

# BOOK OF ABSTRACTS



**7th INTERNATIONAL CONGRESS ON THE ZOOGEOGRAPHY AND ECOLOGY  
OF GREECE AND ADJACENT REGIONS**

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# **7<sup>th</sup> International Congress on the Zoogeography and Ecology of Greece and Adjacent Regions**

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## PLENARY LECTURES

### PHYLOGENETIC ASPECTS OF ISLAND AND MOUNTAIN DISTRIBUTIONS

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Phylogenetic information enables historical aspects of insular biotas to be better understood. The minimum number of colonisations can be estimated and regular and random colonisation patterns distinguished from each other. Ancient lineages that are now confined to islands may be recognisable, which has relevance in assessing their conservation status. It is also possible to separate likely island adaptations from primitive features that are now unique to islands and then subject them to comparative and functional test. Sometimes phylogenies allow evolutionary rates on islands and mainlands to be compared and development of community structure within islands reconstructed.

Mountain distributions are also illuminated by phylogenetic hypotheses. For instance, montane relicts originating from change in climate may be separable from those arising by other means. It will be argued that many mountain endemics have been confined to their present situations as a result of competition with lowland species that may have arisen more recently. Mountains, like islands, often conserve formerly widespread taxa but frequently overlay their relative primitiveness with adaptations to the special conditions found in these environments.

### LANDSCAPE PATTERNS AND DIVERSITY AT DIFFERENT SCALES OF SPACE AND TIME

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The extremely high heterogeneity of Mediterranean habitats and landscapes has had and still has many consequences on biological diversities at both scales of time and space. I will focus on the theme of the dynamics of diversities of species and populations of vertebrates from both ecological and evolutionary points of view and at three scales :

1. *Speciation and endemism of Mediterranean vertebrates.* Any insight in the development of faunas in the Mediterranean basin need to refer to the history of the region since the Plio-Pleistocene. It will be shown that the endemism rates are strongly dependent on the dispersal rates of organisms and that the very low endemism rate of birds (14 % against 25 % in mammals and 62 % in reptiles) must be interpreted in the light of the Pleistocene history of the west-Palearctic life zones. However, recent studies on the molecular phylogeny of some endemic Mediterranean groups (e.g. *Alectoris* spp., *Sylvia* spp.) have shown that the main speciation events must have occurred much earlier than formerly thought. The adaptive radiation of the *Sylvia* group of species is consistent with the hypothesis of separate speciation centres in the three main peninsulas of the Mediterranean basin. A scenario of the spatio-temporal development of this group will be given in the light of paleogeographical and paleobiological events.

2. *The dynamics of species diversities.* At the scale of the Mediterranean basin, there have been many changes in species diversity since the end of the last glaciation. These changes will be examined in the light of climatical changes and especially human impact. Although few extinctions occurred at the scale of the basin (except for large mammals on mainlands and the endemic mammal faunas of Mediterranean islands), several components of biological diversity, the so-called alpha, beta and gamma diversities, have dramatically changed. Few changes probably occurred at the level of gamma diversities but alpha and beta diversities have been much reduced in many habitats, which results in new species assemblages at a local scale and changes in ecosystem function.

3. *The structure and genetic diversity of populations.* Most populations are subdivided in space because of habitat patchiness. Long term studies of some model organisms (e.g. the Blue Tit) have shown that the so-called "reaction norms" of the organisms strongly depend on the structure of the



environment. In the framework of metapopulation theory, it will be shown that local populations may exhibit local specialization, local maladaptation because of gene flow and phenotypic plasticity. Such issues on the genetic structure of populations in habitat mosaics are important for understanding biological diversity at the intra-population level and for designing nature preserves.

## THE MOREA FRENCH SCIENTIFIC EXPEDITION OF 1829 AND THE BIRTH OF NATURAL SCIENCES IN GREECE

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Bory de Saint Vincent led the French scientific expedition in 1829, which covered mainly the Morea (Peloponnesus) and secondarily the Cyclades. For 9 months this group of scientists visited the country, collected material and made several observations *in situ*. The data have been published in 4 volumes, covering the Relation, Plants and Animals, Geology, Geography and Ancient Monuments. The difficulties encountered, the tension among the scientists, the 'philosophy' guiding their work, the first ecological observations they made, and the quantity of the systematic work performed are examined. The survival of this work as well as its impact are assessed. It is argued that the Zoological part constitutes indeed the cornerstone of the faunistic research concerning Greece, but not so for the Botanical part; Tournefort and especially Sibthorp should be given this credit for plants. Finally the reversal of trend and the dominance all along the 19th century of the German influence in faunistic and floristic studies of Greece, as well as its major impact in the formation of the local scientific community are discussed.

## SOME REMARKS ON THE ZOOGEOGRAPHIC STUDIES CARRIED OUT IN GREECE DURING THE PAST 20 YEARS

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A summary account of recent biogeographic results obtained in the area of Greece is given and an attempt for their analysis in a synthetic biogeographical perspective is made.

The following aspects are successively examined:

1. Endemism of animal species
2. 'Oriental' components of Greek fauna
3. Taxonomic diversity
4. Regional variations of some ecosystems and their respective zoocoenoses

A number of indices and quantitative parameters is selected that can facilitate comparisons and exploration of interrelationships between data emerging from different levels of biogeographical approach.

Thus, the significance of possible relations between parameter couples is examined successively, as follows:

1. Endemism. Possible intercorrelations are examined between:
  - the level of endemism in a given group and level of endemism in the several sub-regions of Greece
  - the gradient of variations in level of endemism of several taxa belonging to the same group and the variations of their respective distributions
2. 'Oriental' components of Greek fauna:
  - comparison of gradients and expansion axes of characteristic 'oriental' elements, for a number of cases
3. Taxonomic diversity:



- comparisons of coefficients of diversity for certain dominant groups and attempts of their interpretation with reference to the respective ecological and biogeographical characteristics of the latter
4. Brief review of certain regional variations - at the level of biocoenoses compositions - between some ecosystems that are represented in Greece:
- possible, direct or indirect, relationships of these with certain ecological parameters, and with the 'adaptability' of the taxa concerned.
- Some conclusive comments, discussion and propositions are finally given.

## THE GREAT LEVANTINE LANDBRIDGE AND THE RESILIENT FRAGMENT OF TETHYS

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Innovation, overlaid on historical cyclicality, characterizes biogeography, this most dynamic discipline of biological evolution. On the background of the major cycles of global changes, repetitive features reappear and new ones join the game. Tethys, the circumglobal latitudinal ocean appears when continents fragment, and closes when continents join. In this major cycle, we are in a stage of an evanescent and fragmented Tethys. With the Levantine Landbridge of the Middle East of today, the most important obstruction of the Tethys, the major continental block of the modern globe, came into being.

The short-term cycles of the Glacials, of which we are the contemporaries, imposed their multiple pulsating rhythm upon the Tethyan fragment of the Mediterranean and upon the Levantine Landbridge. In the Mediterranean we witness recurrent latitudinal advance and retreat of biota, whereas on the landbridge, Ethiopian versus Holarctic biota advance and retreat in the longitudinal dimension.

Humans are today important players or even agents in the global cycles. Lessepsian Migration represents a man-made precocious reestablishment of a new Tethys. On Levantine lands, on the contrary, human interference may easily obstruct forever the biotic interchange. Nature conservancy on land and in the seas, and especially in the central biogeographic hub of the Old World, our region, should try to preserve first of all the functioning of the dynamic processes.

## COMMUNICATIONS

### THE DISTRIBUTION OF THE MEDITERRANEAN MONK SEAL IN GREECE

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The Mediterranean monk seal (*Monachus monachus*) is a highly endangered marine mammal. This species, is extinct in many areas of its former range and the main surviving populations are found in Greece and Mauritania. Its world population is estimated to be 400-500 individuals, of which 200 - 250 individuals are estimated to live in Greece. The most stable known populations occur in the National Marine Park of Alonissos - Northern Sporades and the Ionian islands while limited information exist for many islands and sections of coastline.

In this study we try to determine the distribution of the monk seal in Greece using collected or received information related to monk seal sightings from throughout Greece. The information collected include: the date and site of observation and other details on the description of the animal, its behavior, etc. This study is part of a larger project established in 1990, the Rescue and Information Network, which consists of a network of more than 700 contacts in coastal Greece and with which there are two ways of communication:

- indirect: by mail to and from all relevant authorities: port police, fishery and veterinary services, fishery cooperatives, coastal municipalities, locals
- direct: by visiting areas, known to be important, in order to sensitize the local population and collect information about the past and present status of the monk seal (163 locations were visited in the last five years).

During the study period (1990-1995), we have received or collected 379 reports of alive seal observations and 64 reports of dead seals. The distribution of the seal sightings indicate that the Mediterranean monk seal still remains widely distributed throughout Greece. In addition, the sightings of newborn pups collected from various areas suggest that several breeding populations may exist within the species distribution.

Furthermore, the high frequency of seal sightings in conjunction with evidence of breeding in specific areas (Samos - Ikaria, Kythira, Kassos - Karpathos, Pelion - North Evia) suggest that there may be important subpopulations and should be considered in the strategy for the protection of the species on a national scale.

