

E.7. INVERTEBRATES

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E.7.1. Introduction

The number of invertebrate species occurring in Greece is unknown today although it is estimated to be between 20 and 30 thousand. This is due to the fact that the fauna of Greece has been studied sporadically mainly by foreign researchers and also because the literature is scattered in different places.

The number of the invertebrate species of Greece is high in relation to its area. It is unknown though, how many and which invertebrate species of Greece are threatened with extinction. It is probable that at least 10% of the invertebrates of Greece, that is 2-3000 species, are in danger of extinction in the next few years if immediate measures for their protection are not taken.

Certain threatened invertebrates in Greece may have very limited distribution areas while others may have a wide distribution, outside the borders of Greece, but may occur in Greece in small and scattered populations. The habitats which host threatened species are numerous and have certainly not been studied sufficiently. Habitats with sensitive to threats invertebrate fauna are the caves which host very specialized species with small populations. Other habitats rich in invertebrate fauna are wetlands and fresh waters where elevated productivity supports high number of species. An example of threatened species in these areas are dragonflies. Other areas with fauna sensitive to threats are the sand dunes hosting representative species, and old forests that are burned or cut for exploitation hosting many central European or Mediterranean species such as the Coleoptera *Cerambyx cerdo*, *Rosalia alpina* and *Lucanus cervus* (Legakis 1989). Finally, areas where the traditional type of agricultural practice that was applied for many years has been replaced today by mechanization and the use of chemicals. The various butterfly species are characteristic examples of these areas (Heath 1981). *Turanena spp.*, *Lysandra philippe* (which is endemic of Greece) and *Pseudochazara orestes* are few examples of the butterfly species considered as endangered. The marine habitats with hard substrate, have special interest since they host many invertebrates such as sponges, cnidozoans, polychetes, molluscs, crustaceans and echinoderms. The seabeds of the marine phanerogame *Posidonia oceanica* which is a habitat sensitive to pollution, also host a specialized invertebrate fauna which is continuously shrinking along with it.

The population status of threatened invertebrates is also very little known. For some narrow endemic species we know that only a few hundred individuals may exist. The knowledge on the populations of some other species, is restricted to the fact that they are continuously in decline. No data exist about many species for which we have to suppose that they are declining, based on their ecology and the threats they face.

The main threat of the invertebrate populations is the destruction of their habitats. Apart from the destruction of their natural environment, invertebrates suffer from the direct

interference of man. There are also many invertebrate species that are collected either for consumption or for trade.

The protection of the invertebrates in Greece may be considered insufficient. A number of invertebrates are protected by Presidential Decree 67/81. It is prohibited to collect, kill, harm, damage, own, preserve, buy, sell, transport or export these species. Moreover, the list of species protected by this Decree is unbalanced and incomplete.

Twenty four invertebrate species that have been recorded in Greece are included in the Bern Convention. Greece has also ratified the CITES that restricts trade of threatened species such as the butterfly *Parnassius apollo*. Finally, mention must be made to some seasonal restrictions of the Greek law to fishing or collection of invertebrates such as lobsters and snails.

The species that occur in National Parks and other protected areas are also protected. However, as they have not been inventoried there are no specific measures for their conservation.

The public is almost unaware of the significance of the invertebrates. Even school textbooks make little mention to invertebrates and there are people responsible for decision making not well informed. The public either consider them harmful or annoying (butterflies excepted) or their presence or the possibility of their extinction is indifferent to them.

E.7.2. General comments

The number of invertebrate species (including invertebrate chordates) recorded in the proposed Sites of Community Importance (SCI) is 969, 12 of which are listed in Annex II to the Habitat directive and 957 are recorded as Other Important Species in the database.

Only four taxonomic groups are included in Annex II to Directive 92/43/EEC. These are Mollusca Bivalvia (1 sp.), Odonata (2 spp.), Lepidoptera (4 spp.) and Coleoptera (5 spp.). Among them, 1 lepidopteran and 2 coleopteran species are priority species. The Annex II invertebrates have been recorded from 68 (25%) sites. The percentage of occurrence of each order in the NATURA 2000 sites is shown in figure E.23. None of the Annex II species is endemic to Greece. Most of the species (4 Coleoptera, 3 Lepidoptera and 2 Odonata) are protected by international conventions while one of the Coleoptera is protected by the national legislation. The mean number of the Annex II invertebrate species per site where they occur ranges from 1 to 2 (Fig. E.24).

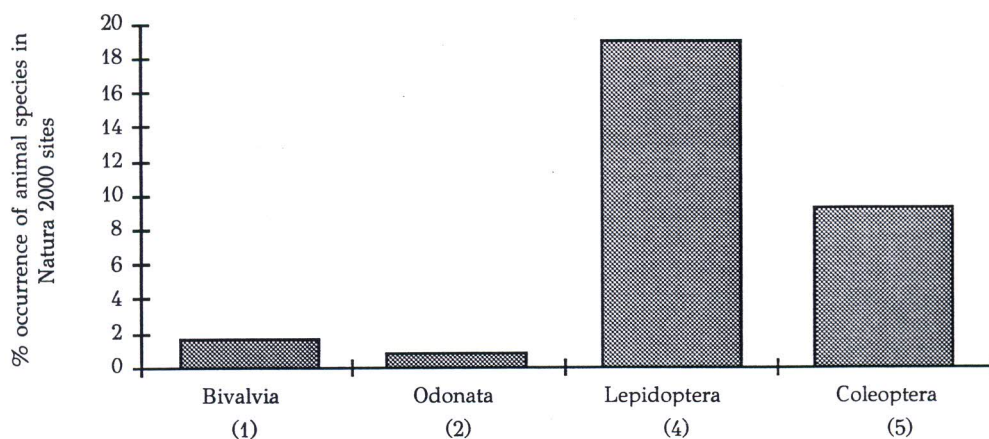


Fig. E.23. Percentage of occurrence of each invertebrate group of Annex II to Directive 92/43/EEC in the "Natura 2000" sites in Greece. The number of species belonging to each invertebrate group is indicated in brackets.

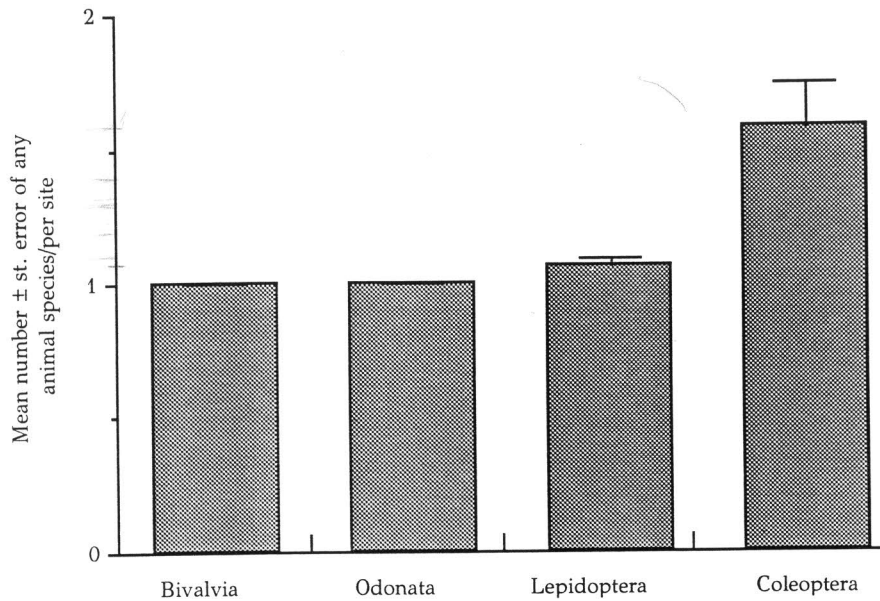


Fig. E.24. Mean number (± st. error) of Annex II to Directive 92/43/EEC invertebrate species per site where they occur for each invertebrate group.

