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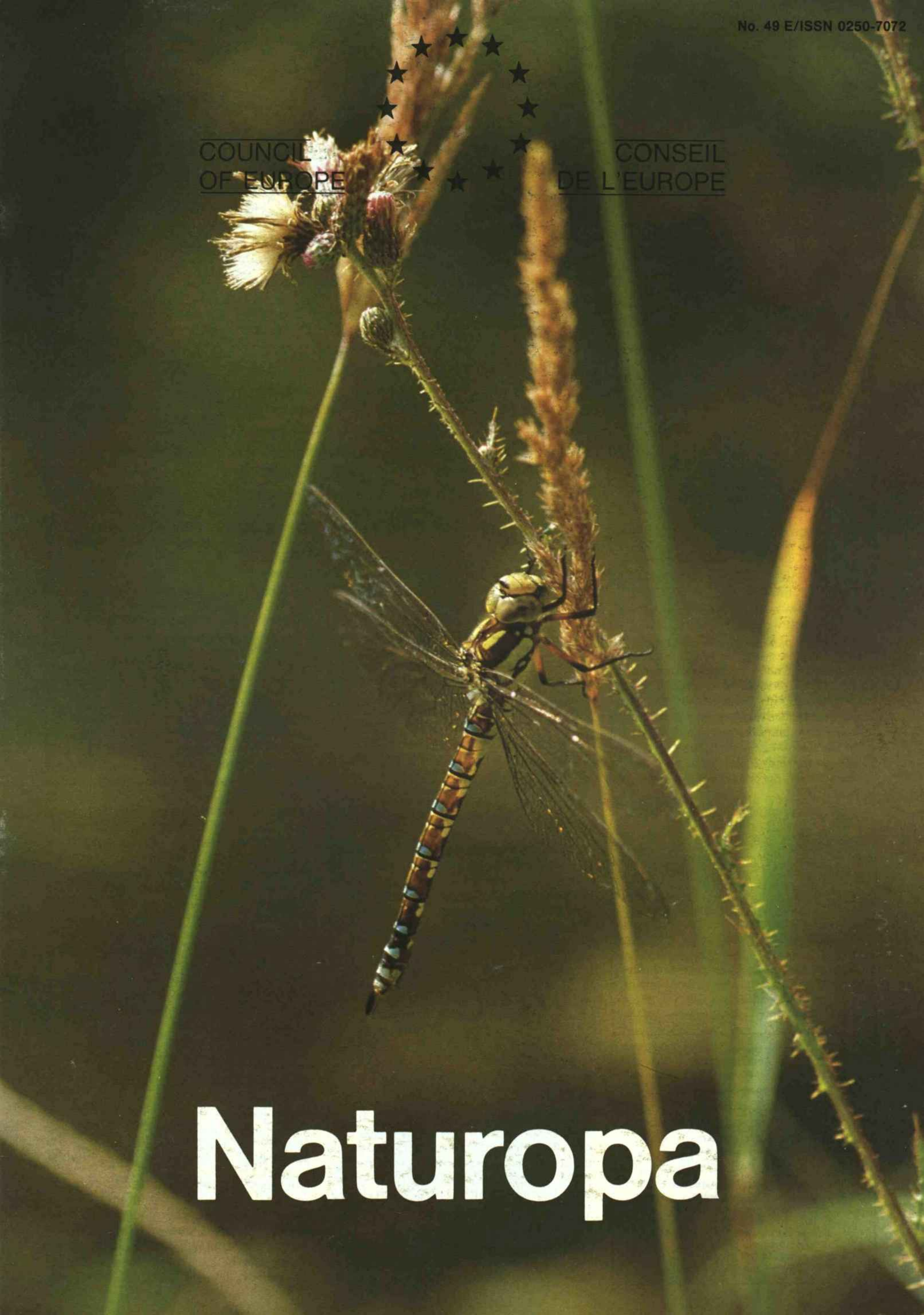

Naturopa

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Captions to illustrations p. 16-17:
Anax imperator
1. Very young larva
(Photo Anne and Jacques Six)
2. Larva eating a mud-worm
(Photo Anne and Jacques Six)
3. The adult insect releases itself from the exuviae
(Photo Anne and Jacques Six)
4. Newly emerging dragonfly
(Photo Anne and Jacques Six)
5. Freshly emerged, the young imago has as yet no colouring
(Photo Anne and Jacques Six)
6. The male with his final colours
(Photo Anne and Jacques Six)

Naturopa

No. 49 - 1985

What a crowd!

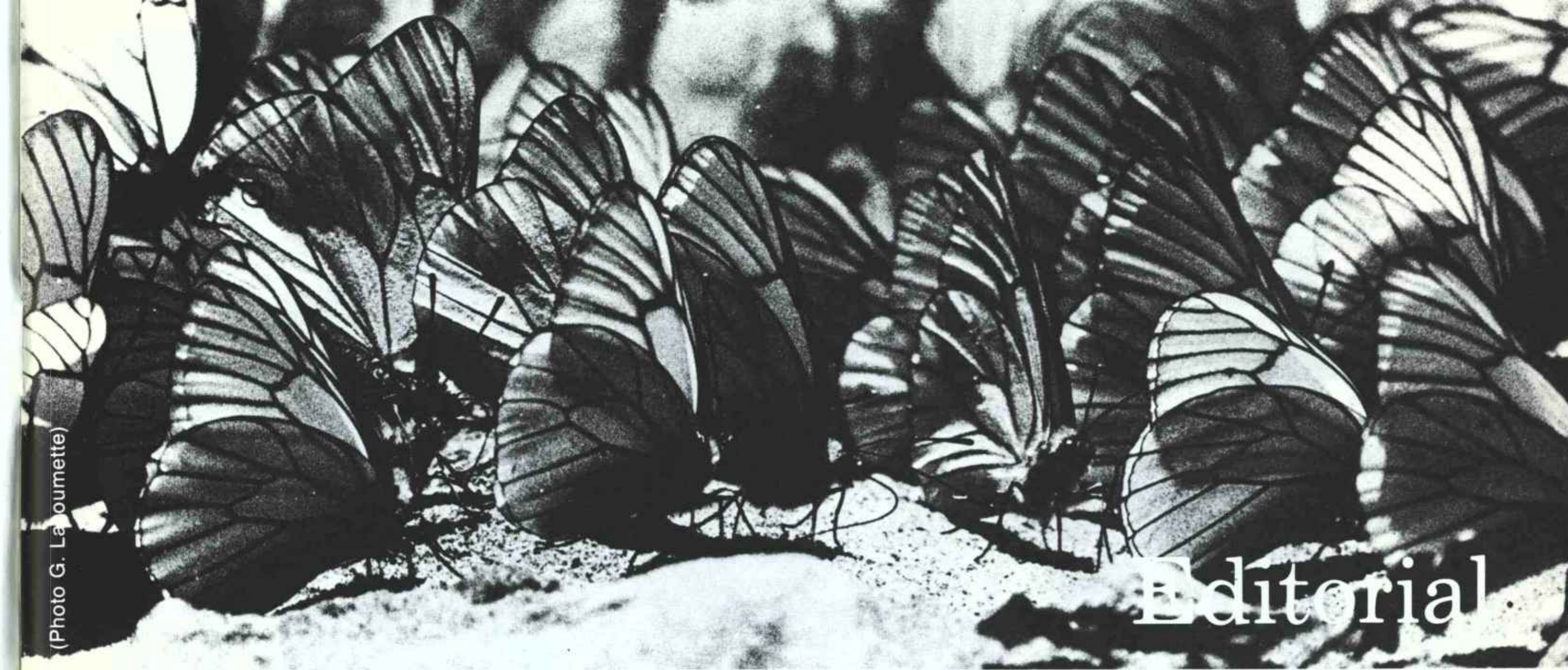
What a crowd!

It is difficult to evaluate the number of invertebrates in the world, for every day new ones are discovered, and every day there are some which disappear for ever. Although most of these species are little known and therefore often not much loved, they are nevertheless of major importance.

This edition of *Naturopa* deals with the work already done in Europe or planned for the near future to improve our understanding of invertebrates, their habits and their way of life. If only as indicators of the "health" of our natural environment, they are indispensable and deserve our bending over backwards to guarantee their survival.

The next edition of *Naturopa* (No. 50) will be devoted to the theme "Young people and volunteers for the protection of nature", and will be published in the context of International Youth Year.

H.H.H.



(Photo G. Lacoumette)

Editorial

After a cold winter we look forward to the spring, to early morning birdsong, to the first blossoms at the edge of the woods and the first butterflies fluttering in the meadows. Alas, the number of butterflies we are able to see on our walks is dwindling fast. Many of those we saw regularly in our childhood settling on flowers in the garden or in the fields are unknown to our children. And when did you last find Peacock or Painted Lady caterpillars on stinging nettles?

This issue of Naturopa is devoted to the familiar and yet strange invertebrate animals. Familiar because we come into contact with them almost daily, yet strange because we know so little about these so varied species. Even for entomologists, they hold untold mysteries and unanswered questions. Whilst there are "only" some 45,000 species of vertebrate animals, the invertebrates number some 1.5 million species. 97 % of all wild animals are invertebrates. The interested layman thinks primarily of individual types of insect (beetles, butterflies, bees, wasps and dragonflies), crabs and spiders and various kinds of molluscs (snails, mussels and octopodi). We may also be familiar with the many "worms", jellyfish and sponges, none of which have a jointed skeleton. Of great importance in nature, too, is the largely unknown world of animal microorganisms. This variety of life, the miracle of nature, is now endangered. The purpose of our efforts to preserve biotopes intact, to keep water, air and soil healthy is to pass on the variety of living communities to posterity. We are responsible for this legacy. The extinction of individual plant and animal species and the sickness of whole communities should be a clear signal to those in authority that life itself is in danger.

Scientific research has confirmed and documented, for example, the disquieting decline of butterflies. In one Swiss locality in 1913, 95 species of butterfly were counted, 60 years later (1972) only 30; over two-thirds of the colourful butterflies have disappeared. An initial Red List of Endangered Butterfly Species (Macrolepidotera) in Baden-Württemberg lists 400 species, meaning that nearly 40 % of the species that once occurred there are endangered. Yet nobody hunts the harmless and beautiful butterfly. No-one hunts the Apollo, for example, and yet it is amongst the rarest species. Its caterpillar feeds only on the thick leaves of the stonecrop, a plant resembling the houseleek. Like other endangered butterflies, the Apollo is a specialised feeder that can only live where its food plant grows, in dry, often stony, grass-tufted places. The number of such unwooded places not intensively cultivated is steadily decreasing. Land is either farmed intensively or built on. The result is increasing pressure on the comparatively few remaining natural spaces. Wild plants and animals are left with fewer and fewer habitats. The variety of species dwindles, nature is the poorer. In the case of butterflies this is amply documented: on fertilised or heavily grazed land, only about five species are found; in marshy land 30 and in dry thinly grassed areas up to 40 or more.

Environmental awareness, appreciation of nature and environmental issues have increased greatly since European Conservation Year in 1970. That is gratifying and credit is due to the Council of Europe. But at the same time, the pressure on habitats has increased and nature's equilibrium has to a large extent been lost sight of in industrial development, the growth of technology in agriculture and forestry and "progress" in biological and biochemical research. More and more alarmed scientists and thinkers are calling for an ethic that embraces our relationship with plants and animals, with the whole of nature.

Co-operation through the Council of Europe in the field of nature conservation and the environment is of great importance for the preservation of our natural heritage. The various projects of the European Committee for the Conservation of Nature and Natural Resources provide valuable basic information about the occurrence of European plant and animal species and about Europe's typical habitats and ecosystems. Better known to the general public are the Council's campaigns for the protection and conservation of endangered biotopes and the Convention on the Conservation of European Wildlife and of Natural Habitats. For Liechtenstein, the Council of Europe's smallest member state, co-operation in nature and environment protection is particularly important. We are accordingly prepared, as far as we are able, to participate actively in the work of the European Committee for the Conservation of Nature and Natural Resources and to make our contribution through the National Agency of the Council of Europe's Information Centre for Nature Conservation.

**HRH Princess
Marie Aglae of Liechtenstein**

Plant-insect "co-operation": fertilisation (Photo Anne and Jacques Six)

European insects

Martin C. D. Speight

There are perhaps 100,000 species of invertebrates animals in Europe. Most of these are insects. Indeed, more than 50 % of *all* the wildlife species, both plant and animal, occurring in Europe, are insects. Dragon-flies and house-flies, lady-birds and weevils, mealy-bugs, honey bees, ants, dung-beetles, may-flies, fleas and butterflies: these and many more, all are insects.

If the conservation of insects is more or less ignored this represents a failure to consider the fate of the majority of Europe's wildlife heritage.

Many of us find the great variety of insects bewildering and the large number of species offputting. Others feel that because insects are small and not much is known about them, they cannot be important. Their small size certainly renders them inconspicuous, so that they are noticed only if they are causing problems. This can understandably lead to the conclusion that insects, apart from those that are good to eat, are generally good for nothing, if not actually a nuisance, or pests, or transmitters of disease!

In fact, although little is yet known about many individual insect species, enough is known to demonstrate that man would be unlikely to survive without them. It is also evident that the sheer number of insect species is of itself no safeguard of *their* survival. The view that, when not just a nuisance, insects are pests is erroneous. Less than 5 % of the European species can be classed as pests and a great majority of the others carry out their activities unnoticed by humanity.

What do insects do?

Insects specialise in the use of resources which are available only in "small parcels". Thus they frequently live in spaces which most vertebrate animals could not squeeze into and survive successfully on foodstuffs available in quantities so minute that frequently they would be impossible for larger animals even to locate. In this way insects characteristically utilise resources which would otherwise be unused and so be lost to the life system of the planet. Many insects make use of food remains discarded as unuseable by larger animals. For instance, many insects are dung-feeders, ekeing out their existence on the energy-rich waste products of the inefficient digestive systems of vertebrate animals and in the process removing what would otherwise represent for humanity a considerable health hazard.

The efficiency with which insects make use of "small parcels" of different resources has led to their being of paramount importance in decomposition processes. Without efficient decomposition much of the sun's energy trapped by plants could not be recycled through the ecosystem when plants and animals die. In decomposition processes the particular role of insects is the reduction of dead organic matter to small fragments. The consequences of environmental conditions occurring in which decomposer insects cannot maintain adequate populations can be seen in bogs and fens, where dead plant materials accumulate to great depths as deposits of peat.

In natural woodland, certain insects are largely responsible for the breakdown into fragments of the wood of dead trees through the biting and chewing action of their larvae. In this way, contained nutrients are again made available for re-cycling to growing plants, via the activities of micro-organisms.