### DIET COMPOSITION OF *Podarcis milensis*, *Podarcis gaigeae* AND *Podarcis erhardii* DURING SUMMER.

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In the present study, the diet composition of three non sympatric lacertid lizard species of Greece is examined.

*Podarcis milensis* and *Podarcis gaigeae* are two species endemic to Greece, while *Podarcis erhardii* is a species highly differentiated in the insular ecosystems of the Aegean. The stomach content of *Podarcis milensis*, *Podarcis gaigeae* and *Podarcis erhardii* specimens was analyzed to ordinal level. All examined animals come from Museum collections and were captured in summer. During this season, *Podarcis milensis* feeds mainly on ants, insect larvae and Araneae. *Podarcis gaigeae* feeds on Heteroptera, ants and Coleoptera, while *Podarcis erhardii* on ants, Coleoptera, insect larvae and Araneae.

Differences in the diet between the three species are considered and further discussed.



## MORTALITY CAUSES OF THE MEDITERRANEAN MONK SEAL (*Monachus monachus*) IN GREECE.

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The decline of the Mediterranean monk seal, *Monachus monachus*, has to a large extent been attributed to the deliberate killing of animals. We examined the mortality causes of this species in Greece from dead animals reported, from 1985 until August 1995.

The reports of dead animals were collected through a network of more than 700 contacts that are distributed throughout Greece as part of a larger project the Rescue and Information Network and through a programme of monitoring the monk seal population of the N. Sporades islands. Whenever possible, depending on how recent the report was, and on the state of decomposition of the animal, full autopsies were conducted and samples were taken for histological, virological, immunological, hematological, and bacteriological analyses to assist in the identification of the cause of death.

Eventhough, identification of the death cause without an autopsy may not always be reliable, for comparative reasons we present results from all the 67 cases of dead animals reported, out of which in 24 cases autopsies were conducted.

Considering all the animals examined, in the adult and juvenile stages, deliberate killing still remains the most frequent death cause and thus an important factor for the decline of the monk seal. The results obtained from the cases where autopsies were conducted indicate that the occurrence of natural deaths, not recorded in the past for this species in the wild, constitute an important mortality factor, especially, at the newborn stage.

The high frequency of deliberate killing in most areas of the species distribution, makes the consideration of this factor critical in the design of effective conservation measures. The reduction of deliberate killing, over the last decade, in the National Marine Park of Alonnisos Northern Sporades, Greece, an area with a considerable breeding population, provides encouraging evidence for the establishment of new protected areas.

## ACTIVITY PATTERNS OF THE GREEK FROG *Rana graeca* (BOULENGER, 1891)

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The activity patterns of the Greek frog *Rana graeca* were studied in many Greek biotopes during the periods 1985-1989 and 1993-1994. The species is active from the end of winter to the middle of autumn. During reproduction, the adults are active twenty four hours per day. During the feeding period, adults, as well as subadults, are active only at daytime, showing a maximum of activity at midday, when the air temperature is high. Hibernation is continuous for subadults and young metamorphs, but not for adults. The latter may interrupt hibernation for a few hours when there are suitable weather conditions. All individuals hibernate on land, in holes, usually among tree-roots, under stones, and in rock crevices. The species is closely linked to water, making only small movements far from it. The populations were small in all biotopes studied, having less than four adults per hundred meters of stream or river.



**DATA ON THE DEVELOPMENT OF THE GREEK FROG *Rana graeca* (BOULENGER, 1981)  
FROM GREECE**

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In this paper, data on the embryonic development, the larval development and metamorphosis of the Greek frog *Rana graeca*, based on field observations made in Greek biotopes are presented. According to these data, egg hatching in the field starts 20-29 days after the first oviposition, and lasts for 20-31 days. The first newly metamorphosed froglets appear in July or, the latest, in the beginning of August. The major part of tadpoles complete metamorphosis at the middle of August, up to the beginning of September. All tadpoles have completed metamorphosis by the end of October or, rarely, by November. The process of development seems to be influenced by the climatic conditions of each biotope, which are quite different from one another.

**DEVELOPMENTAL RATES AND TEMPERATURE TOLERANCE OF THE GREEK FROG  
*Rana graeca* (BOULENGER, 1891)**

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The temperature tolerance and rates of embryonic development of the Greek frog *Rana graeca* were investigated under laboratory conditions.

Water temperature during the experiments of embryonic development varied between 2 and 23°C. The development was possible in temperatures higher than 17°C. Optimum viability was achieved in temperatures 8+/- 1°C, and the worst in temperature 20+/- 2°C. The fastest embryonic development was observed in temp. 18+/- 3°C. The water temperature during the experiments of larval development varied between 6 and 21°C. Larval development was possible in temp. higher than 10°C and the highest rate of larval development was observed in temp. 21+/- 3°C.

**SPECIES COMPOSITION AND DEMOGRAPHIC STRUCTURE DYNAMICS OF POPULATIONS  
OF MAIN RODENT SPECIES IN ALFALFA FIELDS (NORTH BULGARIA)**

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The results of the field investigations on the species compositions and some population parameters of the dominant species of small rodents in alfalfa areas in Pleven region (North Bulgaria) are presented. The abundance (density), sexual and age structures of the populations of common vole (*Microtus arvalis*), house mouse (*Mus spicilegus*) and wood mouse (*Apodemus sylvaticus*) and their dynamics during the period of two vegetation seasons (1992-1993) were established using the CMR method. The common vole is the main permanent dominating inhabitant of alfalfa areas in North Bulgaria. The population of this species and their dynamics play a determining role in the functioning of the small rodent community in the studied agroecosystem. The state of the populations in the beginning of the breeding season, the participation of the females and the different age groups in the reproduction as well as the elimination process by different external reasons (climatic and food conditions, crop-rotation of neighboring agricultural areas, etc.) are some of the factors determining the total dynamics of small rodents abundance in the studied area.

The alfalfa as perennial crop gives favorable conditions to the investigated species (food, shelters, etc.). The different rodent species inhabit the alfalfa areas in different time periods depending on their biology and ecology.

### COMPARISON BETWEEN THE STOMACH CONTENTS OF FOUR SPECIES OF MURIDAE (RODENTIA, MAMMALIA) FROM ALPINE ECOSYSTEMS

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Studies were made of the food consumed by the four species of Muridae - *Apodemus flavicollis*, *Clethrionomys glareolus*, *Pitymys subterraneus* and *Chionomys nivalis* from two alpine zones in Rila and Vitosha mountains. Analysis of the stomach contents resulted in the following data:

1. The vegetable food is predominant for all small mammals in the study areas. The green plant remains of Poaceae, Ericaceae and Asteraceae were determined in the diet of voles, but for mice the seeds and fruits are dominant, comprising about 70 % of the stomach contents.

2. Animal food was between 2.6 % for *Cl. glareolus* and 17 % for *P. subterraneus*. In the diet of *Ch. nivalis* no animal remains have been found.

3. Qualitative differences in the food eaten by small rodents between the two investigated areas depended on the kind of vegetation present.

### COMPARISON OF THE BIOGEN CONTENTS AND BALANCE IN THE BODIES OF THE HOUSE MICE *Mus spicilegus* AND *Mus musculus*

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Nitrogen (N), phosphorus (P), potassium (K) and calcium (Ca) were determined in the seeds of some weed species and in the bodies of two species of the genus *Mus* - *M. spicilegus* and *M. musculus*. The average value of biogen contents in the seeds varied from 2.38 % to 2.85 % for N; 0.30 % to 0.52 % for P; from 0.52 % to 0.77 % for K and for Ca - 0.22 % to 0.49 %. From the total quantity of N in the consumed food, 78 % was excreted with feces and urine and only 22 % was included in the animals' metabolism. For P the percentage is 66 %; K - 84 % and Ca - 89 %. There are no statistically significant differences between the two species.

The results can be used for further calculations on the turnover of these elements in the ecosystems.

### HELMINTHIC INFESTATION IN ANURA (VERTEBRATA : AMPHIBIA) FROM THE PETROVARADINSKO-KARLOVACKI RIT MARSH (YUGOSLAVIA)

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In the course of the spring of 1995, 200 frog specimens of the genera *Bombina* and *Rana* from the area of Petrovaradinsko-karlovacki Rit Marsh (UTM DR 10) were analyzed.

The investigated area lies in a region sporadically flooded by the river Danube. It is situated at altitudes ranging from 74 to 94m a.s.l. and it is under significant anthropogenic influence.



Parasitological analyses of the lungs, digestive system (*gaster, intestinum, rectum*) and urinary bladder were made. Up to the species level, only the representatives of the class Trematoda were established, whereas for representatives of other classes only the quantitative presence was determined. For each species of frogs the following features were determined and compared: infestation extensity, infestation intensity and average infestation intensity.