The other important invertebrates (including invertebrate chordates) are distributed in 7 phyla that include 14 classes with a total of 22 orders. The largest class, the insects, includes representatives of 7 orders. The majority of species belong to the orders of Coleoptera, Gastropoda, Lepidoptera, Orthoptera and Isopoda (Fig. E.25). These groups although are not necessarily the most abundant in species numbers in Greece, they comply with the criteria for inclusion of the species in the database (motivations A, B, C, and D)

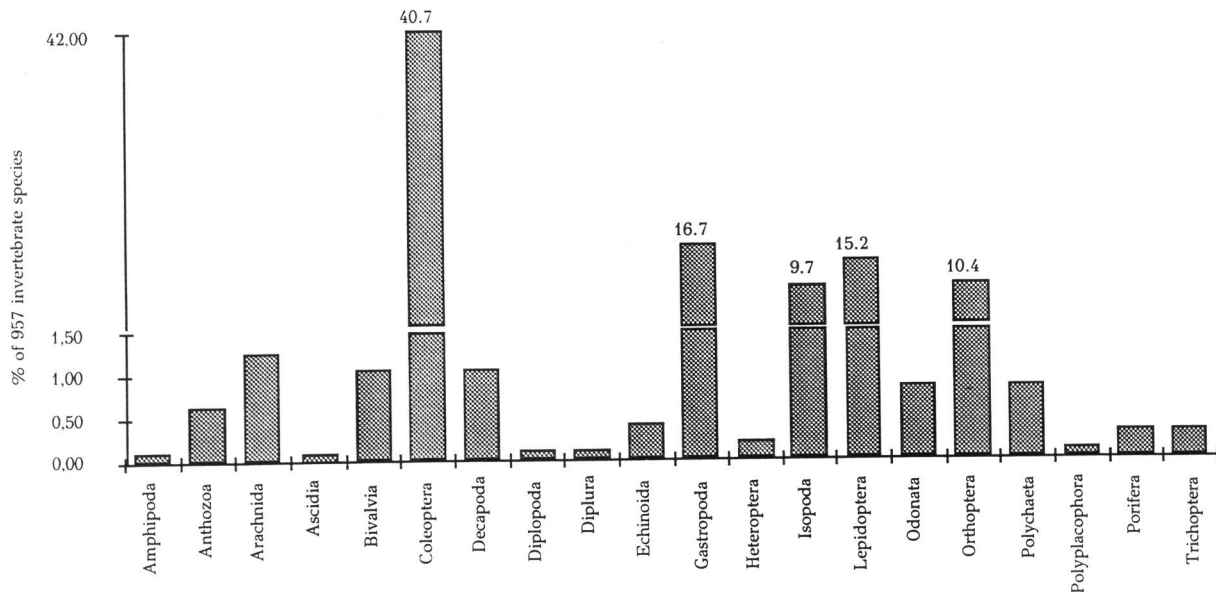


Fig. E.25. Percentage of each group of the other important invertebrate species (including invertebrate chordates) recorded in "Natura 2000" sites in Greece.

The 957 other important invertebrate species are found in 220 (80%) of the proposed Sites of Community Importance. As expected, the five most abundant groups are found in most of the sites (Fig. E.26). The mean number of invertebrate species per site where they occur, ranges from 1 to 8 with Polychaeta, Gastropoda, Coleoptera, and Lepidoptera being the most abundant (Fig. E.27).

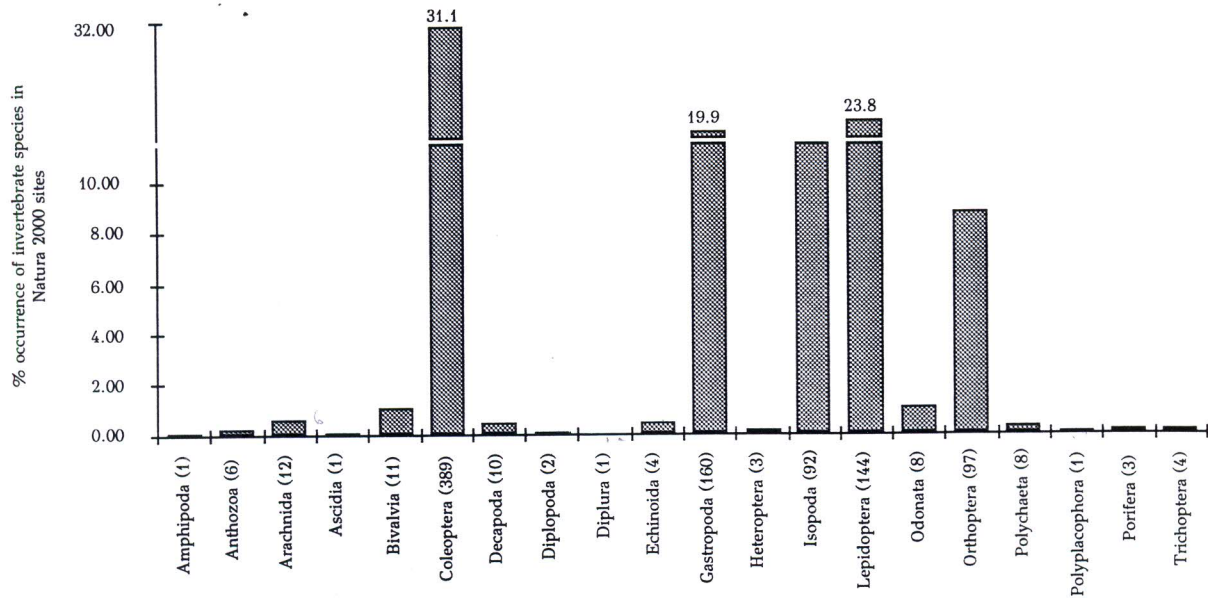


Fig. E.26. Percentage of occurrence of each group of the other important invertebrate species (including invertebrate chordates) in the "Natura 2000" sites in Greece.

