working method and examined material

The filing of species' distribution data was done by two authors (Pantaleoni did the Raphidioptera and the Chrysopidae and Myrmeleontidae among the Neuroptera; Letardi did the Megaloptera and the remaining Neuroptera), and only the part compiled by Letardi was updated to 2003. Most of the reported data were personally checked by one of the two authors: old citations, particularly those referring to the families Chrysopidae and Hemerobiidae, were carefully screened, their assignment to the species currently considered as valid being often difficult, if not impossible in some cases. Lots of the material preserved in the main public and private Italian

collections was included, thanks to study work carried out mainly during the past twenty years. The results of such studies had in most cases already been published, unpublished data therefore mainly accounting for only a small portion of total records.

Biodiversity

Approximately 190 species of Neuroptera s.l. are currently known for Italy, belonging to 14 families and seventy-odd genera (Bernardi Iori et al., 1995). After a rapid climb in the years following 1980, the number of species is still slowly but steadily increasing, and it is not impossible that the fauna of this group may exceed 200 species. Uncertainty concerning the exact number of species is also due to some "taxa complexes" the taxonomic rank of which is still under study, particularly within the Chrysopidae and Myrmeleontidae. A particularly complicated situation is that of *Chrysoperla* and *Dichochrysa*, though *Creoleon*, *Megalomus* and *Symphorobius* also need taxonomic revision. The European Neuroptera s.l. fauna shows (with the striking exception of the Sialidae) a clear increase in biodiversity along the north-south axis. The number of Italian species is comparable to that of the Iberian and Balkan peninsulas which include, however, a higher percentage of endemics, and are considered the centres of diffusion of the Dilaridae and Raphidiidae, respectively. The state of knowledge of Italian Neuroptera s.l. is widely inhomogeneous, both throughout the country and between families. From a territorial point of view, some areas and districts of the country are relatively well known (the Alpine area, Romagna, Sardinia, some parks of central and southern Italy), but vast areas have so far been only very poorly investigated. A big difference in state of knowledge exists between families of agrarian interest (i.e. Inocelliidae, Chrysopidae and Hemerobiidae, with the exception of the Coniopterygidae, which are badly known despite their key role as predators in various agro-ecosystems) or including conspicuous species (Myrmeleontidae and Ascalaphidae), all relatively well known throughout Italy, and the remaining families, which are very scarce in public and private entomological collections.

Ecology

The roughly 190 species of Neuroptera s.l. occurring in Italy occupy, from an ecological point of view, a variety of habitats. The most numerous assemblage – and also the most important one from a practical point of

view considering the possibility of using some species in biological control programmes – is that occupying, both in larval and adult stages, the foliage and trunks of trees, shrubs or herbaceous plants, and feeding on small arthropods, mainly aphids, scale insects and other phytophagous Homoptera. To this group of auxiliary insects – typically comprising the Coniopterygidae, Hemelebiidae and Chrysopidae – most Raphidioptera can be added, due to their importance in forests as predators of corticolous phytophages.

The feeding habits of adult Megaloptera are not known with certainty, while the larvae are predacious.

Raphidioptera larvae are normally corticolous or loosely terricolous and, like the adults, are ferocious predators.

All Neuroptera larvae are predacious, some groups having developed behaviours nearing parasitism, whereas the adults are either predators or glyciophages⁸ and pollenophages. Adults are mainly crepuscular or nocturnal. The larvae of Myrmeleontidae and Ascalaphidae are terricolous, and hunt their prey either in ambush or by building traps (funnels). Most species, with due exceptions, occur in arid and open habitats. Adult Ascalaphidae are the only fast- and steady-flying Neuroptera.

Zoogeography

Italian Neuroptera include a low percentage of endemics, nearly all of which are exclusive to the southern and insular regions (Aspöck et al., 2001). Letardi (1997) provided a general discussion on the zoogeography of these insects. Apart from a small assemblage of species of Afrotropical distribution, the remaining ones are subdivided into three comparable groups of Mediterranean, European (or South European) or wider (Holarctic, Palearctic, Sibero-European and Euro-Mediterranean) distribution, respectively. Single families show less homogeneous chorological spectrums: for instance, Hemelebiidae are mainly of European distribution, whereas Myrmeleontidae contain a majority of Mediterranean species, with the striking occurrence of species with Turano-Mediterranean chorotypes. The various Italian districts are quite similar from the point of view of species' numbers, except Sicily and Sardinia, where numerically poorer but nonetheless interesting faunas occur.