#### DISTRIBUTION OF subg. *Dicampa*, g. *Campodea* (INSECTA, DIPLURA, CAMPODEIDAE) ON BALKAN PENINSULA

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Most species of subgen. *Dicampa* are distributed in the Palaearctic region. About 30 species belonging to this subgenus are known today from all over the world. In Europe, there are 20 species, 5 of which are present in the Balkan peninsula. These are:

1. *Campodea (Dicampa) aristotelis* Silvestri, 1912
2. *C. (D.) sprovieri* Siln., 1912
3. *C. (D.) malpighii* Silv., 1912
4. *C. (D.) frenata* Silv., 1931
5. *C. (D.) campestre* Ionescu, 1955

During our investigations on Campodeidae in Yugoslavia for the past 10 years we have found for the first time the last three species.

#### A HYPOTHESIS ON THE ORIGIN OF THE CYPRIOTE WALL LIZARD (*Lacerta laevis troodica*): EVOLUTIONARY AND ZOOGEOGRAPHICAL IMPLICATIONS

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A zoogeographical analysis of the herpetofauna of Cyprus revealed that most of its recent representatives must have reached the island by rafting or even by human transportation (BOEHME & WIEDL 1994). The Cypriote wall lizard exhibits a much greater phenetic variation than any of its opposite mainland conspecific population. Phenetically, the lizards partly resemble typical *L. laevis* as known from the neighbouring coasts from Turkey to Israel, but others resemble strikingly *L. cf. kulzeri* (*sensu* BISCHOFF & SCHMIDTLER 1994) which has been recently found parapatrically in strict ecological separation from the former. Moreover, intermediate phenotypes can be found which are not known from mainland populations. This variation within the Cypriote population suggests that it could have originated from both mainland forms, the isolating mechanisms between them having secondarily broken down in a newly colonized environment. This hypothesis would be well testable by molecular methods.



## TAXONOMIC DIVERSITY OF INVERTEBRATES ON GREEK ISLANDS

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Taxonomic diversity has been a generally neglected subject in biogeographic studies. The few studies dealing with this dimension of community structure have shown that it can provide useful information on the functions of biotic assemblages. The present study is a preliminary analysis of certain aspects of taxonomic diversity and their relation to the instability of insular ecosystems. Our study deals with the taxonomic structure of terrestrial molluscs and isopods found on the islands of Saronikos gulf, central Aegean and Cretan archipelago. Special emphasis is given on the diversity patterns of very small islands. Actual diversity values of these island groups are compared to values expected from a stochastic model and the differences are evaluated from an ecological and biogeographic point of view. Inter-taxonomic and inter-island group differences of diversity patterns are explained in relation to the particularities of each group. The results of our study may be useful in triggering further research on the properties of taxonomic diversity measures in general and of the structure of Greek island biotic assemblages in particular.

## COMMUNITY STRUCTURE OF LAND SNAILS ON THE ISLETS OF SARONIKOS GULF (GREECE)

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Several aspects of population structure in biological communities have attracted the interest of many researchers, especially as far as insular communities are concerned.

In the present work we attempt an analysis of the population structure of land snail communities on 43 islets of the Saronikos gulf (Greece). We have selected all islets with an area  $< 1 \text{ km}^2$  and carry no more than 10 species. We divided those islets in two groups according to their area. The first groups consisted of the smallest islets, with an area  $< 0.01 \text{ km}^2$ , and the second of all the rest. The interpretation of land snail community structure has been based on the following aspects:

1. The relation of species numbers to islet area, habitat and microhabitat diversity.
2. Morphological features of species, such as shell shape and size.
3. Constancy of species presence. For this we have recognised three categories: constant species (present on more than 50% of the islets), accessory species (present on 5-50% of islets) and accidental species (present on less than 5% of islets).

We further discuss the relation of resulting patterns to other biogeographic and ecological data available for this island group.

The results of this study aim to give a better insight in the processes that determine the biotic communities of terrestrial invertebrates on small islands.

## THE BRACONIDAE (HYMENOPTERA) OF MT. DURMITOR IN YUGOSLAVIA

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Mt. Durmitor is a part of the Dinaric Alps. It is encircled by the canyons of the Piva, Tara and Susica rivers. The greatest part of the mountain is at the altitude of 1500m above sea level (town Zabljak



at 1450m), while the highest peak is at 2525m above sea level (Bobotov kuk). Mt. Durmitor had a vehement geological past. It was made by wrinkling Trias and Jura limestone layers which mixed due to intense tectonic changes in the Quaternary. Significant climatic changes (glaciation and interglaciation) took place during the Quaternary at Mt. Durmitor and in its surrounding which caused development and preservation of specific flora and fauna.

The faunistic diversity of Mt. Durmitor is caused by the richness and zone distribution of vegetation. From the Tara, Susica and Piva River Canyons towards the peaks, zones of oak, beech, and coniferous forests follow each other regularly and then turn into the zone of grass communities.

Our investigations, carried out by various methods of material collecting from many localities of Mt. Durmitor, showed that the braconid fauna of this mountain is diverse and rich. We registered the following species for the fauna of Mt. Durmitor: *Xenarcha lustrator* Hal. (Doryctinae), *Bracon luteator* Spin., *B. obscurator* Nees, *B. variator* Nees, *B. erraticus* (Wesm.) (Braconinae), *Rogas bicolor* Spin. (Rogadinae), *Macrocentrus infirmus* (Nees), *M. collais* (Spin.) (Macrocentrinae), *Acaelius subfasciatus* Hal. (Acaelinae), *Agathis glabricula* Thoms. (Agathidinae), *Apanteles metacarpalis* Thoms., *Pholephesor circumscriptus* (Nees), *Cotesia telengai* Tob., *C. vanessae* Reinh., *C. tibialis* Curt., *Sathon falcatus* Nees, *Ilidops suevus* Reinh., *Inaso* Marsh., *Glyptapanteles fulvipes* Hal. (Microgasterinae), *Desmiostoma parvulum* Wesm. (Opiinae), *Exotela flavicoxa* (Thoms.), *Phaenocarpa ruficeps* Nees, *Anisocyrta perdita* Hal., *Aphaereta major* Thoms. (Alysiinae), *Microctonus melanopus* Ruthe, *M. deceptor* Wesm., *M. brevicollis* Hal., *Pygostolus falcatus* (Nees), *Meteorius obsoletus* (Wesm.), *M. oculatus* Ruthe, *M. eadyi* Hud. (Euphorinae). The species *Xenarcha lustrator*, *Bracon luteator*, *Cotesia telengai* and *Exotela flavicoxa* are new for the fauna of Yugoslavia.

In addition to these, the species of the following genera were registered: *Ontsira*, *Colastes*, *Diospilus*, *Aleiodes*, *Diolcogaster*, *Dacnusa*, *Chorebus*, *Dinotrema*, *Aspilota*, *Tanycarpa*, *Sarops*, *Synaldis*, *Ectilis*, *Asobara*, *Alysia*, *Orthostigma*, *Coelinidea*, *Opius*, *Orgilus*, *Blacus*, *Eubazus*.

## NEW RECORDS OF HARPACTICIDS (CRUSTACEA, COPEPODA) FROM FRESH AND BRACKISH GROUNDWATER OF GREECE

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In this paper the authors provide some new data concerning the researches carried out from 1988 to 1995 on harpacticoids from subterranean fresh and brackish waters of continental and insular Greece. An up-to-date list of the collected taxa is provided and discussed, even if not all the sampled material has been examined yet.

As regards continental groundwater, samples have been collected from wells, reservoirs and hyporheic waters in different sites. It has therefore been possible to find new sampling stations for typical stygobionts belonging to taxa already known for Greek Fauna, such as *Nitrocrella* for Ameiridae, *Schizopera* for Diosaccidae, *Elaphoidella* for Canthocamptidae. For some of these genera, moreover, probable new species still in study have been collected.

Very interesting results have been achieved studying harpacticoids from subterranean brackish water, both from dwells and rivermouths. Actually, the brackish-water fringe between marine and freshwater sediments seems to be an ecotone worthy of further detailed investigations. To this purpose, a very meaningful finding is represented by a new species belonging to the genus *Schizoperopsis* Apostolov 1982, collected in Peloponnesus from a freshwater well near Monemvassia and from the interstitial brackish water of a rivermouth near Kardamili. *Schizoperopsis* is a brand new taxa not only for Greece, but also for the Mediterranean Sea, since until now the genus was represented by two species from the Black Sea and one species from the Kerguelen Islands. These three species have been grouped by Apostolov 1982, in the subgenus *Schizoperopsis*; a fourth species from the coasts of Ghana represents, according to Apostolov (1982), the subgenus *Psammoschizoperopsis*. In the same rivermouth sampling station we have also found a probably new species of *Arenopontia* (family Cylindropsyllidae), worthy of investigations because it seems to be very close to other species living exclusively in fresh or slightly brackish Italian water.



A *Pararenopontia* sp. collected in Naxos Island, from interstitial brackish water at the mouth of Kalandos River, in Kaladu Bay, belongs to the same family. The species belonging to the genus *Pararenopontia* Bodiou and Colomines 1986 are *P. breviariculata* from interstitial littoral water of Sylt Island (Germany) and *P. trisetosa* from interstitial littoral water of Galapagos Islands. The species found in Naxos is without doubt of a great interest not only if it is considered from a faunistical and biogeographical point of view, but also because the phylogenetic positions of the Cyliindropsyllidae is today under discussion.