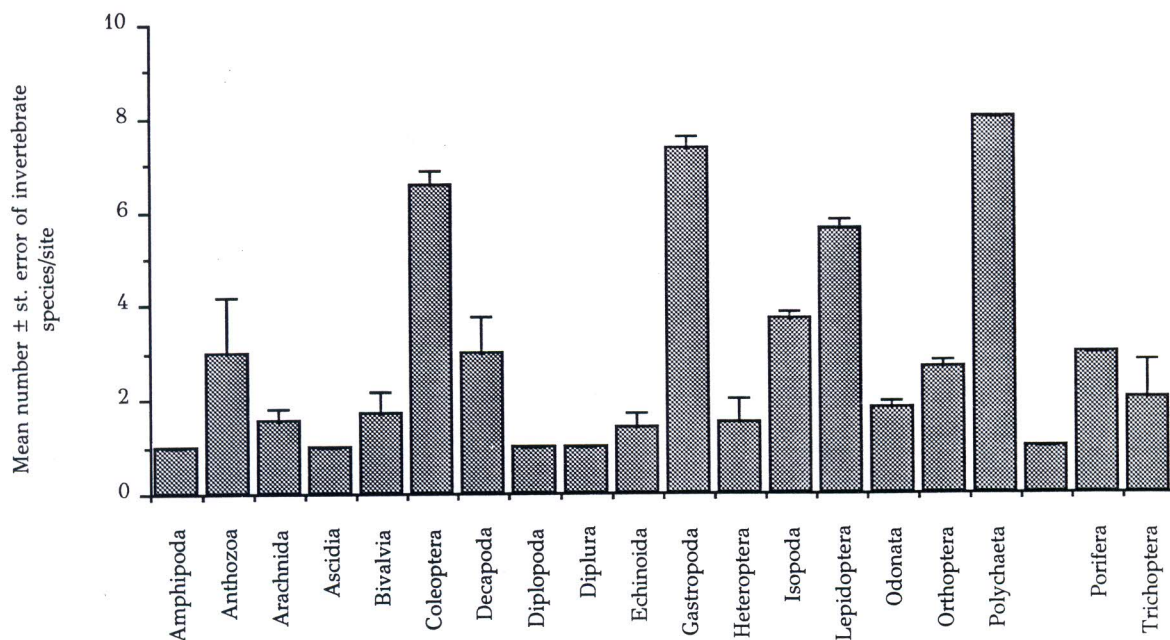


Fig. E.27. Mean number (\pm st. error) of each group of invertebrate species per site where they occur.

The majority of species (78.3%) are endemic to Greece. The order with most of the endemics is Coleoptera followed by Gastropoda, Orthoptera and Isopoda (Fig. E.28). The Lepidoptera do not have many endemic species but have many species that are considered as threatened at European level. The number of species protected by international and national legislation is very low. Only 1.6% are protected by international conventions and 6.7% by national legislation.

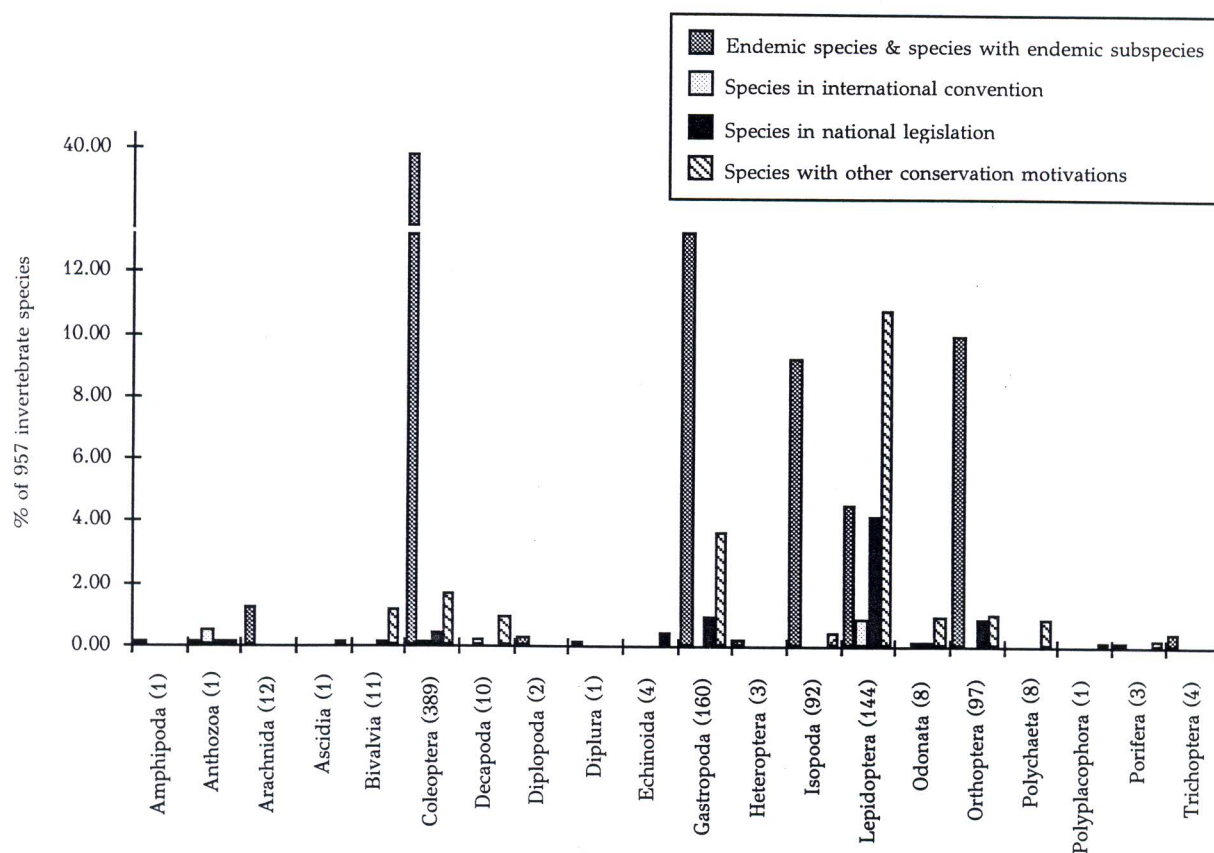


Fig. E.28. Percentage of each group of the other important invertebrate species (including invertebrate chordates) recorded in "Natura 2000" sites in Greece, according to their conservation motivation (Endemic species, species in international legislation, species in national legislation, species with other conservation motivations).

The number of investigated sites per zoogeographical region, the percentage of animal groups and species of Annex II per region and the percentage of animal groups and other important species per region are shown in figures E.29 and E.30 respectively.