Flowers with brightly-coloured petals are such a feature of the European countryside in spring and of suburban gardens almost throughout the year that their ecological meaning is hardly ever given a thought. But were it not for the ability of insects to make use of pollen as food, showy flowers would not exist at all and the world's plants would carry only wind-pollinated flowers like the diminutive and unspectacular inflorescences of grasses and pine trees. Plant/insect co-evolution has produced on the one hand gloriously coloured, deliciously scented and attractively shaped flowers to act as sign-posts and attractants for insect flower-pollinators and, on the other, a host of insects specialising in the use of flower pollens and nectar as food. Fully 80 % of flowering plants (i.e. plants other than ferns, mosses, lichens, fungi, etc.) are pollinated by insects. The fruit, vegetables and other crops pollinated by insects include: pears, apples, peaches, apricots, cherries, almonds, strawberries, raspberries, dates, figs, oranges, lemons, tomatoes, aubergines, cucumbers, melons, grapes, olives, cocoa, coffee, cotton, peppers, flax, beans, peas, chick-peas, oil palm and mustard. The bee *Megachile pacifica* is now cultured extensively for release in alfalfa as a means of ensuring pollination of this crop.

In cool temperate climates bees and their allies may only be of paramount importance in relation to the pollination of certain plants, like peas, beans, clovers and their allies, with flies, butterflies and moths playing an equally important role in the pollination of other flowers.

Europe's lizard and amphibian fauna would virtually disappear without the food supply represented by insects. Similarly, most of the species in Europe's bird fauna, bats, shrews and many fish would be unable to survive without their own particular insect food supply. Many of the insects preyed upon by vertebrate animals are themselves dependent upon yet other insects as their own food supply. Indeed, most of the potentially harmful insects are prevented from becoming problems by other insects that are either predatory or parasitic upon them. This potential has been recognised in the development of programmes of "biological control" of pests. For instance, in southern and central Europe, ants of the *Formica rufa* group are employed on a large scale for control of forest pests.

The ability of insects to utilise the oddest and most inaccessible source of potential food has led to their presence wherever life is feasible on the planet, other than in salt water. There is even one fly species whose larvae live in pools of crude oil.

Insects and people

Active exploitation of insects by man tends to take the form of use of particular species to serve particular purposes. But no more than perhaps 1 % of the available species has as yet been recognised as worthy of exploitation.

In Europe man rarely uses insects as food, but in the tropics a wider range of species is exploited, with beetle larvae, termites, and even locust-oil figuring in the diet of different cultures.

Recognition of the potential utility of predatory and parasitic insect species as controls of pests has led to the setting up of biological control agencies throughout the world. Insects are also being used progressively as experimental animals, both in the laboratory and in the wild. Significant recent advances in genetics, population dynamics, understanding of energy-flow in the biosphere, etc., have in this way come from studies of insects. Further, both in schools and in universities, insects are being used ever more widely as teaching aids, being cheaper and easier to maintain than vertebrates, but very versatile in the principles they may be used to illustrate. In the pharmaceutical industry, there is today evermore exploration of the use of insects as sources of drugs for the combat of human diseases and ailments. They are also used as a source of other chemicals, such as dyes—scale insects are exploited in this way.

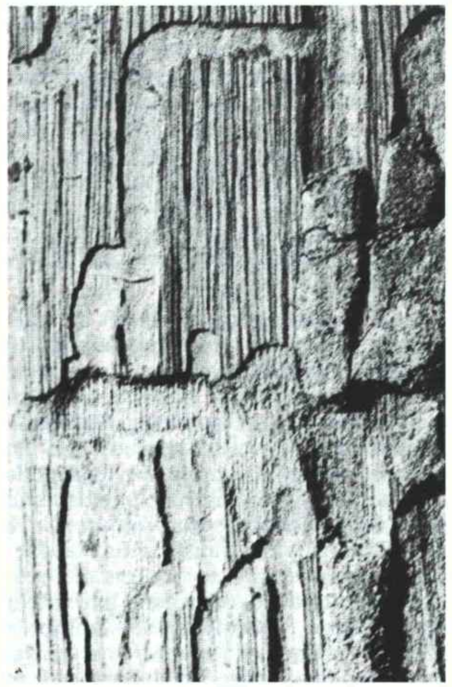
An awakening recognition of the utility of insects is manifest today in phenomena like revision of crop husbandry regimes to ensure that crops are not sprayed or dusted with pesticides while pollinating insects are active among their flowers; the employment of surveys of aquatic insects in monitoring the levels of water pollution found in rivers and lakes and the incorporation of mandatory tests upon selected insect species into the assessment procedures used for gauging the likely environmental impact of newly-developed chemical products which might in future become environmental contaminants.

Insects have impinged upon man's cultural development in a variety of subliminal ways, the most obvious of which is through their provision of sources of inspiration for the visual and aural arts. The sublety of the living colours of butterflies and moths, structure bizarre and beautiful in beetles, stick insects, etc., the industry of the ant, the ruthlessness of the mantis, the song of the cicada and even the light of the glow-worm—these and many other facets of the lives of insects have held the attention of painter, sculptor, musician and poet. At the every-day level the opportunity to wonder at the small animals of pond and hedgerow was once part of every child's heritage.

All extant insect species represent the successful outcome of some 200 billion years of trial and error experimentation into how to perform the functions they each perform today, conducted through the process of evolution. Each insect species thus represents a remarkable store of encapsulated information, far superior to anything man can achieve as a result of a few years of "research and development" work and which will remain available to us for tapping for only as long as each of these species endures.

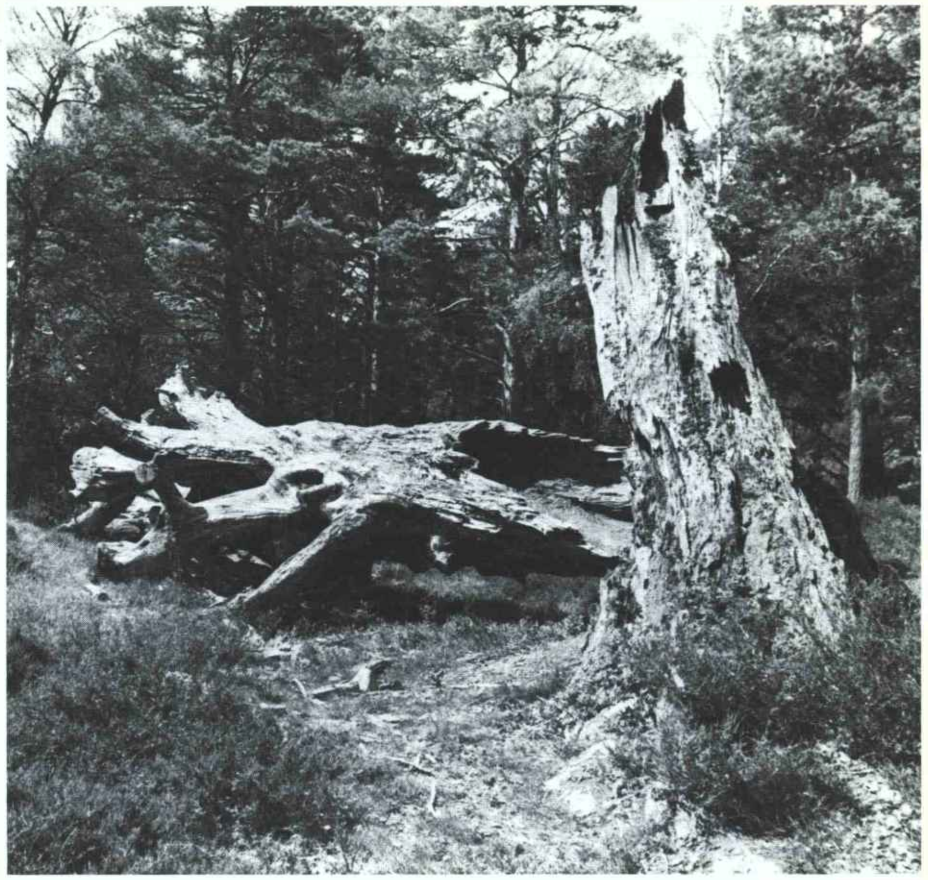
The plight of the insects

A recent Council of Europe study demonstrated that in Europe approximately 20 % of the European butterfly species are threatened with extinction over much of Europe. Preliminary results also suggest that upwards of 35 % of Europe's dragonfly species are under threat in much of their European range. The IUCN invertebrate Red Data Book already numbers various European insects among those endangered. The British Red Data Book for invertebrates covers some 14,000 insect species and lists 10 % of them as either extinct or threatened with extinction in Great Britain. Of 1,700 insect species surveyed in Belgium, it has been concluded that 10 % were either already extinct or endangered with extinction there and a further 25 % could be expected to disappear by the year 2000. In the Netherlands, more than half of the stone-fly species (*Plecoptera*) recorded



Primordial role of insects in decomposition (Photo G. Lacoumette) from the country are believed to have become extinct during the present century, and 15 % of the ground beetle species are now known from 1 % or less of the country's area. Some insects are almost certainly extinct throughout Europe, the members of the fly family *Thyreophoridae* being examples—*no* living specimens have been recorded during the present century.

Extrapolating from these figures it can be concluded that, at a minimum, some 10 % of Europe's insects species are threatened with extinction almost throughout their European range and that many of these threatened species are already extinct over wide areas. This suggests that 6,000 species of insects are currently in danger of extinction in Europe. There is every reason to believe that the slide toward extinction is progressing ever faster—it is likely that by the year 2000 a further 12,000 insect species will be threatened with extinction in Europe.



Insect larva are responsible for the breakdown of dead wood into fragments
(Photo G. Lacoumette)

The vast majority of endangered insect species are under threat due to destruction or deterioration of habitat, caused by man's activity. To take an example, hundreds of insect species are dependent upon habitats which occur in adequate quantity only in ancient woodland containing over-mature, dead and dying trees with fallen and rotten trunks lying *in situ*. Such woodland sites have all but disappeared throughout Western Europe. Even where stands of over-mature trees remain the woodland floor is "cleaned" of fallen timber and both dead and dying trees are removed. In consequence, a large section of Europe's woodland insect fauna is today facing extinction *en bloc*, and exists now only as scattered remnants that, possibly, nowhere comprise reasonably complete communities.

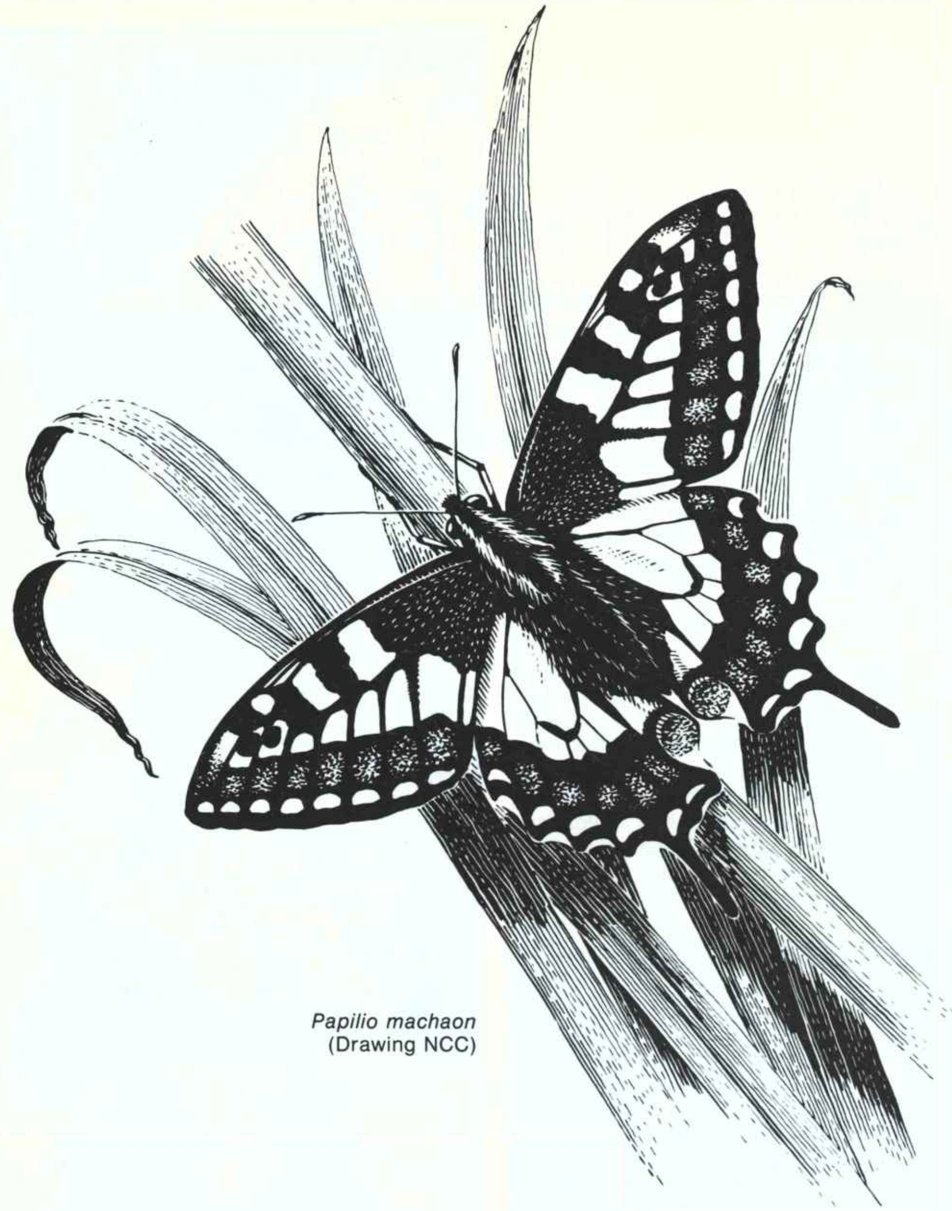
Habitat deterioration caused by pollutants, fertilisers, drainage, change in farming practices away from traditional methods, etc. is as serious a threat to European insects as to other European organisms. The widespread use in Europe of broad-spectrum pesticides —selective pesticides hardly exist and their development is not an economic proposition for chemical companies anyway—wipes out great numbers of "neutral" and beneficial insects and other invertebrates, even when the pesticide proves ineffectual against the target pest species, due, for instance, to development by the pest of resistance against the pesticide.

The plight of the insects has been made worse than it would otherwise be because, to-date, the conservation effort in Europe has been focused largely upon vertebrate animals and flowering plants. This situation has resulted in very few nature reserves being declared primarily because of the interest of their insect fauna. Indeed, it is more normal for the insect fauna to be entirely ignored in processes of assessment of sites for their conservation value and national conservation agencies rarely include personnel trained in the study of invertebrate animals and with specific responsibilities relating to conservation of insects. But there is little data to support the naïve but generally applied dictum "if you look after the plants the animals will look after themselves", especially in the context of conservation of insects.

In schools, insects still represent such a peripheral topic that it is little short of miraculous for a student to recognise that they have any significance beyond including a pandora's boxload of multifarious pestilence, offset only by the honey-bee as the sole positive element recognisable among them! And even honey-bees sting! It is hardly surprising that frank incredulity is the normal response to any suggestion that insects should be protected and conserved like other sorts of wildlife.

The preoccupation of the universities, etc., with more "fashionable" disciplines than systematics has produced a generation of European biologists largely incapable of correctly naming insect species or of even knowing how to set out to do so. Equally, it has resulted in a shortage of professional insect taxonomists. There is thus no cadre of naturalists in Europe which can be called upon to conduct insect survey work on the scale that this can be achieved for flowering plants and vertebrate animals, and potentially great improvements in taxonomic literature cannot be made due to a lack of specialists to carry out this up-dating process. Equally, ecological studies of insects are inhibited by the reluctance of student and researcher alike to embark upon work requiring a taxonomic expertise they almost inevitably do not possess. The result is that sites of international importance for the conservation of insects are in danger of destruction without their importance having ever been recognised; that insect species are being exterminated over wide areas of Europe without prior warning being given that they have reached "threatened" status; that the insect faunas of Europe's nature reserves and national parks remain largely unsurveyed and unknown and the precise ecological requirements of most insect species remain conjectural.