*Afrolophonte pori* Masry 1970, belonging to the family Laophontidae, is a rare interstitial harpacticoid from mediterranean waters; it had been collected, as far as we know, only from israeli and italian coasts. This species, that we have found in brackish water of Skyros Island, on Molos beach, close to Skyros village, has therefore been collected in Greece for the first time. Excluding *A. pori*, the genus *Afrolophonte* is represented by several species living in tropical interstitial waters. Some plesiomorphic morphological features of *A. pori*, could be useful to formulate an hypothesis concerning origin and dispersal of the species belonging to this genus.

## THE PUMPKINSEED - *Lepomis gibbosus* L. (CENTRARCHIDAE, PISCES) - IN THE WATERS OF VOJVODINA

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Despite detailed ichthyological investigations in Serbia, water pollution, as well as very often inadequate stocking with allochthonous fish species from America and Asia, such as *Ictalurus nebulosus* Le Sneur, *Ctenopharyngodon idella* Val., *Hypophthalmichthys molitrix* Val. and *Aristichthys nobilis* Rich., caused changes in the composition of autochthonous ichthyofauna and to the distribution of some species. The pumpkinseed (*Lepomis gibbosus* L., 1758) and large mouth bass (*Micropterus salmoides* Lacipede, 1802), from the family of Centrarchidae, are also present in the waters of Serbia.

The aim of this paper is to review the distribution of *L.gibbosus* in the waters of Serbia, particularly within the protected areas in Vojvodina.

## *Ancyrocephalus paradoxus* CREPLIN, 1839 (MONOGENEA). A NEW SPECIES FOR ICHTHYOPARASITOFUNA OF YUGOSLAVIA

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An inventory of fish parasites of the Danube river has been conducted as a part of basic research of the Ministry of Science and Technology of Serbia. The monogenean species *Ancyrocephalus paradoxus* was found on the gills of *Stizostedion lucioperca* L. at the locality between Belgrade and Pancevo., i.e. 1166 to 1154km of the Danube course. This fish parasite has not been detected in Serbian freshwater yet, nor has it been in the freshwaters of former Yugoslavia. It is a large worm, 4.8 to 5.0mm long, and 0.6 to 0.8mm wide. The species belongs to the order Dactylogyridae, family Ancyrocephalidae, subfamily Ancyrocephalinae. A large number of species (more than 300 forms) belonging to this group have been described from the freshwaters of Africa, South Asia, North and South America (Bauer, 1985). Nevertheless, the systematic justification of the subfamily Ancyrocephalinae has been questioned by Gujev (1955), Bihovski (1957), and Bihovski & Hagibina (1970).



## REAL VS. POTENTIAL DISTRIBUTIONS: APPLICATION TO THE HERPETOFAUNA OF A REGION OF THE MEDITERRANEAN BASIN

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The comparison between the real distribution of a species and its potential range induced from ecological parameters may give information about the historical influences on the biogeography of these species. Amphibians and reptiles are good subjects for this kind of analysis since they are abundant, easily detected and their dispersion abilities are low.

The area of study chosen was the NE Iberian (Catalonia and Andorra). The high diversity observed is due to the frontier effect between dry and wet parts of the Iberian Peninsula. The herpetofauna of this region consists of 44 species (14 amphibians and 30 reptiles) belonging three biogeographical groups: Eurosiberian, Mediterranean and Pyrenean endemics. The data have been analyzed on the basis of the 10x10 km UTM square. Each square was typified for three variables of ecological significance: minimum August temperature, annual rainfall and altitude. A logistic function was calculated based on the values of the variables in the squares where the species was really present in order to determine the probability of presence of this species in each square. Subsequent potential distributions were obtained for each species and compared with the real ones.

This tridimensional model allows the interpretation of the factors influencing the distributions of amphibians and reptiles in this area. Some species show coincident distributions indicating that ecological requirements are enough to explain their ranges. When the real distribution is larger than the potential, it is probably due to smaller scale phenomena (microhabitat). In the opposite, other effects are implied such as historical (expansion, regression or impossibility of colonization) and interactions with other/s similar species (competition).

## THE AVIFAUNA OF THE LAKES OF WESTERN MACEDONIA, GREECE

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The avifaunas of the lakes Chimaditis, Zazari, Vegoritis, Petron, Mikri Prespa, Megali Prespa and Kastoria were studied during 1983-1994. A list of the 247 bird species observed at the lakes and at a radius of 4km around each one of them is given, indicating breeding, wintering, passage migrants and rare species. More species breed at Lake Mikri Prespa, where many rare aquatic species have their strongholds in Greece. At Kastoria and Petron there are small and dwindling breeding colonies of herons (Gray, *Ardea cinerea*, and Night, *Nycticorax nycticorax*) and Pygmy Cormorants, *Phalacrocorax pygmaeus*, whereas in Chimaditis exists the only breeding aggregation of Pochards, *Aythya ferina*, in Greece and the second larger breeding numbers of Whiskered Terns, *Chlidonias hybridus*. In Vegoritis there are no important breeding species. Vegoritis mainly, but also Megali Prespa, host the highest numbers of waterfowl in winter. Commonest species in winter in these two lakes are Coot, *Fulica atra*, Great Crested Grebe, *Podiceps cristatus*, and Tufted Duck, *Aythya fuligula*, the numbers of which are nationally important. The numbers of most heron and raptor species are on the decline during the last years. The same individuals of at least 16 bird species use more than one lake in the same period of the year to fulfill needs of breeding, resting and wintering. Thus, management measures necessary for the protection of some rare species must encompass all lakes since these must in part be considered as a wetland system, rather than separate wetlands.



# CRANIOMETRIC DISCRIMINANT KEYS FOR DETERMINATION OF *Apodemus* SPECIES IN BULGARIA

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The wood mice (genus *Apodemus*) represents one of the most peculiar and numerous rodent group, inhabiting large part of the Palearctic landscape-climatic zones. The genus is characterized by morpho-ecological parallelism and occurrence of morphologically slightly differentiated, but reproductively isolated forms. This reflects its evolutionary youth and the going processes of chromosomal speciation.

The described in the literature morphological criteria don't allow to achieve a clear-cut species determination of the individuals, belonging to subgenus *Sylvaemus*. This necessitated contemporary methods for genetic differentiation to be applied. On the ground of three diagnostic isoenzyme loci - LDH-2, SOD-2 and NP (Hartl et al., 1992) were obtained samples of *A. sylvaticus* and *A. flavicollis* of 45 individuals each. Using the stepwise discriminant analysis of 60 craniometric characters we worked out three craniometric discriminant keys for species differentiation of *A. sylvaticus* and *A. flavicollis* individuals. The first craniometric complex of characters (CCC) includes 5 measurements of the cranium and the lower jaw. The second one is composed of 6 cranial characters and the third CCC includes 5 characters of the lower jaw. The first two CCC allow to achieve 100% correct determination of the individuals and the third one - 94%. This three CCC were computed with high values of F-criterion.

The close propinquity of *A. sylvaticus* and *A. microps* from one hand and its propinquity to *A. flavicollis* from the other hand very often makes the correct determination of the individuals of this three species quite difficult, especially in collections. On the ground of genetically determined samples of *A. sylvaticus* and *A. flavicollis* and a sample of morphologically determined individuals of *A. microps* a diagnostic CCC for this three species was composed. This CCC includes 5 characters. It allows to achieve 97% correct determination for the individuals of *A. sylvaticus* and 100% for *A. flavicollis* and *A. microps*.

The fitness of the obtained craniometric keys was proven in applying them on individuals of the both species in Bulgaria and Germany.

## PHENETIC VARIABILITY AND DEGREE OF SIMILARITY WITHIN GENUS *Apodemus* KAUP, 1829 IN BULGARIA

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A phenetic analysis of the five *Apodemus* species inhabiting Bulgaria: *A. sylvaticus* L., 1777; *A. flavicollis* Melchior, 1934; *A. microps*, Kratochvil & Rosicky, 1952, *A. mystacinus* Danford & Alston, 1877 (subgenus *Sylvaemus*, Ognev, 1924) and *A. agrarius* Pallas, 1771 (subgenus *Apodemus* s. str.) was carried out. The aim of this investigation was 1) to reveal the patterns of the discontinuous variability, characteristic both for the genus and for the particular species and 2) to assess the degree of discontinuous differentiation and divergence of this species. The variability of 23 discontinuous characters (according to Berry, 1963 and Hedges, 1969) with proven Mendelian segregation in the generations (Gruenberg, 1956) was investigated. In the survey have been included genetically determined individuals of the two morphologically similar species *A. sylvaticus* and *A. flavicollis*.

No sexual dimorphism in the expression of this 23 discontinuous characters was found.

The observed epigenetic polymorphism within genus *Apodemus* in Bulgaria could be determined as transient or stable polymorphism. The species *A. agrarius* and *A. flavicollis* are rather differentiated and express the highest epigenetical uniqueness. The species of genus *Apodemus* in Bulgaria are characterized by comparatively similar type of epigenetic variability.