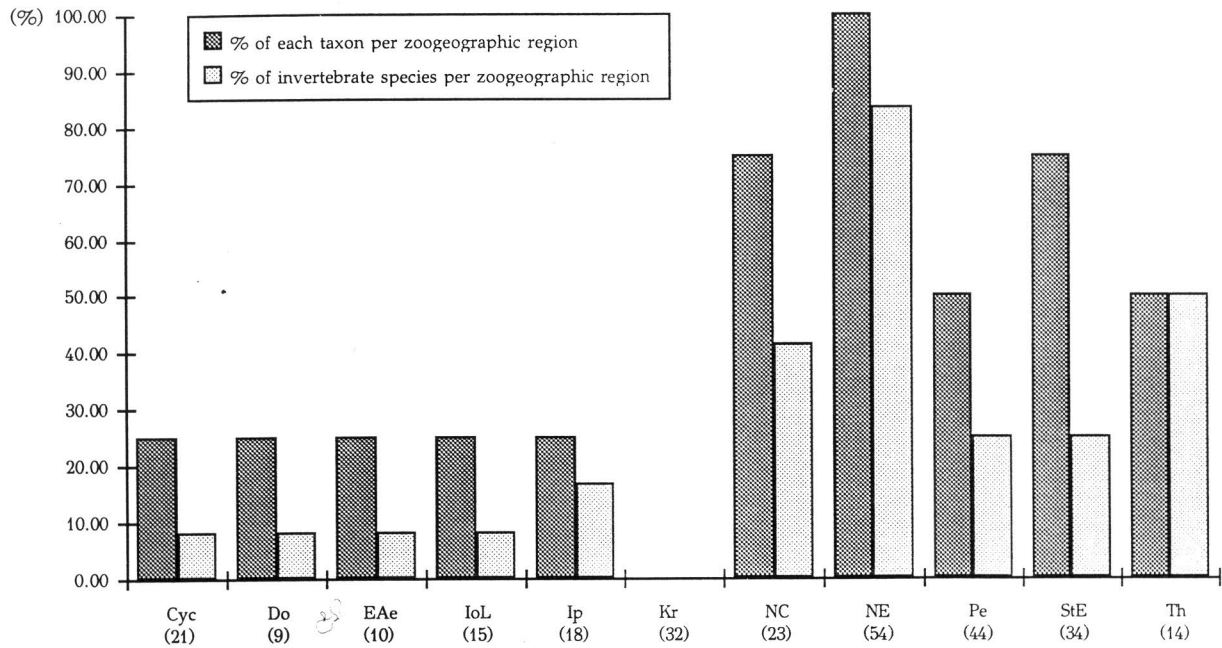


Fig. E.29. Frequency of occurrence of invertebrate groups and species of Annex II to Directive 92/43/EEC according to the zoogeographical regions. The number of the "Natura 2000" sites included in each zoogeographical region is indicated in brackets. (Kyk: Kyklades, Do: Dodekanisa, Vai: Voreio Aigaio, Ion: Ionia nisia, Ip: Ipeiros, Kr: Kriti, VDE: Voreia Dytiki Ellada, VAE: Voreia Anatoliki Ellada, Pe: Peloponnisos, StE: Sterea Ellada, Th: Thessalia)