There is a dramatic need for the immediate introduction of programmes aimed at the conservation of European insects. M.C.D.S.



Papilio machaon
(Drawing NCC)

Projects of the Council of Europe

Faced with the massive scale of the undertaking, and the small number of available specialists, the Council of Europe has moved cautiously in its attempts to deal with invertebrate animals and their conservation. An approach based on a step-wise treatment of taxonomic groups was early recognised as impractical: to deal in this way with all the invertebrate species and at the rate achieved for mammals or birds could occupy the total resources of the relevant committee for more than 50 years. But invertebrates cannot with equanimity be ignored. They do, however inconveniently, represent the majority of Europe's wildlife. And they are evidently as much under threat as other organisms. So some method of selection has had to be employed to decide which invertebrates might most usefully be studied. To establish the extent to which relevant data are available about invertebrates, and to give base-line data about a species-group already receiving attention in national lists of protected species, the first Council of Europe project on invertebrates was focused on European butterflies. The results of this study were published in 1981 [*Threatened Rhopalocera (butterflies) in Europe*, Nature and Environment Species, No. 23, Council of Europe].

Following the successful outcome of the Butterfly Project, further projects concerned with invertebrates have now been embarked upon, based upon the potential of selected invertebrates to function as bio-indicators. One of these projects, which makes use of the sensitivity of dragonflies to water pollution and aims at identifying freshwater sites of international significance for conservation of aquatic organisms, especially dragonflies, is reported on elsewhere in this issue of *Naturopa*. The other project relates to the key role played by invertebrates in the decomposition of wood in natural forests, seeking to identify remaining ancient forest sites of international importance by using as bio-indicators selected "saproxylic" insects: insect species dependent upon over-mature, moribund and dead trees. So far, the only European forests identified as possessing a significant fauna of these organisms are sites where forest has been continuously present for 500 or even 1,000 years and "super-annuated" trees are present today; forests containing living oaks 500-750 years old, for example. One facet of these faunas highlighted by this study is that many of the most localised saproxylics are insects associated with moribund rather than dead trees. Forest "hygiene" practice may well be responsible for the rarity of this particular contingent of insect species.

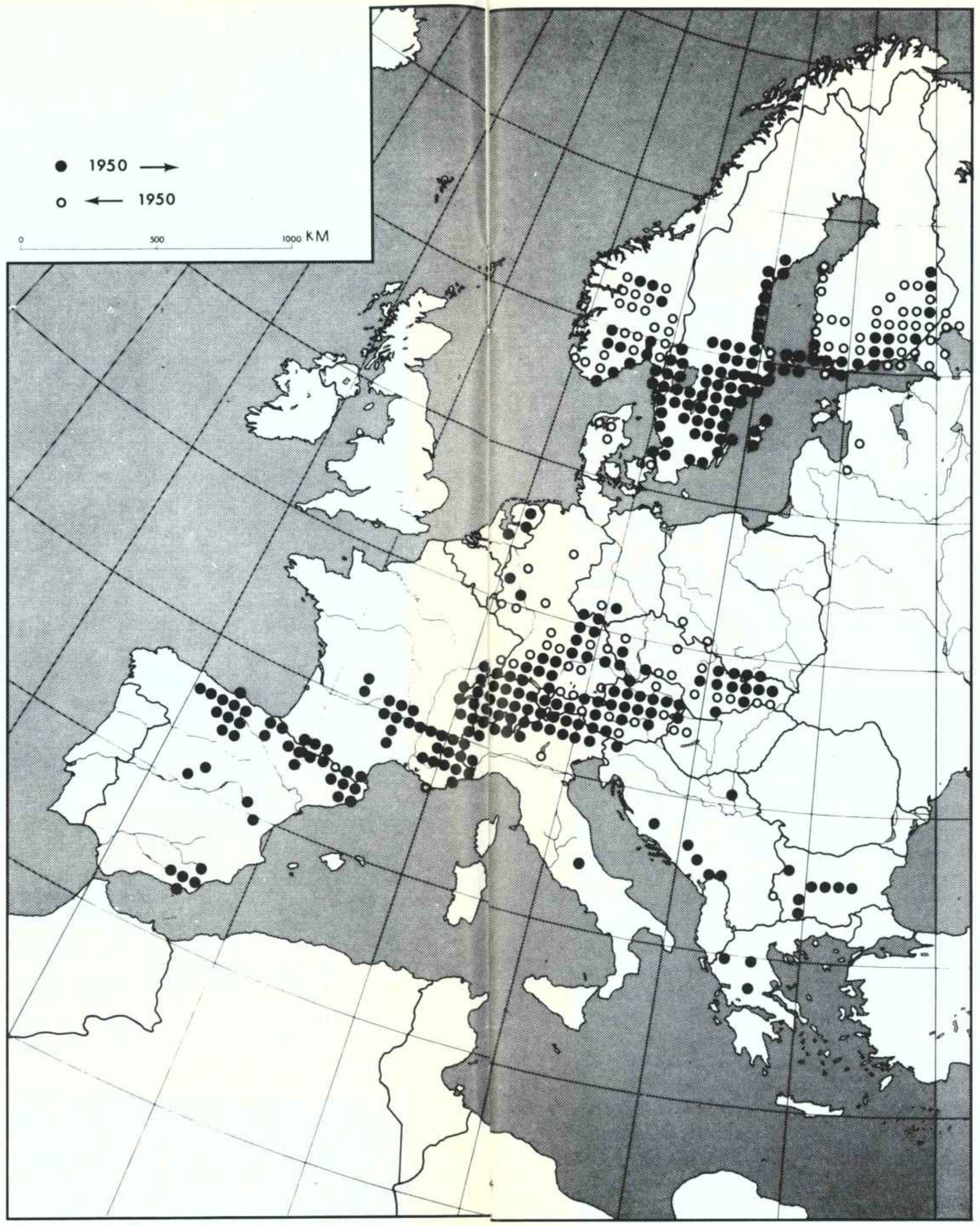
The beautiful, ancient-forest buprestid, *Buprestis splendens*, reached as far north in Europe as southern Sweden within the last 200 years. Today, this beetle is found only in Jugoslavia. The magnificent oak-forest longhorn, *Cerambyx cerdo*, occurred in Great Britain during the prehistoric period, but had disappeared there even before man began to give scientific names to species, though it is still known from localities scattered from Scandinavia to the Mediterranean. "Relict" distribution patterns are characteristic of saproxylic insects in Europe now and few indeed would appear to be the protected sites where appreciable numbers of these species may be found together, as in the Forêt de la Massane, hidden away as the southern end of the Pyreneean mountain chain, on the border between France and Spain.

M.C.D.S.

European Invertebrate Survey

Marc Meyer

The European Invertebrate Survey (EIS) is an informal international body which brings together within a committee people interested in its main aims and people co-opted for particular meetings. Members of the Committee are chosen from among specialists representing all the countries of Europe. They are chosen as individuals. No member so far has officially represented an institute or nation. Since 1983, administrative duties have been carried out by a Bureau composed of a Chairman, two Vice-Chairmen, the Secretary General, the Treasurer and three ordinary members.



An example of a distribution map on a European scale (Parnassius apollo)

Background

On 19 October 1967, at a meeting of the Biogeographical Society, Professor J. Leclercq, Gembloux (B), called for co-operation in the production of atlases showing the distribution of western European insects. At the same meeting, J. Heath, Monks Wood (GB), gave a demonstration of Britain's achievements in biogeography. In 1969, the two promoters of invertebrate mapping published a preliminary document on the setting up of an "European Invertebrate Survey" project, similar to the "Mapping the Flora of Europe" project, involving the production of UTM distribution maps.

Two years later, in 1971, J. Heath's "Instructions for recorders" were published. These instructions specified the nature and form of the information required for an invertebrate mapping project. Page 7 of the booklet mentions the two "co-ordination centres" from which the EIS project was launched:

— Biological Records Centre, Monks Wood Experimental Station, Huntingdon (GB).

— Faculté des Sciences Agronomiques de l'Etat, Zoologie générale et Faunistique, Gembloux (B).

Mention should also be made of the "Abteilung Biogeographie" of the University of the Saar, where the EIS found an experienced promoter in Professor Paul Müller. The membership of the first governing body reflects this situation: Chairman: Professor J. Leclercq (Gembloux); Secretary General: J. Heath (Monks Wood); Treasurer: A. Mousset (Luxembourg).

The EIS Committee has met regularly since 1972 for symposia and general meetings: 1972 in Saarbrücken, 1973 in Monks Wood, 1974 in Luxembourg, 1975 in Zürich, 1977 in Paris, 1979 in Saarbrücken, 1981 in Leiden, 1983 in Luxembourg.

In the meantime, some 10,000 maps showing the distribution of European invertebrates have been produced and new publications are added to the archives each year.

In 1984, the EIS had 52 members from 24 European countries. Its first European atlas was published in 1981: Heath, J. and Leclercq, J. (1981): *Provisional Atlas of the Invertebrates of Europe, maps* 1-27.

Aims of the EIS

Surveys of invertebrates, unlike those of vertebrates and vascular plants, are faced with problems resulting from the vast number of species: one has to reckon with tens of thousands of invertebrate species in Europe. In addition to this, many European regions have been insufficiently explored. These difficulties were summed up by Professor Müller: *"Die Ursache hierfür liegt um großen Artenreichtum und in der Vagilität der Invertebraten und der Individuenarmut ihrer Bearbeiter"*. It was agreed from the outset that the production of incomplete maps is possible and desirable provided that interpretation of the types of distribution involved is confined to the information available. The collection of faunistic and ecological data and the production, publication and interpretation of UTM distribution maps were the preliminary aims of the EIS.

Its statutes currently set it the following aims to promote and encourage:

a) The collection, mapping, interpretation and ecology of invertebrates at European level.

b) The establishment and activities of national centres concerned with invertebrate distribution studies.

c) National and international projects relating to invertebrate distribution.

d) The standardisation of distribution data, precise methods for collecting them and proof of their authenticity.

Methods and results

The above aims must be achieved through the promotion of uniform mapping methods at European level. Data relating to invertebrate distribution are collected on standard forms and centralised in data banks which may be computerised or not. The instructions to recorders also specify the minimum information required for each data item:

— the name of the species and its taxonomic group;

— the precise place of observation;

— the date of observation (the year at least);

— the number of individuals;

— the name of the recorder.

The EIS has adopted the UTM (Universal Transverse Mercator) projection for mapping invertebrate distributions. Since the EIS does not have the staff and financial resources necessary for the production of large-scale European atlases, the Committee has concentrated on encouraging national projects: establishment of wildlife information centres, publication of regional and national atlases, selection of, and support for, suitable co-ordinators, approval of international projects, contributions to projects launched by international organisations, etc.

The results of the surveys carried out in a great many European countries are a source of detailed and objective information concerning the presence of the species studied, changes in their distribution patterns, the interpretation of the many threats facing them, the recognition of indicator species and the explanation of theories relating to phenomena of the Tertiary and Quaternary periods.

The EIS is now seeing some very useful initiatives in a great many European countries in which wildlife information centres have been set up: Austria, Belgium, Federal Republic of Germany, France, Great Britain, Italy, Luxembourg, the Netherlands, Romania, Sweden, Soviet Union, Yugoslavia, etc. The most important series of wildlife atlases dealing with invertebrates have been published in Belgium, Federal Republic of Germany, Great Britain and the Netherlands.

Prospects

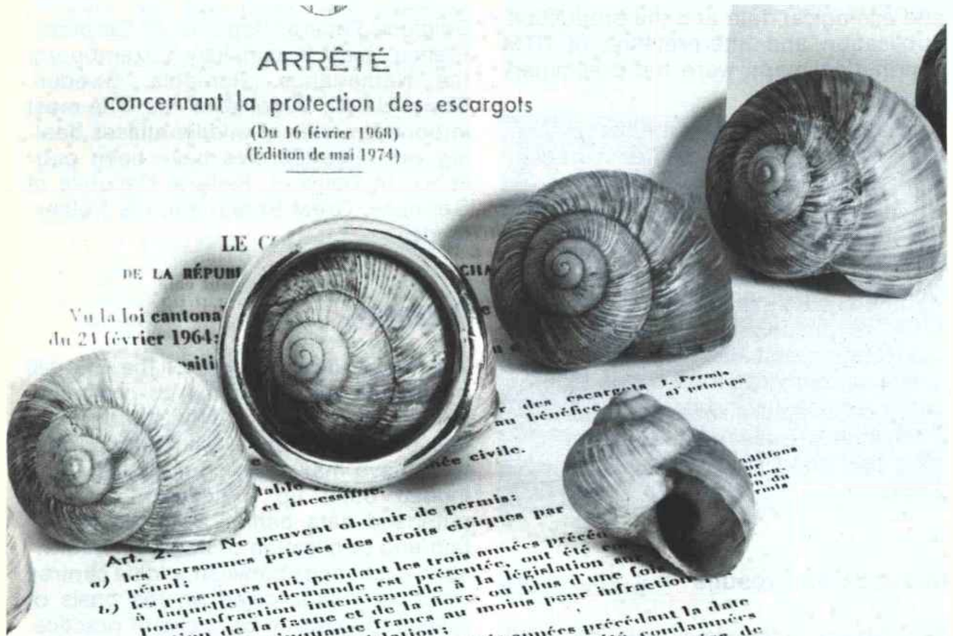
The future development of the EIS will be geared mainly to the co-ordination of national projects and the standardisation of data bases. It will be important to achieve maximum compatibility, and indeed build up a network of computerised data banks. Both the collection and publication of data and information exchanges between wildlife centres must be standardised on the basis of rules of procedure or codes of practice. The situation has changed considerably since the early 1970s because we now have an increasing number of official wildlife information centres pursuing the same aim: centralisation and interpretation of as much data as possible relating to fauna and flora.

Concern for the protection of endangered species and biotopes will be a major feature of future EIS activities, the aim being to maintain or restore the best possible quality of life for people: *"Ein Wissenschaftler darf nicht schweigen, wenn er erkennt, daß — und dies ist hier der Fall — die Grundlagen seines Forschungsgebietes in naher Zukunft von der Vernichtung bedroht sind"* (De Lattin, N., cit. Leclercq, 1973).

M.M.

Protection of invertebrates in Switzerland: legislation and reality

Willi Geiger and Christophe Dufour



It is sometimes possible to gather snails if they slip through the ring issued with the permit (Photo J. von Allmen, Natural History Museum, Neuchâtel)

Every cloud has a silver lining and when, in the 1950s, the hydro-electric installations along the Spöl (the principal river of the Swiss National Park) and those at Rheinau on the Rhine were built in spite of fierce opposition from nature protectionists, the opposition to this measure did give rise to the adoption, in 1962, of an article of the Constitution relating to the protection of nature and the landscape. Its first paragraph contains a basic provision, delegating to the cantons the task of protecting both nature and the landscape. The structure of Swiss law is such that Federal legislation constitutes a framework into which the cantons fit their own legislation, either reproducing or extending the provisions adopted at Federal level.