The obtained qualitative assessment of the variability within particular species shows that they differ slightly one from another by their average number of phenotypes, but the pattern of their intraspecies diversity is different. In the *A. sylvaticus* group the relative part of the rare phenotypes is



highest, the *A. mystacinus* group is more equalized in regard to the frequency expression of the particular variants of the characters, while in *A. flavicollis* the rare morphs are almost absent, but the phenotypic diversity is higher than in *A. sylvaticus* and *A. agrarius*. This means, that the phenotypic diversity in *A. flavicollis* is a result of equal frequencies in the expression of the "normal" and "abnormal" characters. In *A. sylvaticus* and *A. agrarius* the "abnormal" variants of the characters are expressed in higher degree.

The epigenetic distances have been computed by clustering of the mean measure of divergence (MMD, Berry, 1963) and of indices of similarity (Zhivotovsky, 1983). The obtained generalized epigenetic distances between the particular species, reflecting the mean genetic divergence between them, as well as the found phenetic similarity outline simultaneously one and the same structure of propinquity between the species in the genus. The most similar by their epigenetic basis as well as by the pattern of their variability are *A. sylvaticus* and *A. flavicollis*. Together with the other two species of subgenus *Sylvaemus* they form a group, in relation to which *A. agrarius* is more remote. The obtained phenogramme shows correctly the systematic structure of the genus and conforms to the results of the biochemical-genetic analyses (Britton-Davidian J., 1991).

### PRELIMINARY RESULTS ON THE STRUCTURE OF THE POPULATIONS OF *Mytilus galloprovincialis* LAM., 1819, IN THE EAST COAST OF THESSALONIKI'S GULF

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In this paper preliminary results on the study of *Mytilus galloprovincialis* populations, collected from different sites in the east coast of Thessaloniki's Gulf, are presented. No differences were observed on the structure of this populations among the sampling sites during the same season (winter and summer). On the contrary, the populations found to vary significantly between winter and summer. The observed variations are due to both abiotic (mainly hydrodynamic) and biotic factors like immigration, intraspecific competition and predation. Also, the fishery activities in this area should be considered as well.

### FEEDING HABITS OF THE SEA ANEMONE *Paranemonia vouliagmeniensis* DOUMENC *et al.*, 1987 (ACTINARIA, ANTHOZOA)

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This paper discusses the diet of a sea anemone species (*Paranemonia vouliagmeniensis*) from lake Vouliagmeni, near Athens, Greece. The lake, with elevated and stable temperature throughout the year, brackish waters and a high mineral content presents a specialised biotope in which *P. vouliagmeniensis* is an important element. The population consists of two groups; one established on algae in deeper parts of the lake, and an older one living on gravel in shallower habitats. Feeding preferences depended on the anemone's ability to catch prey, combined with the composition of the prey. It appears, that this anemone species utilises a diverse feeding strategy, according to the biotope in which it is found. The main prey items appear to be Mollusca and Crustacea. The anemone is mainly a suspension feeder, although it can also feed by active tentacle action.



**DISTRIBUTION OF *Calliactis parasitica* (COUCH) (ANTHOZOA) POPULATION IN SYMBIOSIS WITH ANOMURA DECAPODA IN THERMAIKOS GULF (MACEDONIA, GREECE)**

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The sea anemone *Calliactis parasitica* associates with several species of the anomouran crabs. In Thermaikos Gulf it is found living symbiotically with *Paguristes eremita* and *Pagurus excavatus*. This study examines the distribution of a population of this anemone, which was found living with *Paguristes eremita*. The results implied that the sea anemone *C. parasitica* initiates its symbiosis from early in its life, that is within the first 10-12 months. This fact may suggest increased nutritional needs at those early life stages, which are fulfilled through symbiosis with anomurans.

**GENETIC VARIATION IN THE MEDITERRANEAN WILD GOAT  
(*Capra aegagrus* ERXLEBEN, 1777)**

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On the Mediterranean islands there is no paleontological evidence of the Quaternary occurrence of *Capra aegagrus* ERXLEBEN, 1777 that has been introduced by humans from the Near East since early Neolithic times. The natural Late Pleistocene diffusion of the species is only documented from the Eastern Mediterranean mainland, where wild goat populations still survive in the South Anatolian mountains. The aim of this paper is to study the genetic variability and relationships between some of the extant Mediterranean wild goat populations through the analysis of samples of goat hairs from the island of Montecristo (Northern Tyrrhenian Sea, Italy), the island of Samothraki (Northern Aegean Sea, Greece), the island of Crete (Greece) and the Termessos National Park (Antalya, Turkey), performed by random amplified polymorphic DNA (RAPD).

**UTILIZATION OF *Trichogramma entomofagous* IN LEAF INSECT CONTROL UNDER ECONOMIC DAMAGE LEVEL FROM RUMANIA**

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Authors present results obtained with *Trichogramma entomofagous* in *Autographa gamma*, *Agrotis* spp., *Scotia* spp., *Mamestra* spp., *Ostrinia nubilalis*, *Lobesia botrana*, and *Anarsia* spp. control, phytophagous insects damage at sugar beet, maize, cabbage, vine, peach and plum crops. A synthetic comparison between results obtained with *Trichogramma* and with insecticide is presented, emphasizing the remarkable contribution of biological measures for public health and environment. Thus:

Entomophagous Insecticide	Dose/ha	Phytophagous	Crop	Efficiency unattacked pl.	Treated area
<i>T.dendrolimi</i> Diazol 40 EC	75,000 2lt	Lepidoptera Noctuidae	sugar-beet	85.7 93.3	Brasov
<i>T.maidis</i> Sevin 85 WP	200,000 2lt	<i>Ostrinia n.</i>	maize(Turda 100)	82.0 57.2	Turda
<i>T.evanescens</i> Sinoratox-35	100,000 0.15lt	Lepidoptera Noctuidae	cabbage	75.3 86.1	Craiova
<i>T.evanescens</i> Decis 2,5 EC	100,000 0.2lt	<i>Lobesia botrana</i>	vineyard	93.0 (bunch) 95.6	Murfatlar

The surface varied between 5 -1000 ha (at plum) using 2 - 4 treatments. In the present context the biological material from Brasov biostation costs about 7USD / 100.000 *Trichogramma*, practically making it possible to keep 1ha under control with 14USD for 2 treatments, small cardboard application manually done.

In conclusion, a synthetic ecogram of Lepidoptera-Noctuidae is presented, which can be used for extracting information on the population dynamics in the absence of other information sources, and a proposal towards the use of different *Trichogramma* species is discussed.

## STRUCTURE AND ACTIVITIES OF CARABIDAE (INSECTA) IN THE SUGAR-BEET CULTURES OF RUMANIA

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Our research started in 1974. Captures have been done from March to September with properly formed traps. In the zones with no pesticide treatment Carabidae species were dominant (*Harpalus pubescens*, *Pterostichus melanarius*, *P.cupreus*, *P.niger*, *Carabus cancellatus*, *C.ullrichi*). Certain species that normally live in the forest zone, were also exploiting the sugar-beets (*Carabus cancellatus tuberculatus*, *Clivina fossor*, *Harpalus griseus*, *Pterostichus niger*, *P.melanarius*, *P.cupreus*). In general, we have captured all epigeal fauna, but here we consider only Carabidae. In order to protect entomophagous insects, it is necessary to use biological and integrated treatments for the protection of both the natural equilibrium in the agroecosystems and the environment, that is the health of Earth.

## PREVIOUS FINDINGS OF RACCOON DOG (*Nyctereutes procyonoides ussuriensis* MATSCHIE, 1907) IN FORMER YUGOSLAVIA AND ANALYSIS OF PROBABLE PATHS OF ITS IMMIGRATION

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After a massive introduction of Raccoon Dog from the area of Oriental Asia (1934-1953) and its successful acclimatization in the European part of former USSR, the areal of this species has explosively spread towards North and Central Europe. In a relatively short time period Raccoon Dog spread all the way up to Finland and Central Sweden, inhabiting Poland, Germany, Czechia, Slovakia, Hungary, Romania and lately FR. Yugoslavia as well. In the West direction, the furthest it goes is France.

During the last 17 years, from the moment of finding the first specimen (20.02.1978. Negotin) the relevant data were collected that undoubtedly speak of a rather wide presence of the Raccoon Dog on the territory of FR. Yugoslavia. On the basis of documented data and reliable testimonies by



naturalists and hunters as well as of ever frequent field observations, the authors indicate points of findings of Raccoon Dog in FR. Yugoslavia and present a map of its actual distribution.

The paper also indicates probable paths of immigration of this species in FR. Yugoslavia on the basis of the chronological analysis of findings on the Yugoslav territory, and published data on its findings in the areas of surrounding countries.

## UPDATED NOTES ON THE HERPETOFAUNA OF THE CIRCUMSICILIAN ISLANDS

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Although the herpetofauna of the circumsicilian islands is generally well known, we are of the opinion it could be useful even for conservation policy, to list *ex novo* the circumsicilian herpetofauna (Maltese islands excluded) as a contribution to an updated knowledge of the central western Mediterranean basin. One amphibian and fourteen reptiles are recorded in this area. The spectra of the different chorological categories of the species present in the above mentioned area show that presence of south european species decreases gradually in a northwest-south direction, while an increase of the north mediterranean and, in general, all the mediterranean chorotypes is observed. European and oriental *sensu lato* species are lacking from the circumsicilian islands, even though they are well represented on the main island.