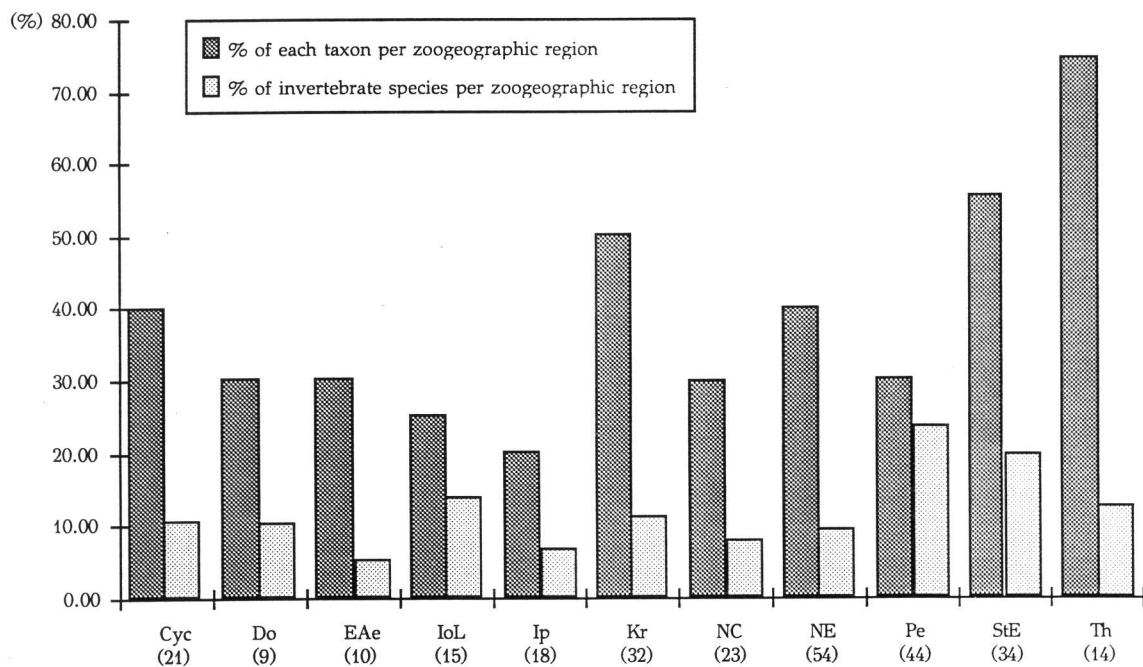
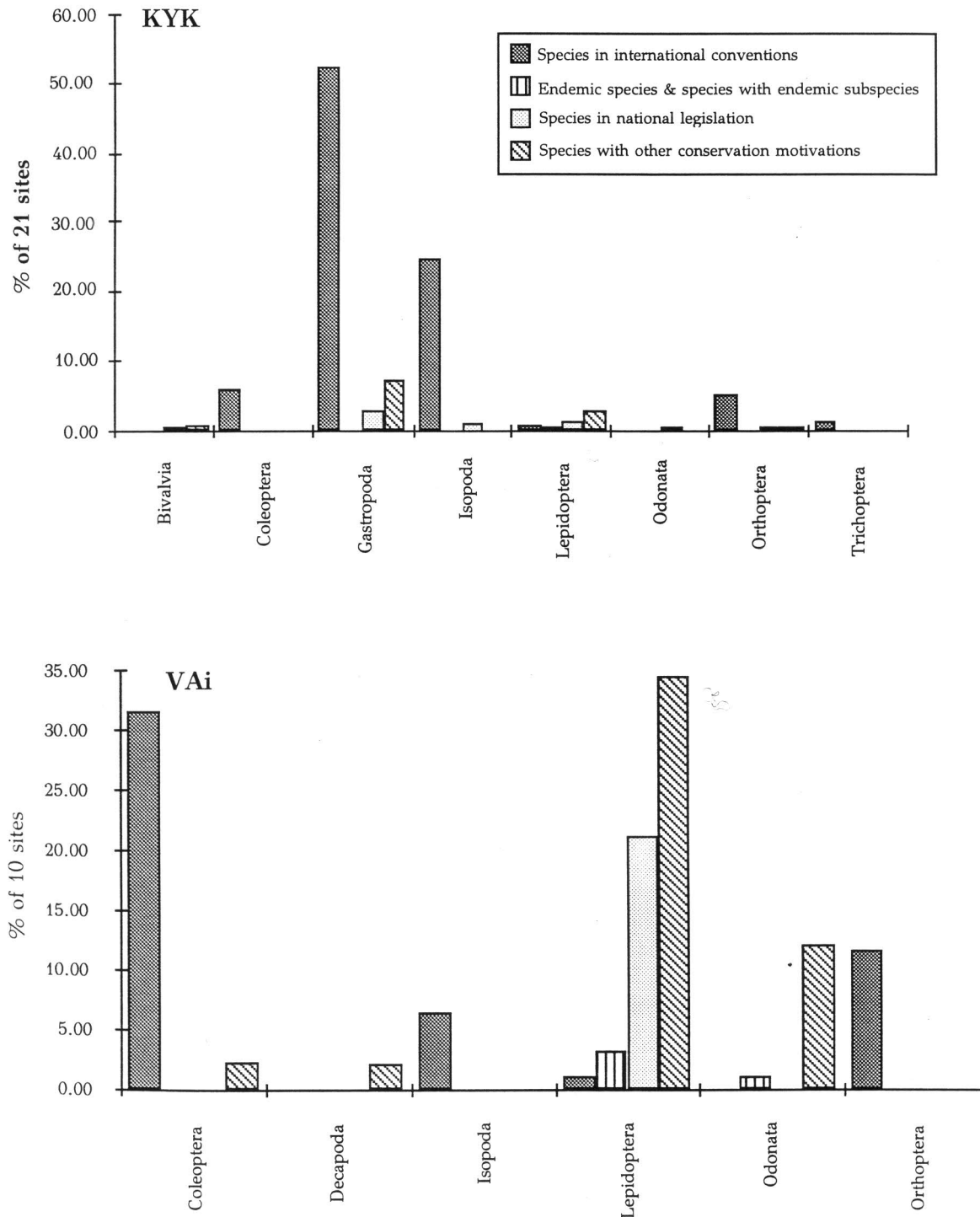
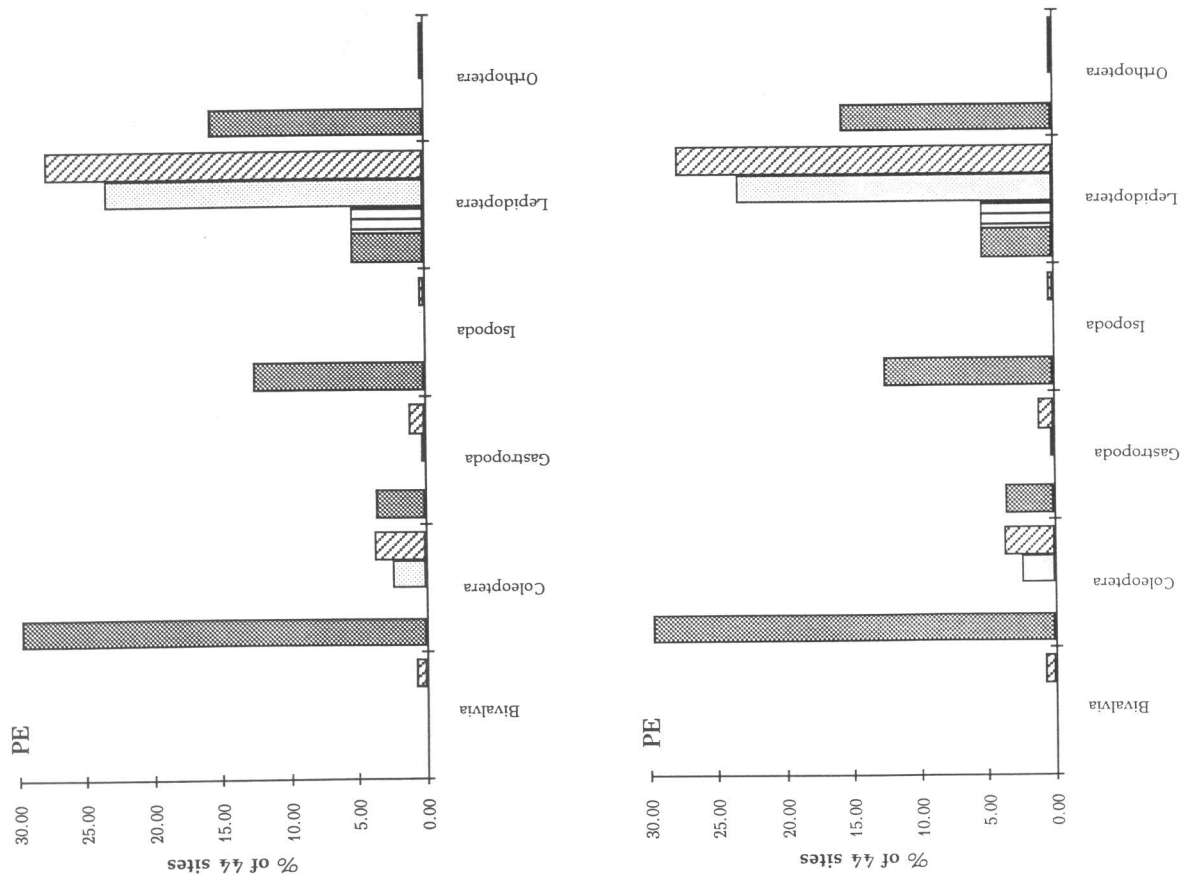
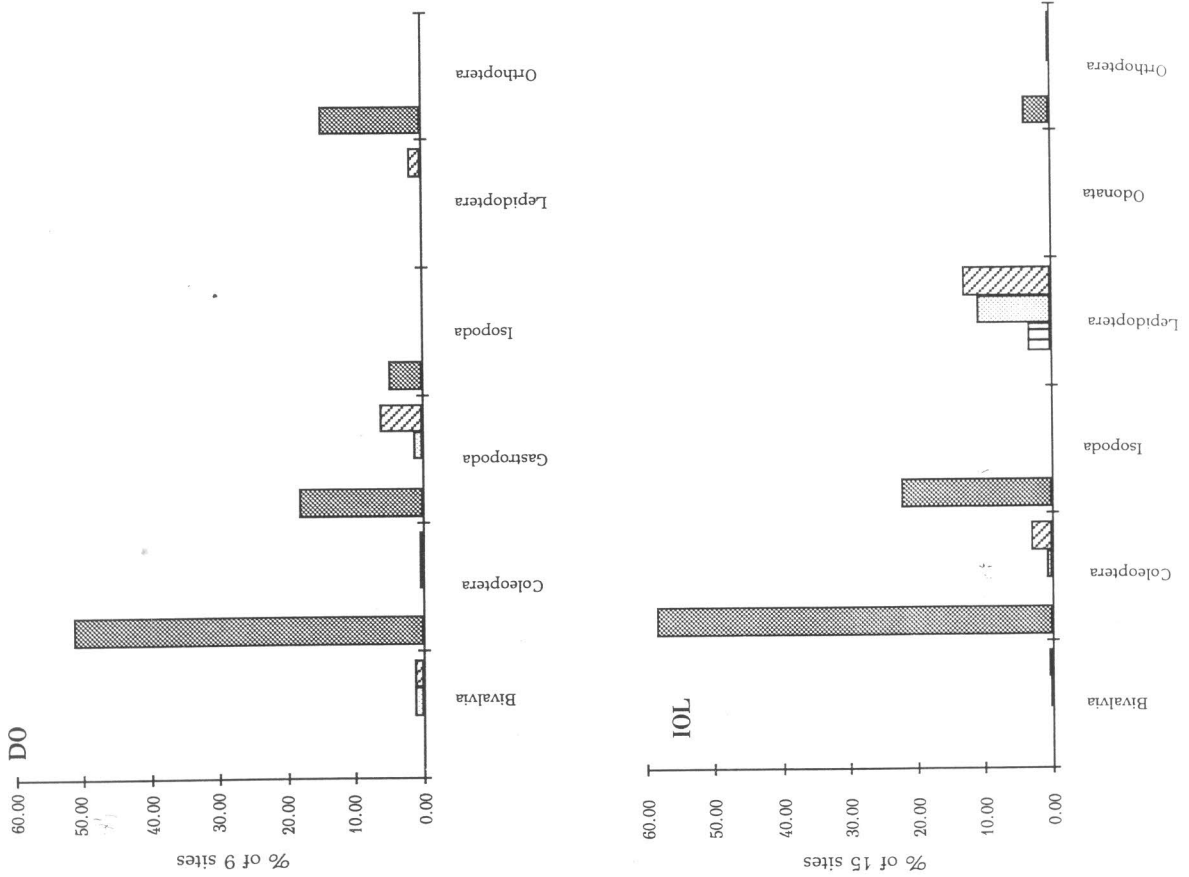