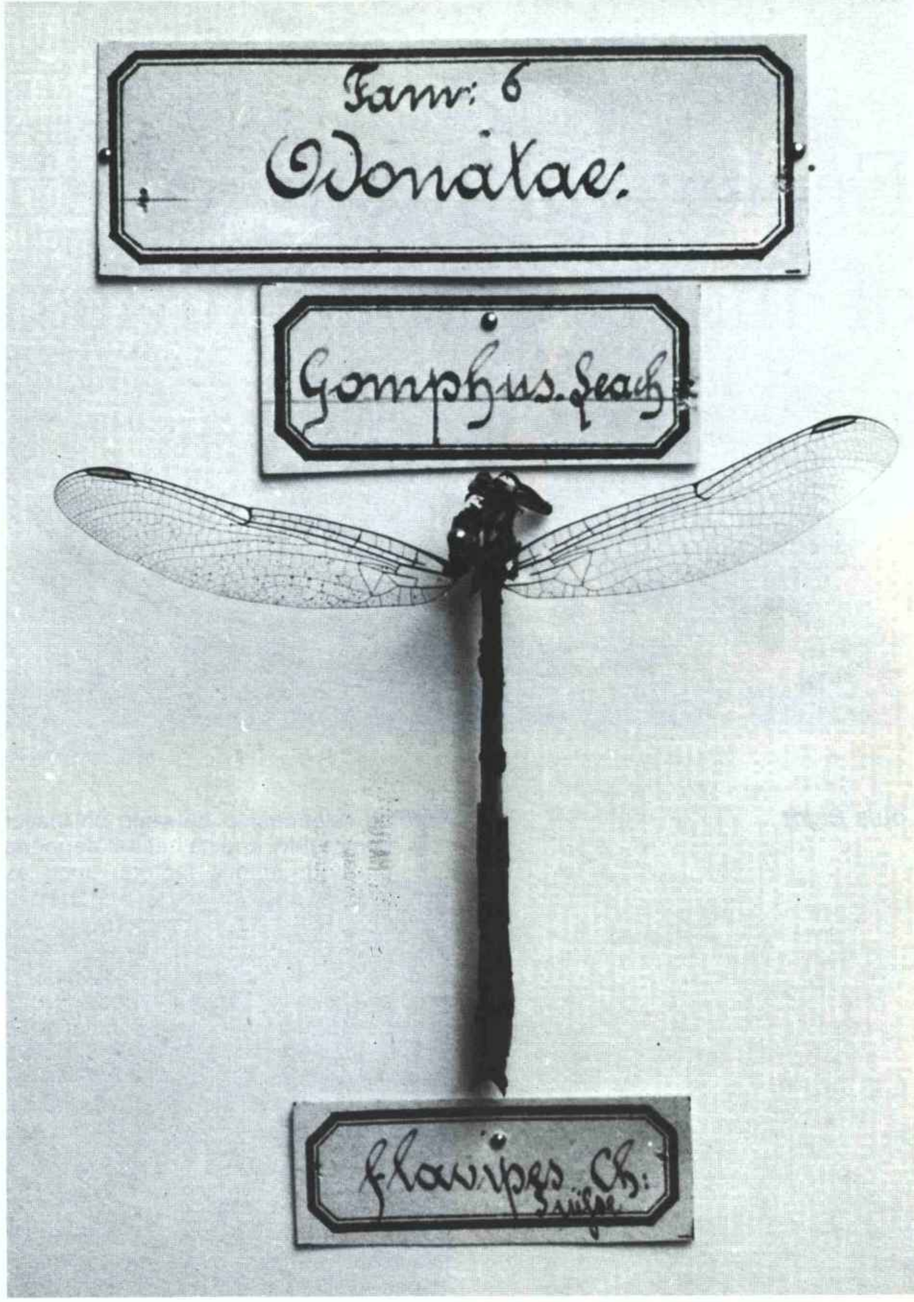
Protection of species

Two aspects of the concept of the protection of endangered species are embodied in Federal legislation, namely protection against direct harassment and the protection of biotopes supporting endangered species. In practice, the first type of protection is the most frequently applied. The Federal Acts on the Protection of Nature and the Landscape (LPN-1966), on Hunting and the Protection of Birds (LChO-1925, recently revised) and on Fishing (LP-1973) contain provisions applicable to the whole of Switzerland and which, together with their implementing Orders, directly concern the protection of endangered species. None of this Federal legislation is greatly concerned with invertebrates. LP-73 merely sets a minimum size for captured freshwater crayfish and LPN-1966 implementing Order protects the *Formica rufa* group. Several sections of this Act and of this Order also mention the protection of biotopes, which is designed to be given concrete expression in the application of the Federal Territorial Development Act (LAT-1979), under which the cantons must draw up master plans and the municipalities detailed plans for land use, including areas designated for protection. It is, then, at cantonal level that practical protection measures must be adopted. While no canton is empowered to countermand the protection of an endangered species mentioned in the Federal Act, it may add to the species protected in its territory and the framers of cantonal legislation have sometimes been more active in the defence of invertebrates. The Federal system does, then, give rise to very diverse situations. The Canton of Schaffhausen played a pioneer role when it included insects among the species worthy of protection. The Canton of Vaud protects all its fauna species, apart from game and destructive invertebrates. Unusual steps are sometimes taken. For example, in the Canton of Neuchâtel, snails can only be gathered if their size exceeds that of a ring issued with the permit.

Is legislation effective?

Generally speaking, it is difficult to judge the effectiveness of a piece of legislation. It would seem at first sight as though the best possible situation prevailed in the Canton of Vaud but, in practice, on both sides of the boundary between Vaud, where all invertebrates are protected, and Neuchâtel, where legislation is concerned only with snails, freshwater crayfish and, of course, red ants, there is no perceptible difference in the fauna. Swiss legislation on the protection of invertebrates is sometimes held to be exemplary, but one is led to wonder whether legislation is really able to cope with the problems relating to the protection of invertebrates, particularly insects. Although estimates of the insect population are still most unsatisfactory—only a little more than half the 30,500 species officially present in Switzerland have in fact been observed, and in very few cases is it possible to make any estimate of their numerical fluctuation—the small number of groups of which there is sufficient knowledge are giving cause for grave concern. It is known, for example, that dragonflies—formerly so common—are falling in number or disappearing in French-speaking Switzerland at an absolutely alarming rate. A recent study has indeed revealed that 60 % of dragonfly species are more or less at risk, while 18 % have already died out!

Similar tendencies have been noted in the case of *Plecoptera* or water-flies, aquatic insects living in as yet unpolluted running water, whereas the preliminary findings of a study of butterflies (*Rhopalocera*) seem to indicate that approximately one-third of the species present in Switzerland are under threat.



Gomphus flavipes, *a unique specimen dating from the middle of the 19th century. As in the case of a great many other species, the disappearance of this dragonfly is a result of the deterioration of its natural environment*
(Photo Natural History Museum, Neuchâtel)

Causes of regression

Among the causes of what can only be called an ecological catastrophe, the foremost is, without any doubt, the deterioration of these species' natural environment, whereas catching by collectors, even with such powerful aids as luminous traps, remains insignificant except in the case of species confined to a given area. The prohibition of straight-forward catching is not, then, an effective means of protection and, on the contrary, would involve the risk of making ignorance of the damage to insect life even more widespread. However, it would be desirable to prevent rare species being bought and sold and to introduce a Code of Honour for Insect Collectors, along the lines of that proposed in Britain in 1981, by John Heath.

On the other hand, it is urgent to draw up Danger Lists of threatened insects, belonging to as many different groups as possible. These lists should not merely provide an inventory of species whose capture will be illegal but, above all, serve to bear witness to the biological value of a habitat whose resources should be protected by conservation measures. Danger Lists should, then, be seen in the first place as a tool for gauging the value of a site and justifying its being placed under protection, rather than as a catalogue of prohibitions.

The inclusion of invertebrates in inventories of fauna serves to increase, to a considerable extent, the number of species taken as indicators and to improve the management of ecosystems, hitherto based solely upon vertebrates. In addition, it provides a unique guide to the management of biotopes of limited size.

The drawing up of Danger Lists of invertebrates implies a great deal of work, which is most frequently carried out by isolated specialists, without any technical or financial support. To remedy this situation, we would strongly advise the setting up of better-organised centres for the study of fauna. This was the idea behind the recent opening of the "Centre Suisse de Cartographie de la Faune" in Neuchâtel, a centre which, in addition to local research projects or those limited to certain aspects, will attempt a more comprehensive evaluation of invertebrate populations, using a computerised data bank.

W.G. and C.D.

Ecological living conditions of insect communities

Louis Bigot

The relationship between an insect community and its habitat depends on both abiotic factors, such as soil texture and structure, the nature of the terrain and climatic conditions, and on biotic factors, such as the nature and density of the vegetation and competition between animal species (e.g. presence of dominant pest populations). We propose to discuss a few points relating to the distribution of insect communities according to their adaptative requirements.

Particular habitats

We shall first say a few words about communities associated with highly specific habitats whose requirements depend primarily on a particular substance, wherever it happens to be located. The example we shall give is that of communities living in stercoral matter and corpses. Populations of coprophagous Coleoptera are not characteristic of a specific plant group (as tends to be the case), but inhabit a variety of areas typical of several different ecosystems.

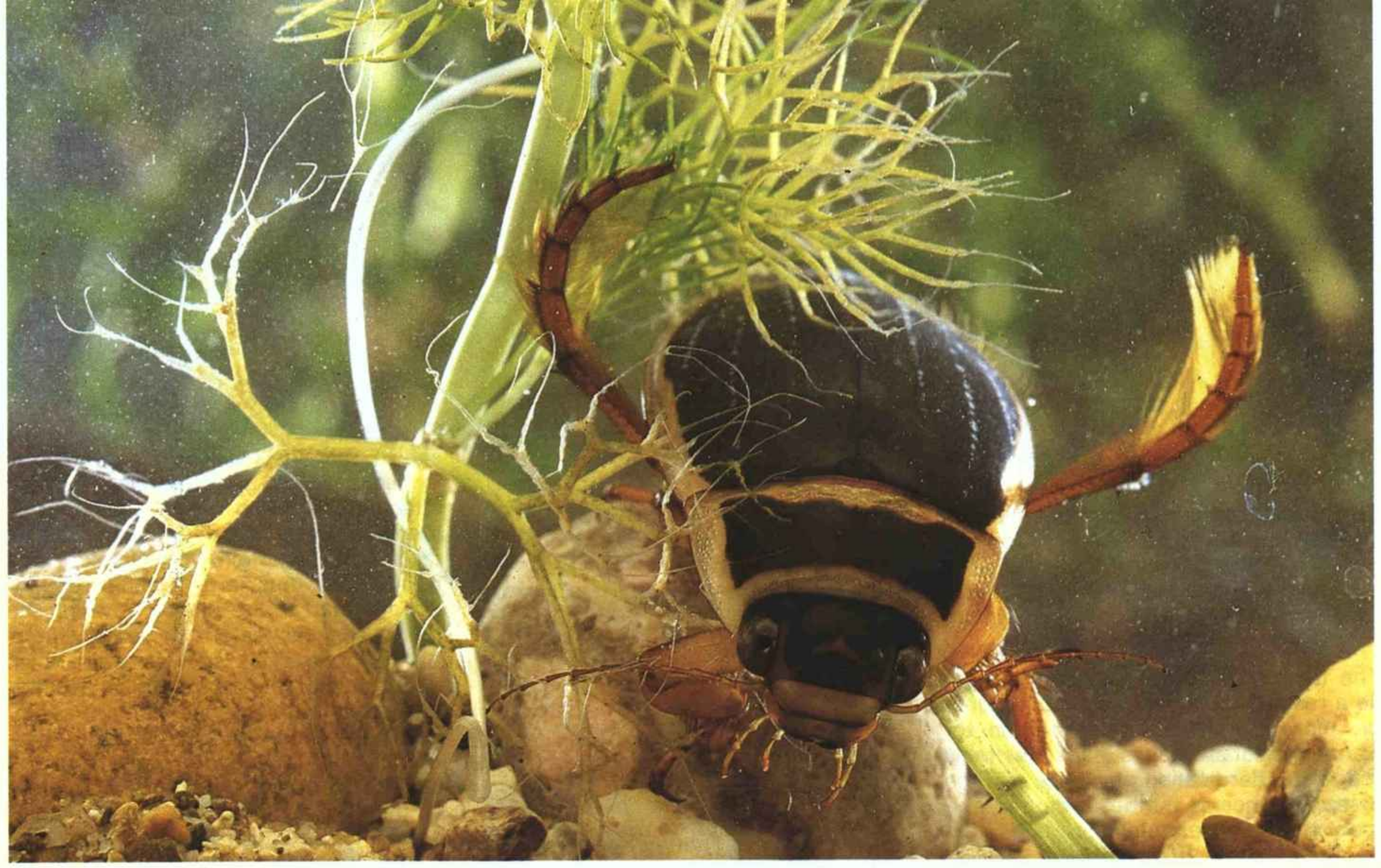
Communities dependent for their food on the excreta of large mammals contribute to soil fertilisation in some West African countries by burying dung. Hence the economic importance of the insects of these communities. Viewed in general terms, they contribute to the recycling of organic matter. And what about *Rhizophagus parallelicollis*, a coleopteran of the Nitidulidae family with a predilection for the mould growing on waxy secretions (adipocere) from buried corpses! This species with a somewhat curious diet is reported as flying "sometimes in fairly large numbers in cemeteries".

Dependence of water

A large number of communities, including aquatic, riparian and hygrophilous populations, are more or less heavily dependent on water.

The insects of aquatic communities have undergone obvious morphological modifications, such as the swimming leg of Coleoptera of the Dysticidae family, or the legs of Heteroptera of the Gerridae family, which are adapted for life on the surface of the water. Some aquatic species live in water for only part of their cycle, e.g. Diptera of the Chironomidae and Culicidae families, and Odonata (or dragonflies), only the larva of which is aquatic. Others, such as Coleoptera of the Dytiscidae and Hydrophilidae families, and Heteroptera of the Naucoridae family, have a strictly aquatic larval life, but adults, which also live in water, can fly from one body of water to another. Because of this dispersion of many aquatic populations in space, the presence of free water (running or stagnant) leads to the formation of unique ecosystems combining elements from two environments (land and water).

The existence of marine insects is not usually recognised. Yet insects occupy ecological niches within communities of the mid-littoral marine zone, e.g. Coleoptera of the Staphylinidae family (*Choiradobium madagascariensis*), found on the boulder ridges of the coral reefs of the Mozambique Channel, and some Heteroptera (*Halobates katherinae*), found in the mangrove swamps of the southern Pacific. The latter move between the infralittoral, mid-littoral and supralittoral zones by skating over the surface of water.