We also report for the first time the occurrence of *Vipera aspis francisciredi* on Vulcano island, almost surely recently imported, and a new locality for the species *Podarcis sicula* (Scoglio Lavane islet).

## SCORPION DIVERSITY IN SOUTHWESTERN PELOPONNESE, GREECE (SCORPIONES)

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An analysis of scorpion diversity in southwestern Peloponnese is presented. Species richness has been used as a criterion for determining some important sites for conservation in the area under consideration. The protection of some humid biotopes, the habitat of the large and vulnerable species *Iurus dufourei*, is considered of paramount importance for the near future.

## MONK SEAL PUP PRODUCTION IN THE NATIONAL MARINE PARK OF ALONNISSOS - N. SPORADES

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The existence of one of the largest known breeding monk seal populations in the N. Sporades islands provides a unique opportunity for studding in the field the biology and ecology of this highly endangered species. Since 1990, a long term project has been established in the National Marine Park of Alonnisos-N. Sporades and the neighboring areas with aim to study and monitor the status of the local

seal population. Part of this project, from which results will be presented, is to record pup production and pup behavior in the wild.

The study is being conducted by regular direct visits to the seal habitats (sea caves) and by the use of preprogrammed photographic cameras within the shelters, through which individuals observed one identified and their behavior is noted.

During the study period, from 1990 until November 1995, 35 new born pups have been recorded and monitored within the study area. The births of pups recorded are distributed between July and December with a peak in September. Morphometric and developmental data were collected when possible and will be presented.

In terms of behavior, during the first and second months of development, pups spend considerable time with their mothers while this decreases by the fourth month of development. Pups were observed to enter the sea within the caves in the first week of life even in the absence of their mothers. In addition, pups were found to change shelters and travel distances of several hundred meters even at an early age.

## COMPOSITION AND DYNAMICS OF MACRZOOPERIPHYTON AND BOTTOM FAUNA IN CRNI TIMOK RIVER BASIN (YUGOSLAVIA)

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Hydrobiological investigations of mezofauna in Crni Timok river system were carried out during 1991-1992 period. Material was collected seasonally from the several representative profiles including high and low water level. The studied fauna consists the next groups: *Turbellaria*, *Nematodes*, *Oligochaeta*, *Hirudinea*, *Gastropoda*, *Bivalvia*, *Amphipoda*, *Arachnida*, *Trichoptera*, *Plecoptera*, *Ephemeroptera*, *Diptera*, *Coleoptera* and *Megaloptera*. On the base of the structure of analyzed part of the biocenosis and their temporal and spatial distribution the biodiversity and water quality of river system were evaluated.

## THE AVIFAUNA OF THE ISLAND OF GAVDOS: PRELIMINARY RESULTS

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The avifauna of the island of Gavdos has been almost unknown until few years ago. The very few records referred only to summer months. The total number of bird species, according to them, was 18, with only 2 of them been reported as breeding ones.

This study is an attempt to estimate the species of birds that stop on the island during the spring migration and also to record as many breeding species as possible, in relation to the habitats and the island character of the biotope. The data, that were collected repeatedly, provide mainly qualitative information, but they constitute a base for a quantitative study which is going to include wintering bird species as well.

A total number of 76 bird species observed. It becomes certain that Gavdos is a station where many passerines rest and forage during their migration movements. The population density of some species, such as *Motacilla flava*, *Phylloscopus trochilus* and *Muscicapa striata*, seems to be particularly high. Some species from other bird orders like *Falco eleonora*, *Streptopelia turtur*, *Otus scops*, *Upupa epops* were found in good numbers as well. Nine species were found to nest, although there is a big possibility that three to five more species may also nest. This number is still very low. Though, the absence of some birds, that were expected due to the habitats, is remarkable, e.g. the species *Sylvia melanocephala* and *Galerida cristata*, although they are very common and numerous on Crete they were



not recorded on Gavdos. Considering the resident species, the population of *Alectoris chukar*, which is isolated for many years, seems to be particularly high.

The avifauna of Gavdos exhibits characteristics of an isolated island avifauna. It is poor, with high disharmony since entire groups of birds, such as the finches and the larks, are absent from the resident or the breeding species. This is probably due to the low diversity of the habitats. Nevertheless, the island is an important station for many migrants, especially for insectivorous passerines.

Moreover, there is going to be a comparison of the bird communities on Gavdos to those from other corresponding islands.

## DISTRIBUTION OF GASTROPODS IN LAKE KERKINI (NORTHERN GREECE): INTERACTIVE INFLUENCE OF VARIOUS PHYSICO-CHEMICAL PARAMETERS

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The aquatic system of Kerkini in Northern Greece, consists of an artificial lake, canals and marshes. The lake water is used for irrigation of the Strymonas valley causing a continuous change in the water level of the lake and of the marshes and canals. The lake supports a numerically rich and diverse fauna, which includes several mollusc species. Little is known about the ecology and biology of the Kerkini freshwater pulmonate and prosobranch snails, which constitute one of the links of the lake trophic web and are also very important as intermediate hosts of several parasites. Consequently, a comparative study of the distribution of the gastropods of Lake Kerkini was conducted from 1989 to 1991.

Five species of freshwater snails were studied in three different areas. The prosobranch snails *Bithynia graeca* (Westerlund, 1879) and *Viviparus contectus* (Millet, 1813) were found in the rocky shore of the lake (site A) and in the marshes adjacent to the inflowing Strymonas river (site B) respectively. The pulmonate snails *Physa acuta* (Draparnaud, 1805), *Lymnaea stagnalis* (Linneus, 1758) and *Lymnaea auricularia* (Linneus 1758) coexisted in a canal situated to the northeast of the Lake Kerkini characterized by static or slightly flowing water (site C). In the three different areas the following physicochemical parameters were examined: water temperature, pH values, dissolved oxygen, total hardness, orthophosphates, chloride. According to the above parameters the snails were distributed in sites with different chemical and physical properties. In the site A, *B. graeca* was found attached to exposed surfaces of the undersides of rocks, *V. contectus* in the adjacent marshes (site B) being unable to face the difference of the water level in the rocky shore of the lake. Finally in the site C, where the pulmonate snails *P. acuta*, *L. stagnalis* and *L. auricularia* were found, the low oxygen tension accounted for the complete absence of prosobranch gastropods.

## SEASONAL FLUCTUATION IN MICROARTHROPOD POPULATION IN NATURAL PASTURES IN GREECE

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The seasonal fluctuation in microarthropod (insects and mites) population in a grass and a broad-leaved natural pasture was studied in Co. Ioannina, Epirus, Greece, during the period November 1993 - November 1994. As a rule the population densities achieved by mites exceeded by far those of

insects in both settings. Aphididae showed population peaks in April and October in grass pasture and in December in the broad-leaved one. *Aptinotrips rufus* (Thysanoptera: Thripidae) developed high population densities during winter and spring and this was more prevalent in grass pasture. Phloeothripidae showed their peak on November - December in broad-leaved pasture while December was also the month with the highest population densities of Onychiuridae (Collembola) in the same pasture. Entomobryidae (Collembola) obtained their highest population densities during winter and during winter - spring in grass and broad-leaved pasture respectively. The other two Collembolan families: Lepidocyrtidae and Isotomidae attained their greater population densities during winter and spring. Seasonal trends of Astigmatic and Cryptostigmatic mites showed their preference for humid and mild habitats which prevail in spring and fall in the area under study.

## STUDIES ON MICROARTHROPODS ASSOCIATED WITH NATURAL PASTURES IN GREECE

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Knowledge on the microarthropods (insects and mites) associated with natural pastures in Greece, a most valuable natural resource, is almost absent. Some results are given of a qualitative and quantitative study on those arthropods associated with a grass and a broad-leaved pastures in Co. Ioannina, Epirus, Greece; which commenced in November 1993. The species richness of insects and mites in both pastures was found to be similar and comprised approximately 25 and 65 species respectively. The evaluation of taxa, using the criteria of dominance and frequency showed that the most characteristic taxa were the following: a) grass-pasture: Entomobryidae, Lepidocyrtidae and Isotomidae from Collembola; Thripidae (especially *Aptinotrips rufus*) from Thysanoptera; Aphididae from Homoptera; Acaridae (especially *Tyrophagus* spp.) from Astigmata; Oribatuloidea from Cryptostigmata; Tarsonemidae and Pyemotidae from Prostigmata and Ascidae (especially *Alliphis halleri*) and Phytoseiidae (especially *Amblyseius graminis*) from Mesostigmata. b) broad-leaved pasture: Onychiuridae and Entomobryidae from Collembola; Thripidae and Phloeothripidae from Thysanoptera; Aphididae from Homoptera; Acaridae (especially *Tyrophagus* spp.) from Astigmata; Oribatuloidea from Cryptostigmata; Tydeidae (especially *Tydeus kochi*), Tarsonemidae, Pyemotidae, Bdellidae from Prostigmata; Ascidae (especially *Alliphis halleri*) and Phytoseiidae (especially *Amblyseius obtusus*) from Mesostigmata.