Relevant Literature

ASPÖCK H., HÖLZEL H., ASPÖCK U., 2001. Kommentierter Katalog der Neuropterida (Insecta: Raphidioptera, Megaloptera, Neuroptera) der Westpaläarktis. *Denisia*, 2:1-606.

BERNARDI IORI A., KATHIRITHAMBY J., LETARDI A., PANTALEONI R.A., PRINCIPI M.M., 1995. Neuropteroidea (Megaloptera, Raphidioptera, Planipennia), Mecoptera, Siphonaptera, Strepsiptera. In: Minelli A., Ruffo S. e La Posta S. (Editors). Checklist delle specie della fauna italiana, 62. Calderini, Bologna.

LETARDI A., 1997. Present knowledge of Italian Neuropterida: history, distribution and current problems. *Acta Zoologica Fennica*, 209: 145-149.

Alien species

No certain information concerning introduced species exists. There have been non-confirmed records of the presence of Afrotropical Palparini (Myrmeleontidae) species in areas along the Tuscan coast, having possibly been shipped together with timber. More plausible, though not yet confirmed, is the possible presence of Chrysopidae of the genera *Chrysoperla* and *Mallada*, having been used in field biological control tests. Some species of the *Chrysoperla carnea* group, which occur in all terrestrial biomes in several species, not all of which are well defined yet from a taxonomic point of view, are bred in large numbers and commercialized, generally as larvae, by European and American biofactories, as auxiliary insects to be used in the biological control of various crops, even in the open field. Moreover, a proved case exists of the use of non-European lacewings in southern Italian crops. However, until today, no evidence of any of these species having adapted to local conditions exists. This issue should be considered more carefully and surveyed, also considering the high capacity of dispersion of various *Chrysoperla* species.

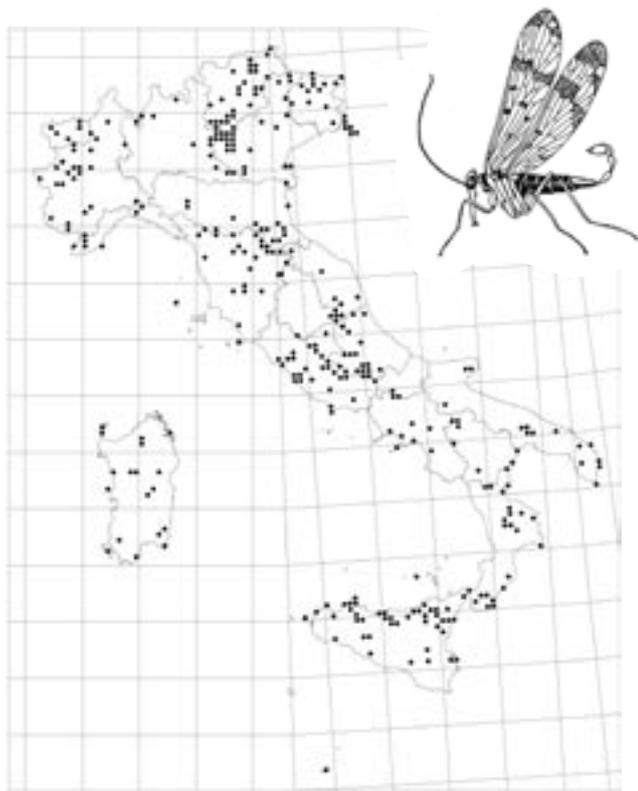
Conservation

Many of the species pointed out as rare could in fact be only poorly known, also because many Neuropterida mainly occur within the tree crown as adults, at heights that make them difficult to collect using standard insect nets. Apart from the case of *Isoscelipteron fulvum*, a species almost certainly extinct in Italy considering it was first and last collected around the middle of the nineteenth century, the few cases of risk of extinction refer to some members of the Raphidiidae and to the genera *Nevrorthus* and *Sisyra*. The preimmaginal instars of the last two genera are, together with those of *Sialis*, associated with freshwater habitats. The combination of specific ecological needs and limited, if not punctual, distributions makes some of these species (namely *Tjederiraphidia santuzza*, *Subilla confinis*, *Raphidia ligurica*, *Nevrorthus fallax*, *N. iridipennis*, *Sisyra iridipennis*, *S. terminalis* and *Sialis morio*) vulnerable or threatened.



Insecta Mecoptera

Agostino Letardi



Mecoptera are a small order of medium-sized terrestrial insects, comprising some 500 species worldwide. Despite the low number of species occurring in Italy and the fact they are easy to collect and therefore common in museum collections, chorological data concerning these species are still incomplete. Recent morphological studies have solved many taxonomical problems, even though a complete revision of the W-Palaearctic fauna is lacking. Parallel to this, the want of an adequate morphological study of the Italian fauna sometimes causes problems in the identification of females of the genus *Panorpa*.