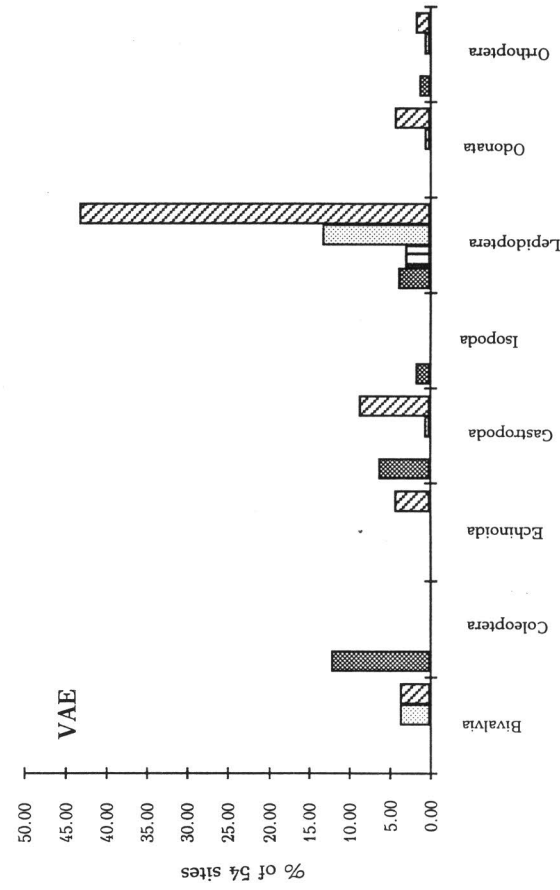
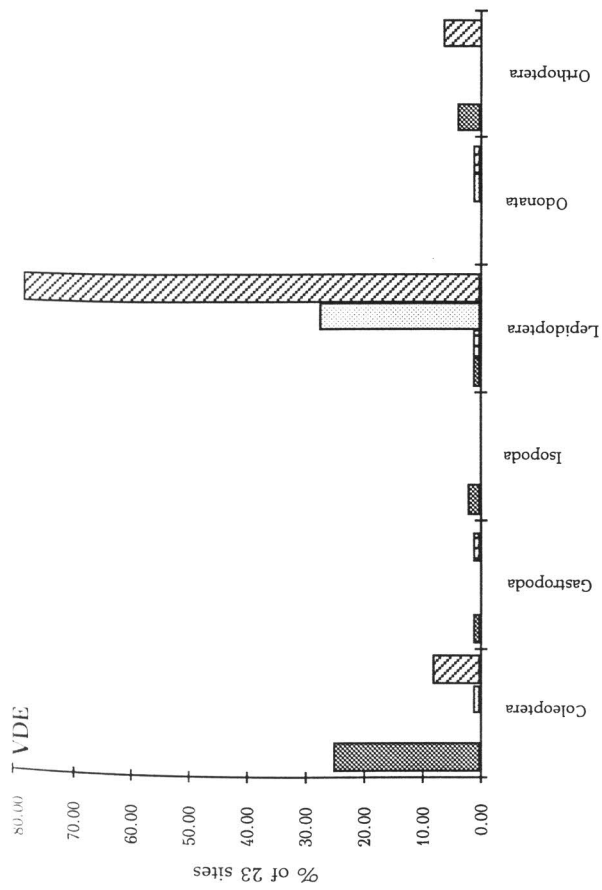
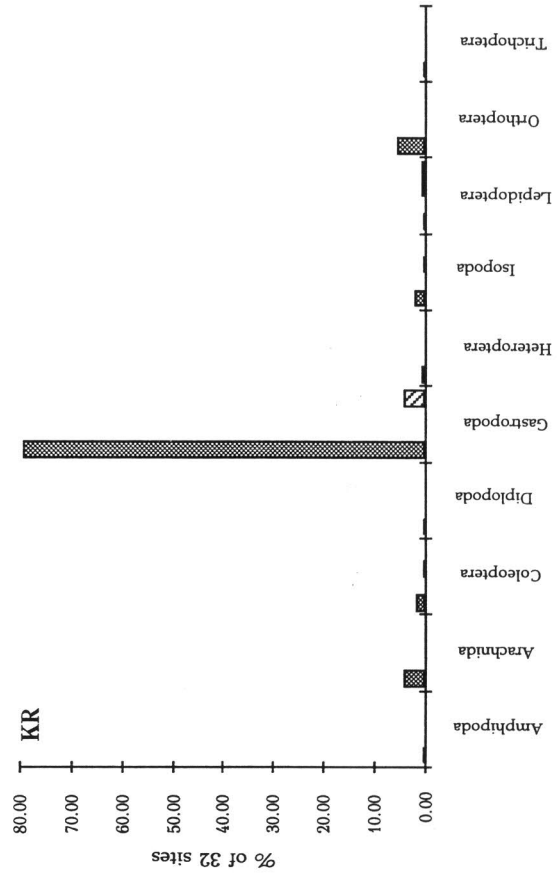
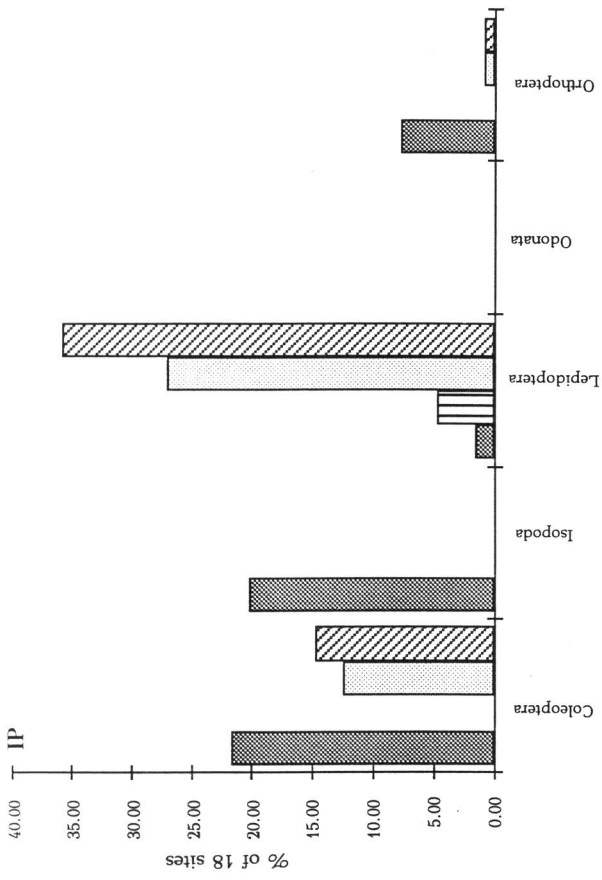