## STATE OF THE *Abies cephalonica* FOREST ON MOUNT AINOS (ISLAND OF KEFALONIA IONIAN SEA, GREECE)

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The Greek Fir, *Abies cephalonica* (LOUDON), is a species of fir endemic to the southern mainland of Greece and the island of Kefalonia in the Ionian Sea. It occurs in altitudes of 800 metres and higher. Such forests exist in Kefalonia on Mount Ainos and on Mount Roudi. In 1991, it was established that *Abies cephalonica* is strongly browsed, mainly by goats but also by sheep invading the national park on



Mt. Ainos. In 1992, 1993 and 1995, the state of the trees was investigated more closely by applying a methodology used in forestry in order to evaluate if natural rejuvenescence of the forest still occurs.

At the northern slope of the mountain, 94% of young *Abies cephalonica* trees (height of less than 200 cm) had tops removed by goats. At the southwestern slope, the situation was even worse. There, it was not possible to find enough samples of young trees for a statistically correct investigation. Browsing of trees strongly affects the growth leading to small diameters of stems and reduced height compared to healthy trees: the growth of the trees with a size within the reach of the goats (height of less than 150 cm) was significantly reduced compared to that of higher trees.

It is concluded that the *Abies cephalonica* forest in the national park of Mt. Ainos is endangered by the browsing of goats, in particular at the southwestern slope where climatic conditions are more harsh. The chance for seedlings to grow is very small and the trees get that chance very late. The implementation of effective protection measures seems to be difficult even within the national park because of the arduous social and financial situation of the herdsmen.

## OBSERVATIONS ON THE THANATOCOENOSIS OF MALACOFUNA OF THE LITTORAL ZONE OF SARONIKOS GULF

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The malacofauna thanatocoenosis of the southern littorals of Sounion and Salamina island was studied from shell debris. Overall 160 species were identified, belonging to: Bivalvia 34, Gastropoda 121, Scaphopoda 2, Polyplacophora 3.

Of these, 93 species that were common in our study, are cosmopolitan. The remaining 67, which present some zoogeographic interest, are considered in this study. Most of them are first records for the study area. Special notice must be given to the Lessepsian emmigrant *Cellana rotta* (Gmelin, 1791). Its distribution along the littorals of Salaina island shows an expansion of its colonization in the Eastern Mediterranean, which was known so far only from the coasts of Israel.

## COMPARATIVE MORPHOLOGICAL STUDY OF *Rana balcanica* AND *Rana ridibunda*

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*Rana balcanica* was first described as a new species of water frogs from Greece. The distinction between *R. balcanica* and *R. ridibunda* and their distribution in Greece have been subject to intensive studies. However, some questions still remain open, such as the one on the northward distribution of *R. balcanica*. Mating call is usually used as the most reliable discriminator of the two species, but the problem of morphological differentiation is also of great interest, especially in females. In the present study, the populations of *R. balcanica* from Gevgelija and the lake Dojran, and the population of *R. ridibunda* from Bitola were analyzed for morphological variation. Twenty two quantitative and nine qualitative characters, as well as twelve standardized indices, were subjected to multivariate analyses. Canonical discriminate analysis of morphometric characters provided a highly significant discriminant function. In addition, six enzyme loci were investigated electrophoretically, but significant interspecific differences were not found. The results are discussed with respect to geographical distribution and ecology of *R. balcanica* and *R. ridibunda*.

# BIODIVERSITY CHARACTERISTICS OF SMALL MAMMAL COMMUNITIES IN BULGARIA

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Bulgaria is located in the central part of the Balkan peninsula where the influence of few biogeographical zones finds expression. This fact leads to the presence of a considerable number of European small mammals (about 40 percents).

Previous investigations on the zoogeographical divisions of Bulgarian fauna recognised two faunistic subregions represented in this country: Eurosiberian (north) and Mediterranean (south). The frontier lies across the sites with the northern submediterranean climatic influence. These subregions are divided in seven zoogeographic districts: Danube, Stara planina and Rila-Rhodope in the north zoogeographical subregion; Struma-Mesta, Tracian, Blacksea coast, Strandja in the south zoogeographical subregion.

Among the physico-geographical conditions in Bulgaria, the relief character and the vegetation are of a greatest significance for the recent small mammal fauna. On this basis we consider the following main biotopes: 1) synanthropic; 2) cultivated areas; 3) wetlands; 4) meadows and grazing grounds; 5) oak forests; 6) beech forests; 7) coniferous forests; 8) biotopes with subalpine and alpine vegetation.

Eco-zoogeographical analysis includes both qualitative and quantitative composition of communities, which are represented by 9 insectivorous species and 31 rodent species in Bulgaria. The first step evaluation of the numbers of each species in a certain biotope is done. Using the number of species and their proportion in the communities, the diversity index for the biotopes in every zoogeographical district is given.

## COMPARATIVE STUDY OF POPULATION DYNAMICS WITHIN THE PULMONATE GENUS *Albinaria*.

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While the pulmonate genus *Albinaria* Vest is thoroughly investigated as far as its systematic and biogeographic status is concerned, its life history remains inadequately studied. However the lack of documented knowledge about the significant features of the life cycle, which influences survival and reproduction, builds a drawback in our attempt to understand and explain microevolutionary processes within the genus.

Population dynamics of the populations of *A. coerulea* (Vravrona, Attica), *A. voithii* (Parori, Lakonia), *A. discolor* (Egina, Saronic Gulf), and *A. turrita* (Kea, Kyklades), was studied over a 2-year period (April 1992 - April 1994). The analysis deals with: a) the density of each population and its changes through time, b) the demographic structure of these populations and its modification through time, c) the mortality rates of the total, mature and immature specimens of each population, d) the spatial distribution of each population, e) the reproductive period and f) the aestivation timing and strategies.

The revealed results on these aspects of the populations studied indicate that: a) density is considerably high, even though its changes vary between these populations and through time, b) there are significant fluctuations as far as the demographic structure of each population are concerned, probably due to intrinsic factors, c) mortality differs between mature and immature specimens and in one case is correlated to population density, d) the spatial distribution is always contagious, e) reproduction period is short and starts after the first autumn rainfalls, f) aestivation is triggered by photoperiod and stops due to humidity and photoperiod.

The above information reinforces the view that within *Albinaria*, species or populations share a series of similar life history features and their variations enables them to maintain an effective continuity



through time. In other words, differentiation in life history is opportunistic within the frame of a common phylogenetic history.

## DISTRIBUTION AND ECOLOGY OF THE LONG-LEGGED BUZZARD (*Buteo rufinus* CRETZSCHMAR, 1827) IN CENTRAL BALKAN

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The long-legged buzzard (*Buteo rufinus*) is relatively rare and one of the less studied bird of prey in Europe. In the present paper the author gives data on the distribution and ecology of this species in central Balkan peninsula. The main material in this work are data collected by the author in the period between 1980 and 1995 in Serbia and FYROM. Also, data from other ornithologists (oral communications and unpublished reports) and from bibliography are presented. This is a preliminary study of the present and past distribution, population ecology and trends, habitat, food, breeding (season, nesting, clutch size, breeding success), interspecific relationships and problems of conservation of this species.

## ASPECTS OF THE LIFE CYCLE, POPULATION DYNAMICS, GROWTH AND SECONDARY PRODUCTION OF THE EDIBLE SNAIL *Codringtonia acarnanica* (Kobelt, 1902) (GASTROPODA - PULMONATA), IN PELOPONNISOS - GREECE

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*Codringtonia acarnanica* (Kobelt, 1902) is an edible and rock-dwelling land snail. It is an endemic species distributed in Acarnania and northern Peloponnisos, but data concerning its ecology and biology are not available.

The life cycle, population dynamics, growth and secondary production of *C. acarnanica* were studied in the area of Kalavryta, in Peloponnisos, for three years. Sampling took place at monthly intervals.

The demographic analysis of the population of *C. acarnanica* revealed that:

- Three cohorts are distinguished in the field throughout the year while a fourth one appeared after the reproductive period.
- The reproductive period starts after awakening from hibernation (early spring), but hatchlings emerge to the soil surface after the first autumnal rainfalls.
- Growth rate increases during spring and autumn.

According to von Bertalanffy's method, *C. acarnanica* needs 18 years to attain its maximum size in the field.

Population density of *C. acarnanica* fluctuated during the study period and its spatial distribution seemed to be contagious.

Life and fecundity table showed that mortality rate is very high during the first and third year of life. Net reproductive rate ( $R_0$ ) was equal to 1.05 and per capita rate of increase ( $r_c$ ) was equal to 1.01. Annual secondary production revealed a mean annual standing crop (B) of 0.0492 g/m<sup>2</sup> and an annual production (P) of 0.0488 g/m<sup>2</sup>/year. Annual turnover ratio (P/B) was equal to 0.992.