Working method and examined material

Due to the relatively recent taxonomical clarification of this order, much data from literature previous to 1980 were considered unusable without a verification of the cited material. The filing of species' distribution data is based on the works of Willmann (1976) and Ward (1983), and was supplemented by the examination of material from the Natural History Museums of Verona and Milan and from the Zoological Institute of Rome University "La Sapienza", as well as by the most recent literature. Because of difficulties in assigning many of the existing

records from the literature, according to species between 25% and 50% of total records were unpublished.

Biodiversity

The Italian fauna only includes 10 species belonging to 3 genera. Until such a time as the taxonomical status of *Panorpa communis* is defined, this taxon being considered a single species by some specialists and a complex of twin species or morphologically very similar species by others, the Italian species' assemblage is comparable to that of the rest of central-southern Europe, and should be considered as quite stable. Despite the diverse ecological preferences of the 3 genera occurring in Italy (two of these, *Boreus* and *Bittacus*, are mainly found in northern Italy; the third, *Panorpa*, is equally distributed throughout mainland Italy), species' richness is practically the same all over the Italian peninsula, whereas in the major islands only species of the *Panorpa cognata* group are recorded. The recent finding of *Panorpa annexa* in Sardinia (Letardi, 2003), which also represented the first record of Mecoptera from this island, is one of the few expectable changes in the biodiversity of this order in Italy. Knowledge of this family is generally poor, particularly concerning *Bittacus*, which is little-studied also in the rest of Europe, and *Boreus*, which is on the contrary very well studied in the rest of the continent. Only a more careful study of the material preserved in public and private entomological collections would allow to better define at least the state of knowledge of *Panorpa*. It must be pointed out that the last certain record of a Bittacidae for Italy dates back to 1978, while the previous one is from as far back as 1951, so the possibility that *Bittacus* may have disappeared from Italy is plausible.

Ecology

Mecoptera are diurnal insects, living in shady and humid places. Their diet is rather varied, including both live and dead prey, and vegetal fluids (in some cases they can cause slight damage to crops). Males show interesting behaviour (similar to that of empidid flies) in offering a "food gift" to the female before mating occurs, a gift which varies according to species from a true prey to a small ball of saliva.

Zoogeography

The Italian Mecoptera are mainly of European, rarely Mediterranean, distribution and only one species is endemic (*Panorpa annexa*), with a Tyrrhenian distribution.



Boreus seems to be confined to the Alpine area. Very few records of *Bittacus* exist, nearly all from northern Italy. A larger amount of data exists for *Panorpa*, which includes prevalently northern species (*P. alpina*, *P. germanica*), mainly or exclusively southern species (*P. etrusca*, *P. annexa*) and species widespread in Italy (*P. communis*, *P. cognata*). Records of *P. annexa* exist for Sardinia and Sicily, but from single localities. A generic record of *P. cognata* also exists for Sicily.

Alien species

No introduced species are recorded from Italy

Relevant Literature

BERNARDI IORI A., KATHIRITHAMBY J., LETARDI A., PANTALEONI R.A., PRINCIPI M.M., 1995. Neuropteroidea (Megaloptera, Raphidioptera, Planipennia), Mecoptera, Siphonaptera, Strepsiptera. In: Minelli A., Ruffo S. e La Posta S. (Editors). Checklist delle specie della fauna italiana, 62. Calderini, Bologna.

LETARDI A., 2003. Nuovi dati sulla distribuzione peninsulare ed insulare italiana di Mecotteri (Mecoptera). *Frustula Entomologica*, (2001), (n.s.), 24 (37): 99-102.

WARD P.H., 1983. Scorpion-flies of the *Panorpa cognata*-complex in the western palearctic region (Mecoptera). *Journal of Natural History*, 17: 627-645.

WILLMANN R., 1976. Zur Kenntnis der italienischen Mecoptera (Insecta). *Bollettino del Museo Civico di Storia Naturale di Verona*, 3: 157-177.

Conservation

The current state of knowledge does not allow for a reliable evaluation to be made in this regard. The only endemic species is at risk of local extinction in the two major islands, especially in Sardinia where suitable habitats for this species are very few. Legitimate doubts exist concerning the current occurrence in Italy of the only species considered as "threatened" (*Bittacus hageni*), but also that of *B. italicus*.