Fig. E.30. Frequency of occurrence of other important invertebrate groups and species according to the zoogeographical regions. The number of the "Natura 2000" sites included in each zoogeographical region is indicated in brackets.

The frequency of occurrence of each group by motivation category per zoogeographical region is shown in figure E.31. A large proportion of endemic Coleoptera is found in most regions, Voreia Dytiki Ellada (VDE), the Kyklades (Kyk) and Kriti (KR) excepted. Although it is known from the literature that the last two regions have a high number of endemic Coleoptera this is not depicted here. Large proportion of endemic Gastropoda have been recorded from the Kyklades (Kyk) and Kriti (KR), both regions well known for their high number of endemic terrestrial snails. Most endemic Isopoda were recorded from the Kyklades (Kyk). On the other hand, most of the internationally threatened Lepidoptera were recorded in the Voreio Aigaio islands (VAi), in the whole of Voreia Dytiki Ellada (VDE).







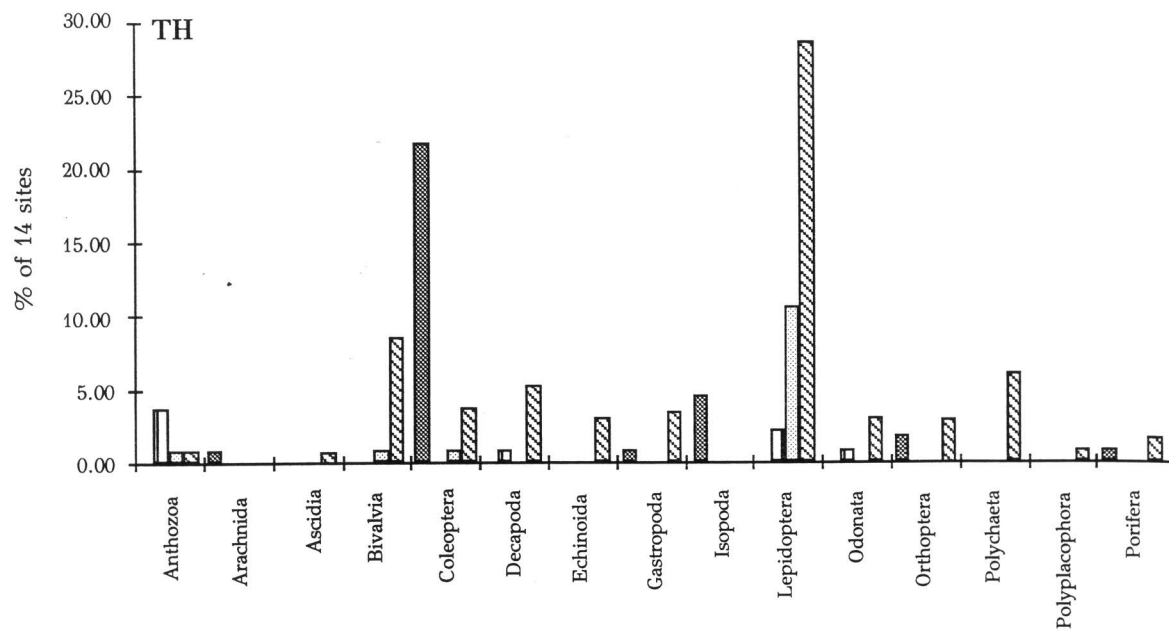


Fig. E.31. Frequency of occurrence of each group of the other important invertebrate species per zoogeographical region.

Selected references:

Heath, J. 1981. Threatened Rhopalocera (butterflies) in Europe. Council of Europe 158 p.

Legakis, A. 1989. The status of the Bern invertebrates in Greece. Coll. The Bern Convention Invertebrates and their Conservation. Council of Europe 17-19 p.

E.7.3. Invertebrates of Greece listed in Annex II to Directive 92/43/EEC

Osmoderma eremita (Scopoli, 1763)

Class Insecta, Order Coleoptera, Family Scarabaeidae

Description: The form, size and coloring of this beetle make it quite unmistakable. It is 24-30 mm long, heavily built with powerful legs, black or dark brown all over (Collins & Wells 1987).

Ecology and habits: Adults can be found on flowers between May and September. They usually fly in the evenings. Very localized. Adults supposedly smell like Russian leather, hence their scientific name. Larvae live in the wood mould of old deciduous trees. Development takes several years (Collins & Wells 1987, du Chatenet 1986).

Distribution: Recorded sporadically only in northern Greece.

Occurrence in proposed Natura 2000 sites:

NUTS I	NUTS II	SITE CODE	DESIGNATION TYPE
Voreia Ellada	Thessalia	GR1420001	Game Refuge 6%, IBA

Status and reasons for decline: *O. eremita* has suffered from the destruction or intensive management of ancient woodlands.

Conservation measures taken: It is protected by the Bern Convention (Appendix II).

Selected references:

- Collins, N.M. and S.M. Wells. 1987. Invertebrates in need of special protection in Europe. Council of Europe, Nature and Environment Series No. 35. 162 p.
 du Chatenet, G. 1986. Guide des Coleopteres d'Europe. Delachaux & Niestle. 480 p.

Cerambyx cerdo (Linnaeus, 1758)

Class Insecta, Order Coleoptera, Family Cerambycidae

Description: One of Europe's largest insects, adults being 24-53 mm long, with even longer antennae. The larvae can reach 8 cm in length and bear galleries 2 cm in diameter (Collins & Wells 1987).

Ecology and habits: Adults are active between May and August, mainly in the evenings and at night on the trunks of old oaks (rarely other trees). Larvae develop for 3-5 years in oak, where they penetrate to the heart-wood rendering it useless as timber (Collins & Wells 1987).

Distribution: Recorded in several localities of northern Greece.

Occurrence in proposed Natura 2000 sites:

NUTS I	NUTS II	SITE CODE	DESIGNATION TYPE
Voreia Ellada	Kentriki Makedonia	GR1220007	IBA, Ramsar 12%
	Thessalia	GR1410001 GR1420003	Controlled hunting area 80 %, Aesthetic Forest 100%, IBA

Selected references:

Collins, N.M. and S.M. Wells. 1987. Invertebrates in need of special protection in Europe. Council of Europe, Nature and Environment Series No. 35. 162 p.

Morimus funereus Mulsant, 1863

Class Insecta, Order Coleoptera, Family Cerambycidae

Description: A handsome species, robustly built, 20-38 mm long, grey-black with black spots on the elytra (Collins & Wells 1987).

Ecology and habits: Larvae feed on dead wood of a number of tree species including *Populus*, *Fagus*, *Quercus*, *Castanea* and occasionally *Abies* sp. Flightless adults found in May and June on tree stumps, trunks and old wood (Collins & Wells 1987).

Distribution: Recorded in several localities of northern Greece.

Occurrence in proposed Natura 2000 sites:

NUTS I	NUTS II	SITE CODE	DESIGNATION TYPE
Voreia Ellada	Kentriki Makedonia	GR1260001	Game refuge 1%, Ramsar 100%, IBA, SPA
		GR1210001 GR1220007	Game refuge 43%, Game breeding station 5% IBA, Ramsar 12%
	Dytiki Makedonia	GR1340001	Game refuge 18%, Core strict of National Park 25%, Perih. zone 75%, IBA, Ramsar 25% Biogenetic reserve 1%
Thessalia		GR1420003	Controlled hunting area 80%, Aesthetic Forest 100%, IBA
		GR1420001	Game refuge 6%, IBA

Selected references:

Collins, N.M. and S.M. Wells. 1987. Invertebrates in need of special protection in Europe. Council of Europe, Nature and Environment Series No. 35. 162 p.

Rosalia alpina (L., 1758)

Class Insecta, Order Coleoptera, Family Cerambycidae

Description: A very attractive beetle with a distinctive light blue pubescence over a large part of its body and very long antennae (Collins & Wells 1987).