Swimming (Dytiscus marginalis) (Photo Anne and Jacques Six)

Necrophorus vespilio *on a dead bird* (Photo Jacques Six)

Sandy coasts shelter an extensive community of insects which have to be highly specialised to live in this "extreme" environment, so termed because of the great instability of the abiotic factors. These insects inhabit the supralittoral and adlittoral terrestrial zones, the supralittoral zone having recently been excluded from the marine environment and recognised as part of the terrestrial environment. "Riparian" animal species do not have particularly conspicuous adaptive systems, but have undergone extensive physiological modifications to withstand submersion: some Coleoptera of the Trechidae family readily take refuge under partly submerged pebbles (e.g. *Perypherus fasciolatus* and *P. eques*).

Watercourses present a riparian population dominated by Coleoptera of the Trechidae family. These are accompanied by other Coleoptera (the Nebridae, Staphylinidae and Scaritidae), insects of other orders (Orthoptera and Heteroptera) and other zoological groups (Oligochaeta, Mollusca, Crustacea, Arachnida, etc.). This community living at the water's edge is subject to a number of highly specific parameters: e.g. location on the wet fringe maintained by the body of water and mobility according to variations in the water level, which may extend to migration to more favourable locations in the event of complete drying up. Hence the temporary nature of this population. It is also a "closed" population, i.e. one that admits very few species from other biotopes, and a "contact population" characteristic of an interface zone, or ecotone, between two major environments, land and water.

The water need not necessarily be free. One community of this kind lives in the vicinity of névés in the wet fringe maintained by melting snow.

Steppeland

At ground level, communities are active throughout the day and night, moving among the stones and low grass, e.g. the unique community associated with the desert-like plain of La Crau in south-eastern France.

The wildlife of this steppeland habitat is well adapted to the particularly harsh conditions prevailing there: wide nychthemeral and seasonal temperature ranges, summer drought and violent winds (the mistral).

The transformation of this environment as a result of socio-economic pressures or, more simply, natural evolution towards pre-forest stages leads inevitably to the standardisation of wildlife and the disappearance of the best adapted and most unique populations, e.g. the La Crau locust, *Prionotropis rhodanica*.

Alpine grasslands are formations in which flora and fauna depend on altitude-related factors (soil and climate). Alpine grassland communities comprise species often restricted to small areas. Hence the high degree of endemism reported among the fauna of this grassland (e.g. *Chrysocarabus olympiae*, found in Valsessera in the Piedmont Alps).

The "sansouires" of the Camargue (plant formations growing on salty soils in the Rhône delta) are inhabited by communities composed of halophilic species. The balance of the entire ecosystem is dependent on variations in the water and salt content of the substrata: fauna and flora respond to these variations by modifying their composition and structure, the former almost immediately, the latter more slowly.

Woodland

Although still virtually unexplored from the ecological point of view, woodland is the major insect environment.

Owing to the enormous volume of its vegetation, the variety of plant species of which it is composed and the multitude of habitats afforded by it (soil, trunk, bark, foliage, different exposures and strata, etc.), woodland shelters a large number of populations accounting for most of the insect orders known in this part of the world. A recent study by numerical analysis showed that leaf-dwelling fauna in the forest of La Sainte-Baume (Var) is related more closely to the plant environment and the ecological context represented by it than to the particular plant supporting it.

Woodland is the main insect environment
(Photo Central Office of Information, London)

The air

The insects of this stratum obviously move by flying: their spatial distribution might therefore seem difficult to establish at first sight. Yet studies have shown that insects which move easily in flight, such as butterflies, remain attached to often small, ecologically identical areas despite their powerful means of locomotion. Some Lepidoptera populations thus form islands, remaining confined to the places in which the plant species eaten by their caterpillars grow. This fact is well-known in the case of diurnal butterflies (Rhopalocera): *Zerynthia rumina* (family Papilionidae) frequents the grasslands in which *Aristolochia pistolochia* grows; but the Microlepidoptera, apparently even more so than the Rhopalocera, confine themselves to particular species known as "support plants", which, logically, ought to be the same as the plants which act as host to the caterpillar. Thus, *Oxyptilus lantoscanus*, a lepidopteran of the Pterophoridae family, which was lost from sight for nearly a century after it was first described, was found again when its support plant, *Hieracium lanatum* of the Compositae, was accidentally discovered. "Plant-hunting", which was always the approach adopted by the great field entomologists, is a truly ecological practice because it implies recognition of the direct relationship between the plant and the insect.

Many of these communities are now threatened with deterioration or even extinction as a result of the changes which biotopes are undergoing. Scientists must remain vigilant if representatives of highly unique ecosystems are to be preserved. L.B.

(Photo G. Lacoumette)

The current situation of dragonflies

Jan van Tol

The Council of Europe has instructed to report on the status of the dragonflies or *Odonata* of Europe. It is intended that after this study, which will be completed by the middle of 1986, protection measures for dragonfly species as well as for the biotopes in which they are living will be proposed. The first aim of our study, however, is the investigation of the present status of all species in the Council of Europe member states. Due to the activities of many amateur as well as professional odonatologists during the last decades, the distribution and occurrence of most European species is relatively well understood. Within the framework of the European Invertebrate Survey (EIS) distribution maps have been published in some countries.

In this article information on this project as well as on the biology of dragonflies and why their protection is needed will be presented. It is emphasised that protection of important dragonfly biotopes may contribute to the survival of interesting aquatic ecosystems, of which dragonflies form only a quantitatively minor component.

Aeschna viridis

Let us have a look at the life history of one of the European dragonfly species, the Green Hawker or *Aeschna viridis*. It is a fairly large species with a maximum wingspan of nearly ten centimeters in both sexes. Colouration in male and female is more or less the same with a remarkable extension of green, as is indicated in its scientific name. Other species of the genus *Aeschna* are predominantly blue or brown, next to black and yellowish white.

The adults of *Aeschna viridis* are usually found in or along extensive lowpeat moor areas, which is a rather scarce biotope in Europe. The species is widespread in Asia, but exact information on its commonness in this area is scarce. In Europe it ranges from southern Sweden to the northern part of the Balkans; the central part of the Netherlands forms the western boundary. It is absent in e.g. Belgium, France and the countries in the Alps, but also in Germany it is ranked among the rarest species. As in a lot of other dragonflies, larvae of *Aeschna viridis* live between waterplants. Larvae of all *Odonata* live under water, although there are a few exceptions in tropical rainforests. Larvae of most lotic species are burrowers in sandy and silty bottoms. Larvae and adults of all species are predacious. The larvae catch prey from waterfleas up to small fishes, depending on species and size. The larvae are very small when they hatch from the egg, and do usually not exceed a few millimeters.

The larva of *Aeschna viridis* moults about 13 times. The final instar larva reaches a total length of 40-45 millimeters. The development from prolarva to the ultimate stage takes two to three years in this species. In other species this number may be quite different. Some species, particularly in the tropical and subtropical region, have two or three generations per year, whereas larvae of some Gomphidae reach maturity only after five years.

The ultimate instar larva leaves the water to emerge. The actual emergence of the adult insect usually takes place while the larva is resting close to the water edge on the bottom or is hanging at a firm stem of a plant. After the emergence the last larval skin or exuviae can be found still hanging in the vegetation along pools, rivers or other water types. From this one may conclude that not only water quality, stream velocity and water vegetation influence the distribution of dragonflies, but even the composition and structure of the vegetation of the water edge.

The adults, males as well as females, live at some distance from the water for one or two weeks. The length of this period again varies significantly

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ANAX IMPERATOR

from larva to adult insect...

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5

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between species. They spend their days with feeding on all kinds of smaller flying insects, while the eggs are ripening in the female. After their return to the water edge, the males become temporary territorial, i.e. each male defends a territory during only a few hours daily. Females that enter such a temporarily territory are caught behind the head immediately. After a short flight *in tandem*, in which the male takes the front position, the male fills his accessory genitalia on his second abdominal segment with sperm. Thereafter the female brings the end of her abdomen close to the male's secondary genitalia, the pair then forming a "wheel". The actual mating takes place in wheel position between reed vegetation. In other species pairs mate hanging in trees or on stems of emergent waterplants. This wheel position is a unique feature among insects and occurs in all dragonflies.

Soon afterwards, although preferably at dusk, the females return to the water to oviposit. The ovipositing behaviour is quite peculiar in this species. Most species that lay their eggs in the tissue of waterplants are not very strict in their choice, laying for instance in all floating leaves of aquatic plants. The female of *Aeschna viridis*, however, has a strong preference to the leaves of Water Soldier, *Stratiotes aloides*. This behaviour has, of course, great influence on the distribution.

Not all species of *Odonata* show endophytic ovipositing. Those who have, are also adapted morphologically, since the eggs have to be put in the soft plant tissue under the epidermis. Other dragonflies, e.g. libellulids, disperse their eggs by dipping their abdomen at the water surface. Such eggs sink to the bottom, whereafter the prolarva emerges after some time. In some species the emergence of the prolarva occurs only after overwintering of the eggs. This is usually true for species living at northern latitudes, where winter conditions are unfavourable for young larvae to survive and time to grow after emergence of the prolarva is only short.

Threatened species and habitats

Aeschna viridis is just one example of a long list of dragonfly species that are confined to very specific biotopes. Other species are only met in, for example, the lower courses of large rivers (*Gomphus flavipes*), in mesotrophic waters with Magnocaricion vegetation (*Nehalennia speciosa*), or in extensive peatmoors in mountainous areas (*Somatochlora alpestris*). Quite a lot of these species are now in danger of at least local extinction. Habitat destruction is certainly the main reason for this phenomenon, but in some cases also climatological changes may have influenced distribution patterns. When species are considered for protection, several other aspects next to exclusive occurrence in a rare biotope have to be taken into account. We mention here, for example, the distribution within Europe, the worldwide range, the total number of populations and the vulnerability to habitat destruction.

A favourable biotope for dragonflies (Photo G. Lacoumette)

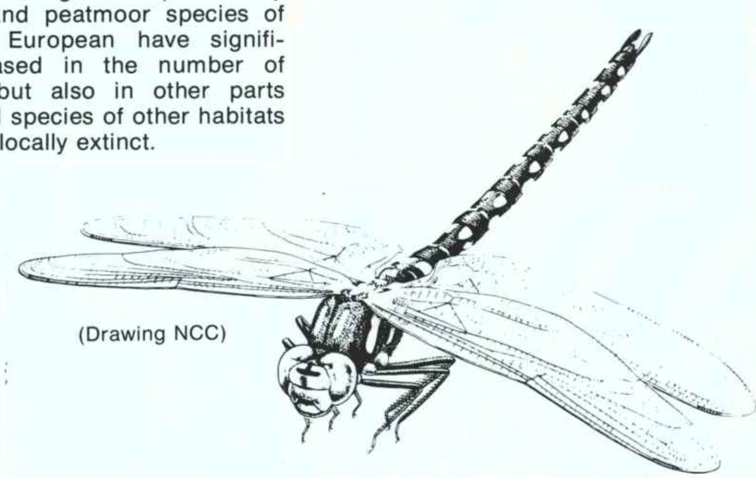
Some species are very common and also very widespread. The libellulid species *Libellula quadrimaculata* or Four-spotted Chaser is Holarctic, and is very common in Europe by its ubiquistic habits. Other species have a very limited range, although species restricted to Europe are rare. Most European species extend at least to the western part of Asia, particularly the area around the Caspian Sea. An important reason for this phenomenon form the Pleistocene glaciations, which made north and central Europe unsuitable for the survival of dragonflies. Most of our recent species were then restricted to southern Europe and western Asia. Among the very few truely European *Odonata* are *Macromia splendens* and *Gomphus graslini*. Protection of such species should have priority, since their local extinction would be fatal. Both can be found in river systems of central France, while *Macromia splendens* also occurs at a few localities on the Iberian peninsula. The preparation of a list summarising the areas of utmost importance for the survival of characteristic dragonfly biotopes forms also a part of the study.

Why do dragonflies need protection?

The question why dragonflies need protection is certainly legitimate. Indeed, the 5,500 species of *Odonata* form a quite remarkable group among the c. 30 million species of insects. Predecessors of recent species lived on earth as early as 325 million years ago. Also the largest insect that has ever existed belonged to the dragonflies. This species, known as *Meganeura monyi*, had a wingspan of more than 65 cm. The recent species are only a relict group of an insect order that had its maximum diversity hundreds of millions years ago. During this very long period very peculiar lifeforms as well as habits have evolved. Particularly in the tropical region species diversity is high. Here we find species specialised in breeding in epiphytic bromeliads, and species with an abdomen of 14 cm length and only 1 mm width. European species seem to be less extreme in morphological features, but their habits are just as interesting as those of tropical forms. Although some are ubiquistic, most species are quite stenotopic. Species of the last mentioned category are very suitable indicators of water quality. A lot of species are very vulnerable to eutrophication, thermal pollution and other human influences to the aquatic environment. It is rather superfluous to mention that a lot of species in Europe have suffered much during the 20th century. In general particularly the riverine and peatmoor species of northwestern European have significantly decreased in the number of populations, but also in other parts of Europe and species of other habitats have become locally extinct.

The Council of Europe has understood that we have special responsibility for the survival of these insects. It has now stimulated the study "Protection of dragonflies and their biotopes". It is also very important that a connection has been made between the protection of dragonflies and the protection of their biotopes. Protection of dragonflies only, i.e. a general prohibition to collect them, is useless. Only when the protection of dragonflies results in the protection of important sites for dragonflies, will these measures be successful. In such cases, the *Odonata* form just the monitors for environmental quality, and their conservation may result in the conservation of other interesting aquatic insects. To these ones belong for instance the mayflies Ephemoptera and stoneflies Plecoptera, but also more generally known groups as the waterbeetles. These insects are in fact just as interesting as dragonflies, although they are usually less conspicuous.

Summarising one may conclude that dragonflies are very suitable as indicators in environmental monitoring schemes, since they are conspicuous, frequently stenotopic aquatic insects with a life cycle of up to five years. When protection measures for dragonflies result in the protection of important sites and include the conservation of water quality in these areas, then other components of these ecosystems also may have better prospects for survival in Europe. J. van T.



(Drawing NCC)

Orthoptera

Sigfrid Ingrish

A couple of grasshoppers (E. ephippiger) (Photo Anne and Jacques Six)

The term *Orthoptera* in the broadest sense comprises the order of grasshoppers/crickets (*Saltatoria*, Orthoptera in the narrower meaning of the term) and some orders with fewer species which are more or less related to Saltatoria, namely stick insects (*Phasmida*), earwigs (*Dermaptera*), praying mantises (*Mantidea*), cockroaches (*Blattidea*) and termites (*Isoptera*). The Saltatoria are divided into two series: long-horned families (*Ensifera*) whose major representatives are bush crickets (*Tettigoniidae*) and true crickets (*Gryllidae*); short-horned families (*Caelifera*) including grasshoppers (*Acrididae*) and ground hoppers (*Tetrigidae*).

Many Saltatoria can produce a sound (stridulation): for this purpose a toothed ridge located on the front wings or on the inside of the jumping leg is scraped against a sharp edge. Ensifera scrape their front wings together, Caelifera scrape the hind leg against the wings. Each species has a specific trill, which may be used for identification.

Grasshoppers/crickets mainly live on open land. In woodland they mainly settle in clearings. Only tree-dwelling species such as bush oak crickets (*Meconema thalassinum*) also colonise dense woodland. The majority of grasshoppers/crickets are therefore dependent for their living space on man-made zones, especially biotopes with extensive exploitation of the land in a favourable climatic situation.

Focus on the stridulator organ in action (Photo Anne and Jacques Six)

Conditions necessary

Most Orthoptera are heat-loving (thermophile), preferring temperatures between 30 and 40 °C. They thus only become really active in warm weather or sunshine, being able to increase their body temperature by sunbathing. Many more species therefore live in warm climates than in cool ones. Moreover Orthoptera require specific microclimates (temperature, amount of sunlight, moisture), environmental structure (plant growth) and soil structures, the conditions required varying from one species to another. Communities of species or individual stenotropic species which can only withstand minor variations in environmental factors may therefore be used as indicators of environmental quality.

Threats

Threats to species of Orthoptera mainly arise from changes in their environment and the direct or indirect effect of pesticides and fertilisers. For example grasshoppers have proved sensitive to fertilisers containing nitrogen, which can release ammonia. Compared with unfertilised soils, the number of eggs laid per female and the survival rate of the eggs were markedly diminished.

Sites where Orthoptera abound or which are valuable to specially adapted species are dry or semi-dry grassland, open sandy zones (e.g. dry, sandy heathland, dunes including inland dunes, abandoned sand and gravel quarries, the gravel banks of Alpine rivers), unfertile grassland, steppes, abandoned vineyards and water-meadows untreated with fertiliser. Many of these zones need to be used for grazing or mown occasionally in order to maintain them in their original condition. Changes in the use of the land such as more intensive exploitation (e.g. transforming meadows into ploughed land or draining wetlands) or the abandon of cultivation resulting in new growth of scrub and trees alter the life-support conditions and change, and usually impoverish, the Orthoptera communities.

In Southern Europe dry habitats abound. According to my own observations in the Peloponnese, Orthoptera which are adapted to the corresponding biotopes, e.g. *Calliptamus italicus*, can be found in massive quantities; in Germany on the other hand this species is threatened with extinction. In order to conserve a rich array of Orthoptera in Southern Europe, wet biotopes and woodland should be the chief targets of protection.

Mapping as wide an area as possible is necessary in order to keep track of the insect populations, to update possible dangers and to be able to make use of their indicator function. However mapping makes heavy personal and financial demands. For this reason only regional maps of fairly small groups of insects have been successfully completed to date. Restricting maps to a few monitoring species promises more rapid results. Such a project is now being prepared in the framework of the EIS scheme (European Invertebrate Survey). To be suitable as a monitoring species, (1) a species must have a strong relationship with the biotope and therefore a high value as an indicator, (2) its occurrence or absence must be able to be established with a high degree of certainty within an acceptable time. Among the Orthoptera, stenotropic species with a striking trill (stridulation) are suitable, e.g. *Ephippiger ephippiger* (known as the "tizi").

Ephippiger ephippiger

This cricket belongs to the Tettigoniidae. It has a curved, saddle-shaped, thoracic shield (*pronotum*) which covers the greater part of the reduced wing. Only the base of a covering wing has remained, transformed into a song apparatus. Both sexes, but chiefly males, chirp. On warm days they emit their chirp, interrupted by short pauses (it sounds something like "ts-tssss") almost the whole day long and into the evening. When seized, both males and females produce a sound of alarm, consisting of rapid repetition of the chirp at three or four times the normal rate.

E. ephippiger prefers to live on bushes in open land with plenty of sunshine. It is not eclectic as regards its food, devouring smaller insects as well as many parts of plants. Compared to other grasshoppers its jumping legs are poorly developed. Being unable to fly, its range of movement is limited and it therefore has a poor spreading potential. Its colour matches the vegetation and it is therefore difficult to locate unless it betrays itself by its loud song.

Reproduction

The larvae hatch in May. They already resemble the adults (instars); development is direct (hemi-metabolic), the insects being adult after five or six moults. Instars can be found from August to October. Females ready to mate are attracted by stridulating males. In addition to the chirping, the courtship ritual comprises vibratory movements of the body. The male slides backwards under the female in order to mate. Once he has anchored his cerci to the female's sub-genital plate, the female springs forward, causing the male to fall on his back and hold fast to the ovipositor with his forelegs. The male then fastens a large spermatophore to the female's sexual orifice; as well as sperm, this spermatophore contains many nutritional substances and is later eaten by the female.

E. ephippiger lays its eggs chiefly in the ground, sometimes in plant stems. Like many other Tettigoniidae, the eggs take several years to complete embryogeny. This means that the eggs only hatch after the second or third winter following the laying. The continued existence of the populations is therefore less subject to transient fluctuations in the weather, e.g. cool, rainy summers in the North or drought in the South of its range. On the other hand the eggs are exposed for a long time to any land exploitation or use of fertiliser.

Distribution

E. ephippiger's distribution ranges from the north of Spain to the Ukraine. The northernmost point at which it is found in Western Europe lies in the Netherlands. In Eastern Europe it is found all along the Vistula to the Baltic Sea. In the south it is common in the mountains of northern Spain, the Italian Alps and the Balkans down to northern Greece. Its wide range, combined with low vagility has resulted in great local differences between separate populations. Seven sub-species are distinguished today. Distribution is markedly patchy (disjunct). In particular north of the Alps *E. ephippiger* only occurs in patches. The highest concentrations are found in south-east central Europe, south-east Europe and southern France.

The patchy distribution is conditioned by high ecological requirements. *E. ephippiger* only thrives under the influence of warm dry summers. In the French Massif Central almost all its habitats lie in zones where the dry weather index for the month of July is lower than 30. On the basis of its ecological requirements *E. ephippiger* was presumed to have been widely

Grasshopper (Photo G. Lacoumette)

distributed in central Europe in the warm period which followed the ice age (subboreal period). As climatic conditions worsened and became cooler and more Atlantic, its range gradually shrank. Finally it could only be found in places which emerged as islands of warmth from the surrounding landscape and where man had prevented the advance of trees. *E. ephippiger* therefore owes its recent occurrence in central Europe to the hand of man. However its northern populations are now regressing, so that for example it has been classified in the Federal Republic of Germany's "Red List" as a species "threatened by extinction". In addition to possible climatic causes the danger arises particularly from man's influence on the landscape. The chief threats are: housing construction over suitable biotopes, industrial facilities or traffic facilities (e.g. in the Rhine-Main area); greater use of pesticides, especially in vineyards, since *E. ephippiger* is frequently found in wine-growing areas (e.g. mid-Rhine and Moselle). As an indicator, the occurrence of *E. ephippiger* points to favourable climatic zones but it also identifies biotopes as yet unharmed by man and deserving protection.

At the points of highest concentration in south-east Europe and southern France, *E. ephippiger* is usually found over a wider range than in central Europe, and dense populations are found in some areas. Here, in its optimum climate, it is also able to colonise small areas since, generally speaking, it only has to cover short distances in order to make contact with a neighbouring population. This permits an exchange of genetic information on the one hand and on the other a recolonisation of localities in which its existence was adversely affected by environmental factors or the hand of man. This is difficult in the north of its range where its occurrence is patchy and the sites where it is found usually lie several kilometres apart.

Frequency of occurrence variable according to the areas

This shows that the frequency of occurrence of species of Orthoptera and any threats to them can vary greatly from one region to another. Concentrations arise in regions where the ecological requirements of a species with regard to climate are optimally met. In such regions its link with the biotopes is weaker, it occurs in large numbers and is not endangered. On the fringes of its range its ecological requirements are only met in a few biotopes which stand out from the surrounding landscape because of local climatic conditions, possibly because of the structure of the vegetation or composition of the soil. If we wish to prevent a species dying out in such areas, this can only be done by maintaining these specific biotopes.

The habitats of rare Orthoptera house a multitude of rare insects belonging to other orders and are also usually floristically important. In many cases their preservation requires not only their designation as nature reserves but also extensive farming in order to suppress unfavourable changes in the plant structure. Appropriate biotope protection measures can replace this. Buffer zones should separate the protected biotopes from built-up areas and land under intensive farming, especially where a lot of pesticides are used. A suitable habitat for ecologically less demanding species or Orthoptera can also be maintained even in a farming area if it is well sub-divided, if the use of fertiliser on grasslands is reduced and if water-meadows, hedges and small patches of wasteland are allowed to remain.

S.I.

Why this decline?

N. M. Collins and J. A. Thomas

The first step in any new conservation programme is documentation of threatened habitats and species. During the past five years the insects of Europe have come under close scrutiny as conservationists began to realise that vast numbers of species may be declining through man's activities. The growing body of published results is revealing a conservation problem of startling proportions. Every group of insects studied so far includes a high number of species at risk. To take just one small group, the butterflies, a recent Council of Europe report demonstrated that 96 of the 380 resident European species are threatened, 15 of these being in danger of extinction.

Regression of insects in Europe

Several European nations have commissioned reports on insects. Of the 14,000 species assessed in the British Insect Red Data Book, over 6 % are endangered or vulnerable and a further 5 % are rare. In Belgium a survey of the distribution of 1,600 insect species revealed that over 11 % were disappearing so quickly as to be in danger of extinction. Assessments of insects have been made in West Germany, Austria, Spain (Lepidoptera only), the Netherlands, Czechoslovakia and Finland, all with similar startling results. Most other countries, including Switzerland, Luxembourg, France, Italy and Poland, have published documents or legislation that indicate threats to their native insects.

The message is clear: thousands of Europe's insect species are on the retreat in the face of mounting pressure from agriculture and industry. Local extinctions are already occurring, Britain has lost four butterflies, the Netherlands has lost eight. But this is not a local problem, before long the total disappearance of numerous insect species from Europe may be commonplace. Concerted action by national and international conservation bodies is needed in order to bring this situation to the attention of the public and, by influencing public opinion, bring about decisive efforts to improve the protection of vital insect habitats throughout Europe.

Co-operation IUCN-WWF

The partnership between the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wildlife Fund (WWF) is unique in its capacity to bring about integrated, international conservation efforts. Working together, IUCN and WWF have aided over 3,000 conservation projects in 130 countries. IUCN has an unrivalled network of technical expertise while WWF contributes its sophisticated fund-raising and publicity skills, coupled with a network of national offices. IUCN and WWF share an international secretariat in Switzerland, but WWF also has national affiliates in 26 countries, 14 of these in Europe. These are Austria, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, Netherlands, Norway, Spain, Sweden, Switzerland and United Kingdom. Some of the countries with WWF offices are spearheading insect conservation in Europe and are taking steps to counteract the threats.

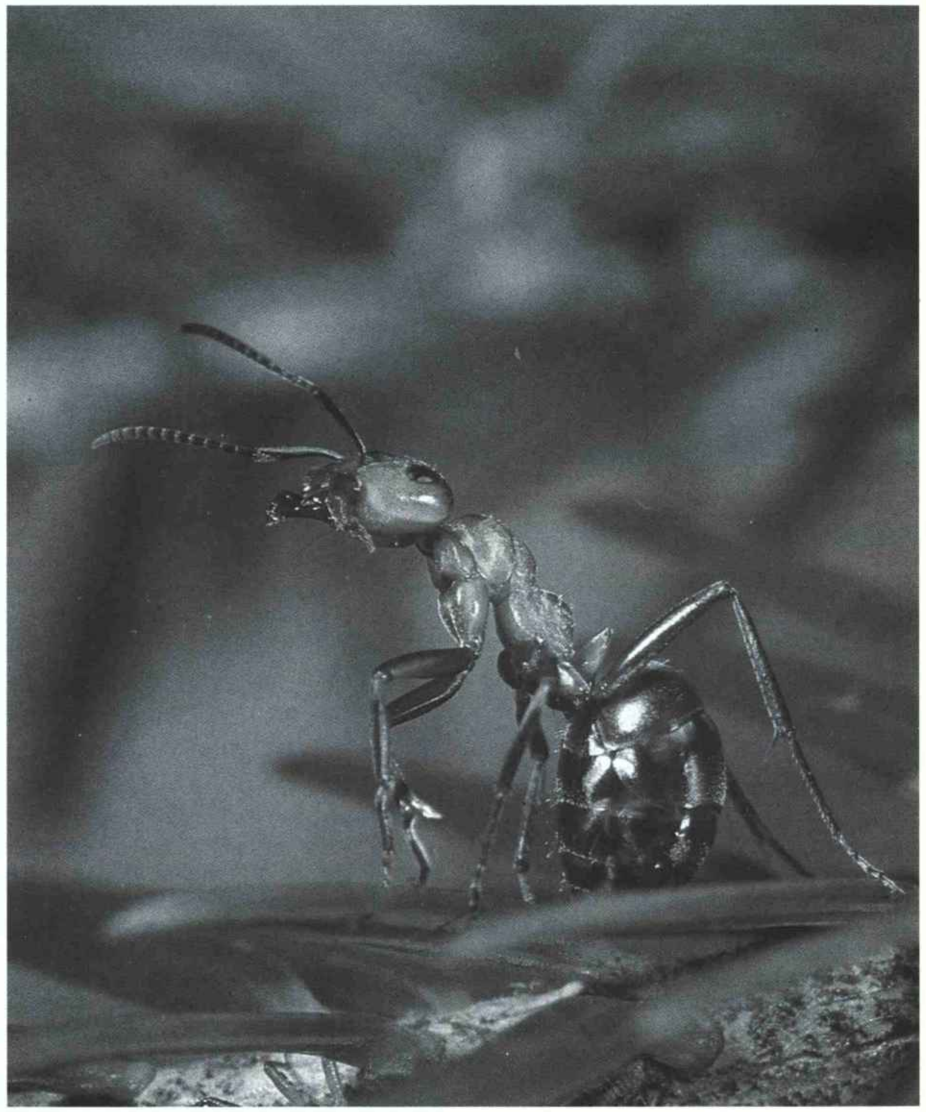
Although the specific needs of invertebrates have taken up only a small proportion of the IUCN/WWF effort, many habitat conservation programmes are a great help to invertebrates as well as the more obvious birds and mammals. However, the special needs of insects have sometimes been overlooked in these programmes, and there is great scope for improvement. Habitat destruction has been the dominant cause of decline in insect numbers, particularly the virtually irreversible problems caused by land drainage. This has been responsible for the dramatic decline of 16 species of butterflies (including three of the European species of Large Blue butterflies discussed in detail below), as well as numerous dragonflies.

IUCN and WWF are taking the lead in an international campaign to conserve European wetlands. Much of the interest stems from IUCN's voluntary role as secretariat for the Convention on Wetlands of International Importance (usually called the Ramsar Convention). The 36 Contracting Parties to the Convention have listed almost 300 Wetlands of International Importance, the majority of them in Europe. They cover a surface area of around 20 million hectares, but as the number of parties grows this

Lycaena (Photo K. Ross-Jacana)

figure is expected to treble. To support the Ramsar Convention, IUCN and WWF have developed a Wetlands Programme with 89 projects, 39 of them field projects. Many of the projects are outside Europe but some, such as the Wadden Sea Conservation Programme, are in vital European sites. Documentation of the sites is still unfinished and no assessment of their value to insects has been made, but there can be no doubt that many groups will benefit. An international assessment of the threats to one important group of freshwater insects, dragonflies (*Odonata*), will be included in the programme.