Ecology and habits: From June to September the beetles can be seen in the daytime on standing or felled beech trees, sometimes on flowers. Larvae develop in the wood of diseased beeches, but occasionally also in other deciduous trees such as maples (Collins & Wells 1987).

Distribution: Recorded from several localities in northern and central Greece.

Occurrence in proposed "Natura 2000" sites:

NUTS I	NUTS II	SITE CODE	DESIGNATION TYPE
Voreia Ellada	Kentriki Makedonia	GR1210001	Game refuge 43%, Game breeding 5%
		GR1420003	Controlled hunting area 80%, Aesthetic Forest 100%, IBA
	Thessalia	GR1420001	Game refuge 6%, IBA

Selected references:

Collins, N.M. and S.M. Wells. 1987. Invertebrates in need of special protection in Europe. Council of Europe, Nature and Environment Series No. 35. 162 p.

Lucanus cervus (Linnaeus, 1758)

Class Insecta, Order Coleoptera, Family Lucanidae

Description: The male has characteristic huge mandibles which are used to fight rival males in the breeding season. Coloration black with brown mandibles, anterior margin of the head and elytra. Female similar, sometimes almost black. Size variable, 25-85 mm (Chinery 1986, du Chatenet 1986).

Ecology and habits: Found on trunks and branches in broad-leaved forests and parks with ancient trees from mid April till September. The adults fly well, usually in the evening feeding on sap oozing from trees. Larvae develop in cavities of dead wood of *Quercus*, *Fagus*, *Salix*, *Populus*, *Tilia*, *Aesculus* and fruit trees. Development lasts 4 or 5 years. (Koomen & van Helsdingen 1993, Chinery 1986, du Chatenet 1986).

Distribution: Recorded from many localities in northern, central and southern mainland Greece.

Occurrence in proposed "Natura 2000" sites:

NUTS I	NUTS II	SITE CODE	DESIGNATION TYPE
Voreia Ellada	Anatoliki Makedonia, Thraki	GR1130009	Game refuge 21%, IBA, Ramsar, SPA
		GR1140001	Natural monument 55%, Game refuge 100%, IBA, SPA, Biogenetic reserve 55%
	Kentriki Makedonia	GR1260001	Game refuge 1%, Ramsar, IBA, SPA
		GR1270005 GR1270002	Game refuge 64% IBA
Dytiki Makedonia	GR1340001	Core strict of National Park 25%, Game Refuge 18%, IBA, Periph. zone 75%, SPA, Ramsar, Biogenetic reserve 1%	
Thessalia	GR1420001	Game refuge 6%, IBA	
	GR1430001	Game refuge 20%, IBA	
	GR1410001		
Kentriki Ellada	Sterea Ellada	GR2450005	Aesthetic Forest 1%, Core strict of National Park 20%, Game refuge 58%, IBA, SPA 20%
		GR2420001	IBA
	Peloponnisos	GR2550006 GR2550002 GR2550001	Game refuge 3%, IBA

Selected references:

- Chinery, M. 1986. Collins guide to the insects of Britain and western Europe. Collins. 320 p.
 du Chatenet, G. 1986. Guide des Coleopteres d'Europe. Delachaux & Niestle. 480 p.
 Koomen, P. and P.J. van Helsdingen. 1996. Listing of biotopes in Europe according to their
 significance for invertebrates. Council of Europe, Nature and Environment No 77, 74 p.

Callimorpha quadripunctaria (Poda, 1761)

Class Insecta, Order Lepidoptera, Family Arctiidae

Synonyms:

- Euplagia quadripunctaria* (Poda, 1761)
Panaxia quadripunctaria (Poda, 1761)
Callimorpha hera L., 1767

Infra-specific taxa:

- Callimorpha quadripunctaria rhodosensis* (Daniel, 1953)
Callimorpha quadripunctaria fulgida Oberthur, 1896

Description: The adult is brightly colored with striped black and cream white forewings and bright red to orange hindwings with black spots. The larva is black with a broad yellow stripe on the back and pale spots on the sides. (Chinery 1986).

Ecology and habits: Mainly in evergreen riparian forests and maquis. Found in narrow valleys with streams bordered by mountains or hills with steep sides and fully covered with trees and shrubs. All habitats are characterized by lower temperature and higher humidity compared to the conditions outside the valleys. During summer, the insects migrate to the most humid and cool valleys of the area where they aestivate. They disperse again in autumn to their original valleys for oviposition. During summer, the insects are found at high densities (up to 50-100 ind./sq.m.) on the trunks, branches and leaves of the trees and on humid rocks, migrating during the night towards higher positions on the canopy.

Oviposition occurs in the autumn, probably from late September till well into November at various suitable sites. The development of the eggs lasts from 8 to 15 days. The larval stage lasts 6 months. The pupal stage lasts about 1 month. The adults emerge around May and migrate until June to the most humid and cool site of the region where they aestivate without feeding. During September, they mate and then disperse to oviposit and then die.

The larvae feed on a variety of plants: Rosaceae, *Platanus orientalis*, *Vitis*, *Morus*, *Robinia*, *Castanea*, *Pisum sativum* and many others.

There are no significant predators of the adults due to the presence of repellent chemicals. There are no data on larval predation and mortality.

Distribution: In Greece the species has been recorded everywhere on the mainland and in all the island groups: Ionian, Aegean and Crete. On several sites there are no post-1950 records because of under-exploration. The subspecies *C. quadripunctaria rhodosensis* has been recorded only from the island of Rodos (Dodecanese islands Greece).

Occurrence in proposed "Natura 2000" sites:

NUTS I	NUTS II	SITE CODE	DESIGNATION TYPE
Voreia Ellada	Anatoliki Makedonia, Thraki	GR1110004	
		GR1150003	Game refuge 20%
	Kentriki Makedonia	GR1240003	Game refuge 13%
Kentriki Ellada	Peloponnisos	GR2320003	Game refuge 27%, IBA
		GR2540001	Game refuge 13%, IBA
		GR2320008	Game refuge 5%, Game breeding station 1%
		GR2520001	Game refuge 2%
		GR2540003	IBA
		GR2520002	IBA
		GR2530003	
		GR2540004	IBA
		GR2510003	
	GR2550006	Game refuge 3%, IBA	
Ionia Nisia		GR2230002	Game refuge 5%
		GR2230003	
		GR2230001	
Nisia Aigaïou, Kriti	Voreio Aigaio	GR4120002	Game refuge 27%
		GR4120003	IBA
		GR4120004	IBA

NUTS I	NUTS II	SITE CODE	DESIGNATION TYPE
		GR4130001	Game refuge 8%
	Notio Aigaio	GR4220011 GR4220014 GR4220016 GR4220001 GR4210008 GR4210007 GR4210006	Game refuge 24% Game refuge 2%, IBA Game refuge 20%, IBA Game refuge 17%

Selected references:

- Chinery, M. 1986. Collins guide to the insects of Britain and western Europe. Harper Collins Publ., 320 p.
- Legakis, A. 1996. *Callimorpha quadripunctaria*. In: van Helsdingen P.J., L. Willemse and M.C.D. Speight (eds.). Background information on Invertebrates of the Habitat Directive and the Bern Convention Part I: Crustacea, Coleoptera and Lepidoptera. Council of Europe, Nature and Environment, No 79. 90-92 p.