In recent years, invertebrates have begun to attract attention in their own right. IUCN began to tackle the problem of insect conservation by forming international Specialist Groups for Butterflies, Moths, Dragonflies, Ants and Cave Invertebrates, all under the umbrella of the IUCN Species Survival Commission (SSC). These groups of experts have been taking important steps in identifying priority needs and implementing recovery plans. They have also been influential in providing material for two important new IUCN publications: *The IUCN Invertebrate Red Data Book* (1983) and *Threatened Swallowtail Butterflies of the World - The IUCN Red Data Book* (1985), both produced at the IUCN Conservation Monitoring Centre in Cambridge, UK.



Formica rufa (Photo Anne and Jacques Six)

Ants

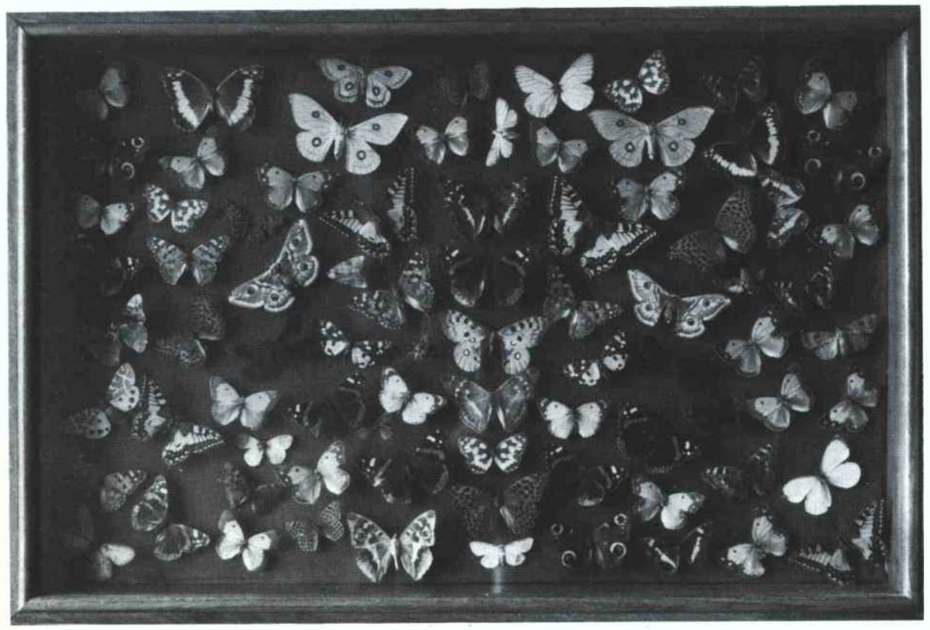
In 1977 the IUCN/SSC Ant Specialist Group, in conjunction with WWF Switzerland, began a campaign called "Ant Conservation in Central Europe" and published a pamphlet, *Les fourmis des bois et leur protection*, which described the distribution and conservation of Wood ants in Switzerland. This marked the beginning of a huge effort to protect Wood ants, mainly by drawing public attention to the problem, but also by encouraging the placing of protective barriers around nests, by dividing nests, and by mass rearing of queen ants to start new colonies. It has been recognised since the early 1960s that Wood ants were endangered in many parts of their range and as early as 1964 the Council of Europe encouraged its member countries to protect them. The main threat was forest exploitation, but damage to individual nests by passers-by was also a serious problem. The nests look like an untidy pile of pine needles, but in fact they are carefully constructed to maintain a stable nest microclimate. The Wood ants are an important part of ecology of European forests, where they help to maintain the biological equilibrium by feeding on vast numbers of phytophagous insects, many of them potential pests. The ants also help to improve soil quality, disperse plants through seed collection, and increase the yield of forest honeydew from aphids. Although the ants use most of the honeydew to meet their own energy needs, much of the surplus is taken by bees and turned into honey. In one summer season a single nest of *Formica rufa* in Germany collected 200 litres of honeydew, 50,000 seeds and 6 million prey insects, including 400,000 forest pests.

Dragonflies

The European members of the IUCN/SSC Dragonfly Specialist Group have been particularly active in documenting threats and promoting conservation action. Six out of Europe's 130 or so species are in need of protection. Two of these are widespread outside Europe but may soon disappear from their European range. The other four are endemic to small areas in Europe, three of them in south-west France. The fourth is Frey's Damselfly (*Coenagrion freyi*), now known only from one or two alpine lakes. Due to the limitations of available funds, little action has been possible so far. Conservation needs, documented by the Dragonfly Group in *The IUCN Invertebrate Red Data Book*, include surveys of possible new localities and prevention of eutrophication and disturbance of littoral zones in lakes known to harbour the insect.

Butterflies

The Butterfly Specialist Group includes numerous European lepidopterists who are very active in conservation in their own right. Many are also members of the Societas Europaea Lepidopterologica, which has its own conservation committee. Much attention has been given to the Apollo butterfly (*Parnassius apollo*), mainly because of its importance in trade. Several other species are much more seriously at risk, including *Hypodryas maturna*, *Coenonympha oedippus*, *Lycaena dispar* and, perhaps most important of all, *Papilio hospiton* from Corsica and Sardinia. Some have received project finding from national WWF offices, notably in United Kingdom and Netherlands. The WWF-UK appeal to save Britain's butterflies is seeking £ 40,000 for research and conservation action on behalf of 14 of Britain's butterflies.



"Game bag" (Photo G. Lacoumette)

A noteworthy example: the failure of the measures taken to preserve *Maculinea arion* in Great Britain

Conservation of the European species of Large Blue butterflies has been recognised by IUCN/WWF as an international priority. Three species, *Maculinea arion*, the Scarce Large Blue (*M. teleius*) and the Dusky Large Blue (*M. nausithous*) have already disappeared from the Netherlands, and *M. arion* is extinct in Britain. These butterflies and their close relatives, the two Alcon Large Blues (*M. alcon alcon* and *M. alcon rebeli*—now believed to be distinct species), are all at serious risk on the European mainland.

Large Blue butterflies have a strong appeal for naturalists because, in addition to the cachet of rarity and impending extinction, they are very beautiful and possess fascinating life cycles: in each species, the eggs are laid on flowers which the young larvae eat, but older larvae are carried by Red ants (*Myrmica* spp.) into their underground nests, where the butterflies live for nine months and feed on ant brood. There have been numerous attempts to conserve Large Blue colonies, but few have been successful. The failure of measures to prevent *M. arion* from becoming extinct in Britain illustrates well the special problems that arise with insect conservation, and will be described in more detail.

Role of the habitat

Maculinea arion inhabits dry grassland, laying its eggs on Marjoram in warm climates and on Thyme in cooler regions such as Britain. Thorough surveys and monitoring of the British populations began in the late 1940s and have continued ever since, often funded by WWF-UK. By 1961 every colony had been found, but their conservation proved to be extremely difficult. Extinctions had been occurring on British sites for over 150 years. Many losses were caused by the obvious destruction of the habitat, but most extinctions were puzzling because they occurred on sites that still looked as suitable as ever, and contained an abundance of Thyme flowering over large areas, with *Myrmica* ants easy to find. The butterfly was even lost on the five nature reserves that were established to save it.

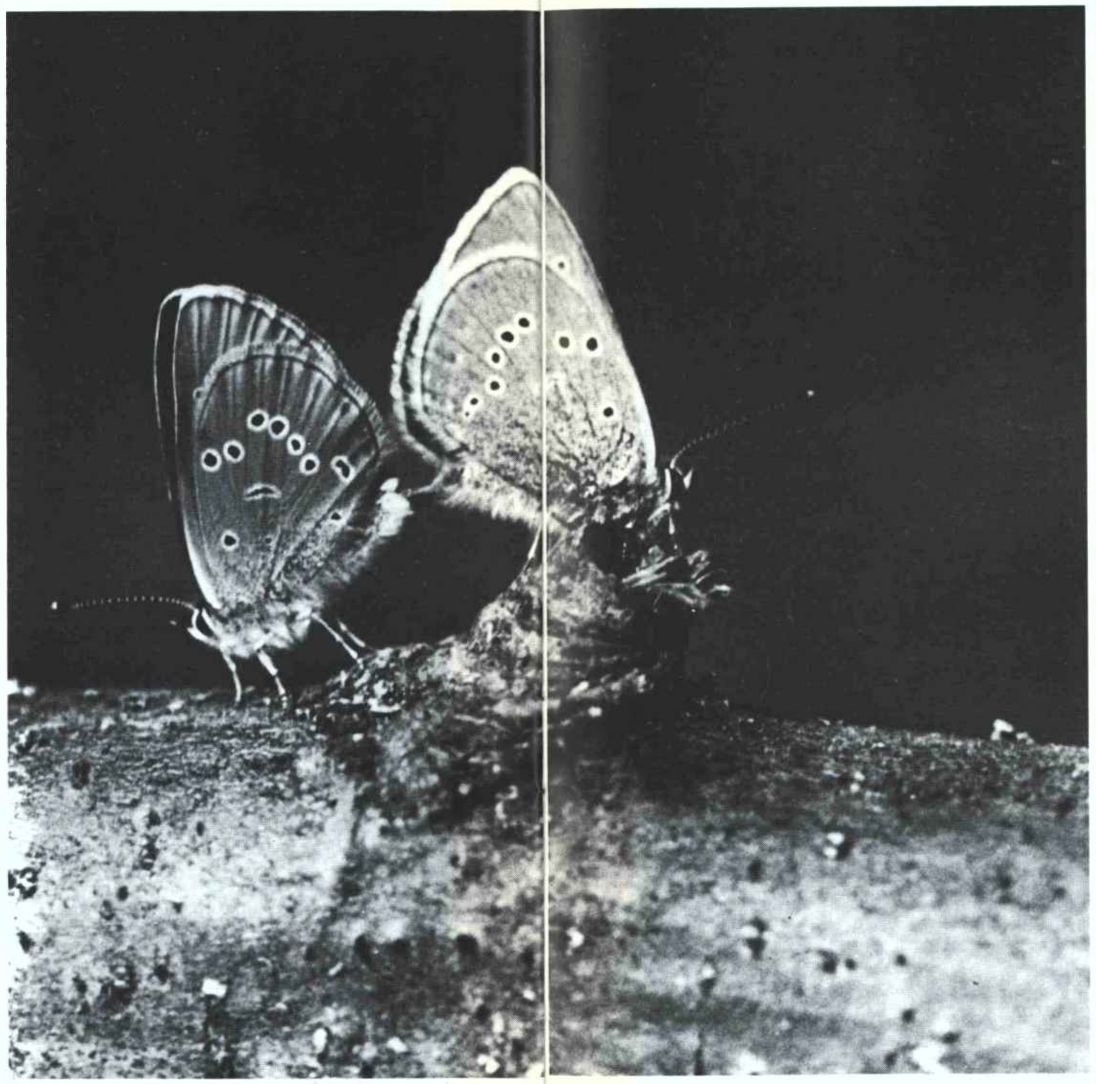
For 45 years, there was much speculation about the causes of *M. arion*'s decline in Britain. Since the habitat usually seemed unchanged, other factors, such as butterfly collectors, the weather, or genetic deterioration through in-breeding, were often blamed, and these hypotheses were used as the rationale for conservation measures. This had disastrous results; for example, one site was obtained as a reserve in the 1920s to protect the colony from butterfly collectors, but, unfortunately, the cattle that grazed the site were also excluded and the colony soon became extinct. Other scientists rightly thought that the habitat had become unsuitable in obscure ways, but they invariably guessed the wrong reasons and great efforts and much money were spent on well-meaning measures that are now known to have been irrelevant or even harmful to *M. arion*'s needs.

Importance of *Myrmica sabuleti*

By 1972, *M. arion* was on the verge of extinction in Britain. It was clear that its requirements had not been correctly guessed, even though the basics of the lifecycle had been known for nearly 60 years. A full-time programme of ecological research was therefore started by the Nature Conservancy, and continued by the Institute of Terrestrial Ecology (ITE). This soon revealed that *M. arion* had more specialised and slightly different requirements than had been suspected. In particular, although up to five species of *Myrmica* ant may inhabit a *M. arion* site, the butterfly survived well only in the nests of one species, *Myrmica sabuleti*. Moreover, very large numbers of this ant must be present on a site, because few nests can support more than one butterfly each. Thyme or Marjoram need not be abundant; merely well enough distributed to be accessible to most ant nests.

It was also found that, in cooler climates, *Myrmica sabuleti* occurs in sufficient abundance to support *M. arion* only on warm slopes where the turf is heavily grazed and trampled, allowing the sun to heat the underground nests. If the turf grows 2-3 cm too tall, *Myrmica sabuleti* deserts its nest and its parasite, the Large Blue, becomes extinct on the site. In contrast, Thyme and other (unsuitable) species of *Myrmica* often flourish in fields that are much too evergrown for *Myrmica sabuleti* and the Large Blue. This is the explanation of most British extinctions, including those that occurred on nature reserves. During this century, farmers have found it increasingly uneconomic to graze unfertilised hills to the required intensity, and most sites have been abandoned. The final wave of extinctions occurred when rabbits were lost due to myxomatosis. Thus, after the 1950s, the specialised conditions needed by this butterfly were unlikely to be produced as a by-product of British agriculture, and its survival as a British species was only likely to occur on nature reserves where its habitat was deliberately maintained. Unfortunately, this did not occur, not because of a lack of will or money, but because it was thought sufficient merely to protect its flower-rich sites from obvious destruction. The exact needs of this butterfly were not discovered until it was too late.

At present, attempts to recreate suitable habitat are being made, and it is hoped that *M. arion* will be re-established in Britain using continental stock. This difficult and expensive project is being undertaken by a consortium of conservation bodies and partly funded by WWF-UK. It would never have been necessary if research into *M. arion*'s needs had begun a few years earlier.



A couple of Lycaena (Photo K. Ross-Jacana)

Decline of other species

The extinction of *M. arion* stimulated a detailed look at Britain's other butterfly species and, very often, a similar situation was found. Most species are in decline due to changes in forestry and agriculture and several species will probably be largely or wholly eliminated from commercial woods and farmland in the foreseeable future. Nature reserves, mainly established to conserve plants, birds and mammals, have provided little protection for local butterflies and other insects. One woodland lost 14 of the 17 local species of butterfly that had inhabited it when it was bought as a reserve, and this is not an isolated case. As with *M. arion*, conservationists had often failed to maintain particular habitat types within nature reserves, and these soon disappeared when site management was changed or ignored. Because they have short life cycles, lay many eggs, and experience large natural mortalities, insect populations react rapidly to changing circumstances. The decline of butterflies on a nature reserve established principally for its plant community is more than a regrettable loss; it should be recognised as a serious warning of gradual change. Perennial plants can withstand adverse conditions for some years whereas annuals may survive as buried seed, but Thyme and many other low-growing plants are eventually shaded out of ungrazed *M. arion* sites just as Milk Parsley (*Peucedanum palustre*) slowly declines in uncut reedbeds in the years after its butterfly, the Swallowtail (*Papilio machaon britannicus*), is lost.

Several studies planned

These lessons are being heeded in Britain where several surveys of local butterflies have been made, and many more are planned, funded by the WWF-UK appeal. A few detailed and several unintensive ecological studies have been made, mainly by ITE scientists. As a result, it now seems that the Heath Fritillary (*Mellicta athalia*) has been saved from the brink of extinction in Britain and that at least five other endangered or vulnerable species can be maintained on nature reserves that were largely established for other groups of wildlife.

Similar projects have begun elsewhere in Europe. Particular attention is being paid to the other species of Large Blue. Using WWF funds, ITE has made a survey of Dusky and Scarce Large Blue colonies in parts of France, and their ecological needs have been studied. Although both butterflies use the same foodplant and often breed together in the same wet fields and marshes, it transpired that each butterfly was using a different species of *Myrmica* ant, and that these ants had different habitat requirements. It should now be possible to conserve both species on Europe's wetland reserves, with very little effort. This is essential, because these beautiful butterflies are unlikely to survive for long on other land. The same is true of *Maculinea alcon alcon*, a butterfly of moist heaths, and, to a lesser extent, of *M. alcon rebeli*. The needs of both species are currently being studied.

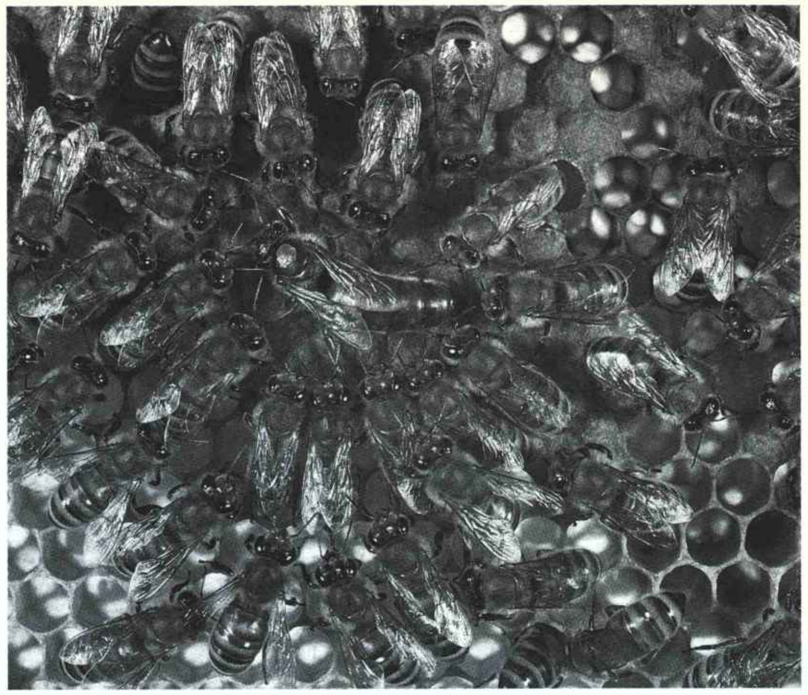
Conclusion

In conclusion, it is true that the limited resources of IUCN and WWF have so far mainly been used for effecting habitat conservation and protecting endangered vertebrate species. At the same time however, IUCN has been acutely aware of the unexpectedly long national lists of threatened insects and other invertebrates that are emerging from many European countries. The IUCN Conservation Monitoring Centre continues to build a computer database on European insects and currently holds over 5,000 records of conservation issues relating to insect species. More Red Data Books will follow in the tradition of the Invertebrate and Swallowtail volumes already produced by the Centre. The network of European WWF offices is taking the lead in notifying conservation problems and effecting recovery programmes for insects, while the IUCN/SSC Specialist Groups serve a vital function in obtaining an overview of European needs and priorities. So far the level of funding for insect projects has been modest, but momentum will gather as the citizens of Europe recognise that many familiar species are on the brink of extinction.

N.M.C. and J.A.T.

An amazing diversity

Ali Demirsoy



The queen holds court
(Photo Anne and Jacques Six)

The biggest prize of the Universal Lottery was possibly won by Earth, about four billion years ago with the creation of the first living being which could multiply by itself. Since then, the tiny ferment branched out, ramified and varied in shape and size. It became the source of many other creatures which could adapt to all kinds of conditions. The insects certainly received the greatest share from the branching and variation. Today we know about 1,200,000 kinds of species, of which 800,000 are insects and the number of species can extend to about 2,000,000 by careful and detailed studies. The great richness in the kinds of living creatures actually represents the richness of nature itself.

Geological considerations

The geological period during which the insects developed the most is the carboniferous age, about which we have learnt from fossil studies. Today we know about 20,000 different fossils of insects. After this period, there was a large differentiation in the order of insects. Their increase in numbers is parallel to the enrichment of the classes of plants, especially the flowering types. The large variety of insects and their evolution, and particularly the evolution of those known as "developed" insects (such as lepidoptera, hymenoptera and diptera) follows closely that of plants and is like a nuclear chain reaction.

One of the most valuable elements in nature

A group of creatures with such a variety necessarily took the suitable place it deserved, adding thus to the basic structure of the fantastic network of life. Even other creatures owe their existence and capacity of fertilisation to the insects' presence. Most plants for instance can only achieve fertilisation through insects. Undoubtedly the marvellous and complicated structure on which life is based has been built, directly or indirectly, by insects. We must admit their important role in life, even if sometimes we cannot see them because of their size or because they adapt and thus hide themselves perfectly in the environment.

Even though some plants multiply vegetatively, the small creatures which carry the pollen from one flower to another serve yet another purpose: they cause genetic variation, i.e. hybridisation, which results in the creation of new plants.

Insect-man

Insects have played an important role in the evolution of humanity and some societies have been greatly influenced by them. In the past mosquitoes, for instance, forced people out from many areas around the Mediterranean now only ruins of ancient cities remain. On the other hand, other insects offer us honey, silk, resins, lacquers, etc. In the cosmetic industry and in histological studies carmine dye obtained from scale insects is used as well as tannin produced with gallflies. Some products derived from insects (such as extracts of *Lytta vesicatoria*) are used by man as medicine. Finally, insects and especially butterflies give us deep pleasure when we observe their beautiful colours and admirable designs.

Out of the 800,000 kinds of insects, 2,000 only are harmful for man directly, while 3,000 of them can harm us indirectly, that is to say that only one out of 160 is harmful. This ratio is probably no greater than that of human beings who may harm others. The fight which man started against the insects, without much thought about the consequences, not only caused many defects in the network of life but also endangers the future of man. The methods we use to destroy some few harmful insects, are wiping out many kinds of other forms of life. Moreover, this has sometimes caused an increase in the population of some other "harmful" species. Together with the plants we harvest we also destroy other plants on which "harmless" insects live. The water species are also being destroyed by pollution.

Today, in many parts of Europe, there is a decrease in the numbers of butterflies and damselflies which used to fill the sky during sunset, of cicadas, the daytime singers and of crickets, the musicians of our evenings. These insects and other forms of wildlife are disappearing because of man's actions Nature is becoming plain, monotonous and lonely with the disappearance of insects.

A.D.

International laws: a worrying insufficiency

H.-E. Back

The national legislation of some countries affords protection to insects whose range is far wider than the area of application of the particular law and which in many cases occur predominantly outside that area. For example, the Federal Republic of Germany's endangered species regulations afford special protection to all European Ascalaphidae (owlflies), Myrmeleonidae (ant lions), Cicadidae (cicadas), Papilionoidea (true butterflies), Sphingidae (hawk or sphinx moths) and other insect groups. Similar legislation exists in other countries. It often happens that species which enjoy no protection in the countries in which they mainly occur are given special protection within the area of application of these laws (e.g. cicadas).

The Washington Convention

"Recognising that wild fauna and flora in their many beautiful and varied forms are an irreplaceable part of the natural systems of the earth, which must be protected for this and the generations to come;" and "that international co-operation is essential for the protection of certain species of wild fauna and flora against over-exploitation through international trade", an international committee meeting in Washington in 1973 drew up a Convention on International Trade in Endangered Species of Wild Fauna and Flora. To date, 87 governments have signed this convention and made it enforceable law in their countries. It is open indefinitely for accession.

The only insects mentioned in Appendix II of the convention are the following butterflies:

Ornithoptera spp.
Trogonoptera spp. } all species of these taxa
Troides spp.
Parnassius apollo

Appendix II includes all species which, although not necessarily now threatened with extinction, may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilisation incompatible with their survival and/or in order that trade in specimens of such species may be brought under effective control.

Article IV of the convention regulates trade in specimens of these species.

EEC regulations

The convention's provisions have been enforceable national law in the EEC member states since 1 January 1984 by virtue of the following special regulations:

Council Regulation (EEC) No. 3626/82 of 3 December 1982 on the implementation in the Community of the Convention on International Trade in Endangered Species of Wild Fauna and Flora

in conjunction with

Commission Regulation (EEC) No. 3418/83 of 28 November 1983 laying down provisions for the uniform issue and use of the documents required for the implementation in the Community of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

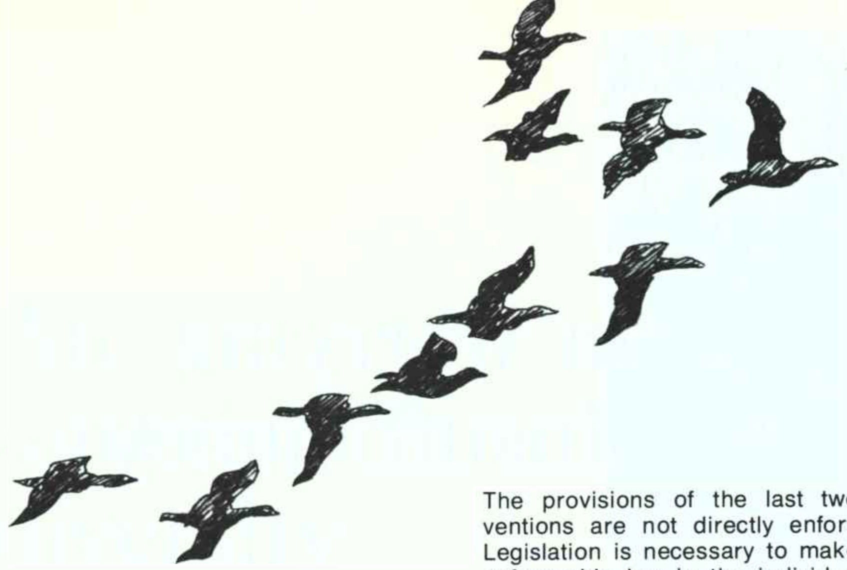
The regulations apply to imports and exports of specimens of listed species (those included in the appendices to the Washington Convention) entering and leaving EEC member states and to trade in, and transport of, specimens of such species within the EEC member states.

The provisions of the convention are actually made stricter because the EEC regulations contain a special provision —Annex 1—under which the butterfly species mentioned are to be treated, from the legal point of view, as species of Appendix I in the Washington classification.

The effect of this is that anyone who imports or exports living or dead butterflies (or part thereof), trades in them or merely transports them within the EEC, must be able to produce certain documents proving that the legal requirements as to the various exceptions have been satisfied.

The exceptions and requisite documents are specified in the regulations (in relation to the Washington Convention).

Danaus plexippus - *the only insect mentioned in the Bonn Convention*
(Photo J.-L. Dubois-Jacana)



Convention of 23 June 1979 on the Conservation of Migratory Species of Wild Animals

The purpose of this convention is "to prevent, reduce or control factors that are endangering or are likely to endanger" migratory species (preamble). One of these factors is "taking" in the broadest possible sense.

Appendix II to this convention lists migratory species which have "an unfavourable conservation status". The only insect mentioned there is *Danaus plexippus*.

Convention of 19 September 1979 on the Conservation of European Wildlife and Natural Habitats

This convention, which is the result of a Council of Europe initiative, is intended both to achieve a greater unity between the member states in the nature conservation field and to show recognition of the fact that "wild flora and fauna constitute a natural heritage of aesthetic, scientific, cultural, recreational, economic and intrinsic value that needs to be preserved and handed on to future generations".

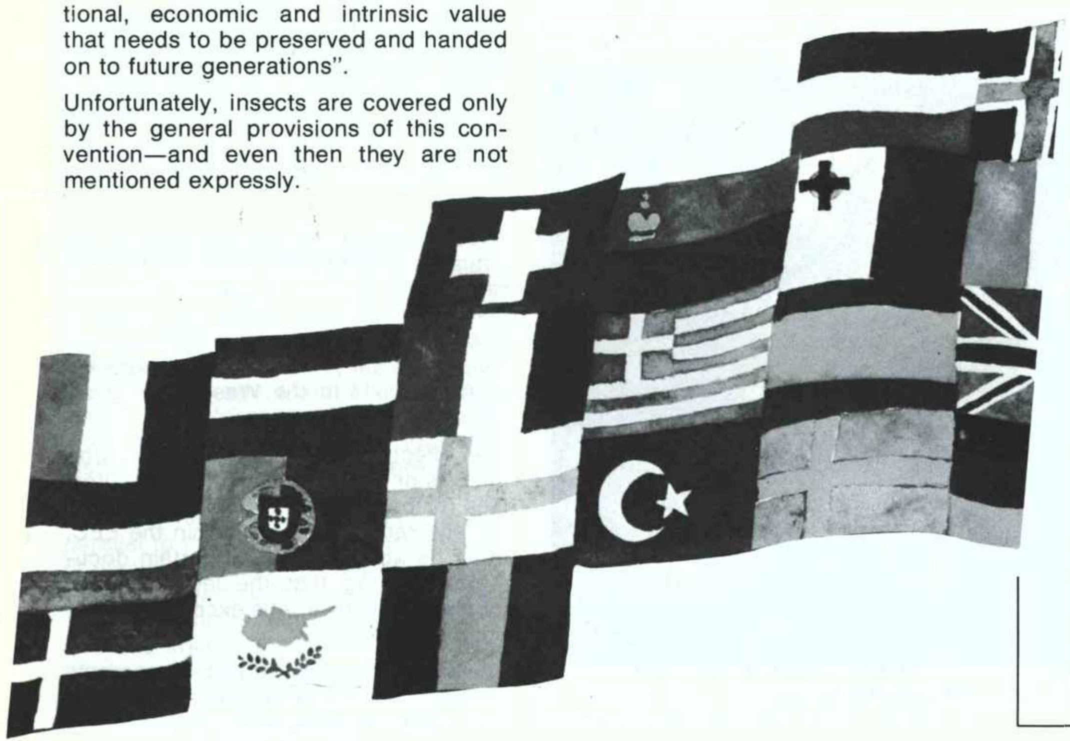
Unfortunately, insects are covered only by the general provisions of this convention—and even then they are not mentioned expressly.

The provisions of the last two conventions are not directly enforceable. Legislation is necessary to make them enforceable law in the individual contracting states.

The last of these conventions shows all too clearly that insects are underrated and indeed disregarded in international law.

Furthermore, the appendices to the Washington Convention are in urgent need of extension—as are national legislative provisions, which, by being brought into line and adjusted to each other can be made into a body of international law.

The "red lists" of endangered plant and animal species which have been drawn up by many countries show both an extremely rapid rise in the degree of danger and an increase in the rate at which populations and species are dying out. This awful realisation should provide the impetus and scientific basis for speedy legislation at national and international level so that the knowledge, convictions and concerns expressed in the preambles to the conventions can be translated into action and do not remain mere words. H.-E.B.



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