## SUMMER ASPECT OF SOME MACROZOOBENTHOS GROUPS OF THE GREEK FLOWING WATERS

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During September 1995, the summer aspect of several groups of macrozoobenthos was observed in 4 types of flowing waters in Greece: 1) Kastalia's springs in Delphi, 2) epirhitral below Olympos Mt., 3) metarhitral in Olympia (Kladeos river), and 4) potamal in Pinios river, 20 Km to the west of Lamia. Eight species were found belonging to the order Ephemeroptera, 5 species in Plecoptera, 5 species (including 2 unindentified) in Trichoptera, and 5 species in Diptera (Simuliidae). Five of the species found appeared to be new for the Greek fauna: *Baetis buceratus*, *B.nexus* (both Ephemeroptera), *Protoneura nitida* (Plecoptera), *Nevermania cryophila* and *Eusimulium angustipes* (both Diptera, Simuliidae).

## COMPARATIVE ANALYSIS OF THE DIET OF THE ANURA (VERTEBRATA : AMPHIBIA) FROM THE PETROVARADINSKO-KARLOVACKI RIT MARSH (YUGOSLAVIA) DURING THE MATING SEASON

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During six field studies in the spring of 1995, 200 specimens of the *Anura* (genera *Bombina* and *Rana*) were collected in the Petrovaradinsko-karlovacki Rit Marsh (UTM DR 10). The investigated area is situated in the region periodically flooded by the river Danube, and under great influence of anthropogenic factors.

Prey analysis of the representatives of the genera *Bombina* and *Rana* points to the qualitative and quantitative dominance of Invertebrata, particularly of Insects. Remains of the representatives of Vertebrata (Lacertilia, Ophidia) were found as well, but their amount was considerably smaller. All of the analyzed frog species mainly fed on terrestrial species. Besides the qualitative and the quantitative prey composition, the breadth of the niche and their overlapping were calculated and compared as well.

## ECOLOGICAL EVALUATION OF WATER QUALITY AT RIVER ALIAKMONAS

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According to the new instruction of the European Union about the ecological quality of fresh water (94C 222/06 10/08/1994), all the members are obliged to establish national freshwater monitoring networks until the end of 1998.

Pollution biomonitoring in water ecosystems is widely used since it provides information about the ecological quality of water systems before and during the sampling in contrast to the chemical approach which characterizes the water system only during the sampling. However, ideally, pollution monitoring must combine both chemical and biotic parameters.

Up to now it has been found that benthic macroinvertebrates are the most appropriate animal organisms to be used as biotic indices. The evaluation of the river quality is based on their tolerance to the lack of oxygen and on the changes in their communities caused by organic pollution.



An attempt was made to estimate the water quality and to check the applicability of three biotic indices at river Aliakmonas. This was executed in two sampling sites along the river, one upstream and one downstream. Aliakmonas is the longest river in Greece; it runs exclusively on the greek territory. Its sources are situated at the area of Grammos and Pisoderi. Along the river an artificial lake has been formed because of the construction of three hydroelectric dams. The river receives urban, rural and industrial pollution.

The two sampling sites were situated upstream the lake near the city of Grevena and downstream the lake at Niseli, near the estuary of the river. Samplings were monthly and lasted one year. They included measurements of several physicochemical parameters ( substrate, flow, pH, ZC, BOD(5), P-PO<sub>4</sub>, N-NO<sub>3</sub>, N-NO<sub>2</sub>, N-NH<sub>4</sub> ) and sampling of benthic macroinvertebrates with a semi-quantitative 3 min kick/sweep method. The three biotic indices used were the Biological Monitoring Working Party (National Rivers Authority, NRA), the Average Score Per Taxon (Armitage et al. 1983) and the Lincoln Quality Index (Extence et al. 1987).

The dominant classes of the benthic macroinvertebrates and their most numerically important taxa, identified up to the highest possible level, were the following: Ephemeroptera (*Baetis rhodani*, *Caenis luctuosa*, *Ephemerella* sp. and *Ecdyonurus* sp.), Trichoptera (*Psychomyia pusilla*, *Hydropsyche* sp. and *Hydroptila* sp), Diptera(Chironomidae and Simuliidae), Plecoptera (*Rhabdiopteryx* sp.), Gastropoda (*Physa* sp.) and Oligochaeta which were found in large amounts in every sample.

The performance of the biotic indices showed excellent water quality at the sampling site near Grevena and moderate to excellent water quality at the sampling site at Niseli. Concerning the relationship between chemical parameters and the biotic indices, it seems that there is not a clear correlation between their monthly data but in overall, biotic indices qualify water quality as sufficiently as chemical analyses.

## CIRCANNUAL DYNAMICS OF HEMATOLOGY OF RAINBOW TROUT (*Oncorhynchus mykiss*)

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Number of erythrocytes, haematocrit, haemoglobin concentration, mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC), number of leucocytes and differential blood count were studied in rainbow trout (*Oncorhynchus mykiss*) in different seasons. Blood was collected by heart puncture. All analyses were performed with native blood without addition of anticoagulants. On the basis of the results obtained haematological characteristics of the species in different periods were established and discussed in the view of the phases of its life cycle.

## THE FIRST RECORD OF *Haplotaxis gordioides* (HARTMAN, 1821) (OLIGOCHAETA, ANNELIDA) IN THE OLIGOCHAETOUS FAUNA OF SERBIA, YUGOSLAVIA

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The species *Haplotaxis gordioides* from the family Haplotaxidae, though of cosmopolitan distribution, has not been previously established in Oligochaetous Fauna of Serbia and Yugoslavia. The first record of this rare species was in 1988, when one specimen, 32 mm long, from the benthic communities of the Jablanica River (the source arm of the Kolubara River) was determined. *Haplotaxis gordioides* was also found in 1989 during water quality assessment of The Water Supply System of the town of Cacak. Namely, one specimen, 115 mm long and 1 mm wide was found in the well in the village

of Prijedor, at the depth of 10 m, in the sandy substratum. According to literature data the species *Haplotaxis gordioides* occurs in the northern part of the Balkan Peninsula. As its distribution towards the south has not been confirmed these findings will contribute to better understanding of this species's areal both in Yugoslavia and in the Balkans as a whole.

## THE NEW OCCURRENCE OF THE RARE SPECIES - *Ancylus fluviatilis* MULLER, 1774 (MOLLUSCA: ANCYLIDAE) IN THE BENTHOECOENOSSES OF THE VLASINA RIVER, SERBIA, YUGOSLAVIA

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In the scope of hydrobiological, i.e. saprobiological studies of plankton and periphyton communities as well as benthic fauna of the Vlasina River and its drainage basin, we have found the species *Ancylus fluviatilis* Muller, 1774, which is the representative of freshwater snails from the family Ancyliidae and is rare not only for the fauna of Serbia but also for that of Yugoslavia. This species is otherwise typical of karst fast running waters with stony bedrock. Thus, it was also found in the river Gradac, near the town of Valjevo (West Serbia). The Vlasina River itself flows through a markedly mountainous-hilly region of SE Serbia and represents the effluent of the Vlasina man-made lake, which is situated in the plateau of Vlasina (42° 40' N; altitude 1219 m). Before the construction of the present lake, here there was the well known Vlasinsko Blato - one of the biggest sphagnum peat bogs in Europe. During 1994, the sampling periods for limnological investigations were in June, August and November. Given that the Vlasina is fast flowing mountainous river plankton community is poorly developed. The observed forms of phyto- and zooplankton originate from periphyton and benthocoenoses and belong to the groups: Bacillariophyceae, Cyanophyceae, Chlorophyceae, Dinophyceae, Rhizopoda, Rotatoria and Copepoda. The species *Ancylus fluviatilis* was detected only in autumn samples. As for other representatives of benthofauna, there were found 10 faunistic-ecological groups whereby insects were significantly predominant, which is common for such a type of waters. The most numerous were Chironomidae, then Trichoptera, Ephemeroptera and larvae of Coleoptera. Besides, the significant role was also played by Oligochaeta and Hydracarina. Saprobiological analysis showed the presence of organisms indicative of pure and naturally eutrophicated waters, where favourable ecological conditions for the development of hydrobions prevail. Under such conditions, in the absence of pollutants, the existence and development of *Ancylus fluviatilis*, is possible. This species is the indicator of oligosaprobic waters, preferring mountainous courses with strong water currents to which it is adapted by its morphology.

## THE ECOLOGICAL AND GEOGRAPHICAL FISH DISTRIBUTION IN THE YUGOSLAV SECTION OF THE DANUBE

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Hydroenergetic and navigable system HEPS Iron Gate I was constructed in 1971 by damming the Danube between Yugoslavia and Rumania near the village Sip (km 943), when the formation of the first Iron Gate reservoir started, comprising an area of 17,000ha and a volume of  $2,48 \times 10^9 \text{ m}^3$ . The slowing effect propagates up to 270km upstream the dam.

The HEPS Iron Gate II was constructed in 1984 near the village Kusjak (km 863) when the formation of the second Iron Gate reservoir started, comprising an area of 8,000ha and a volume of  $80 \times 10^6 \text{ m}^3$ .



After the construction of the Iron Gate I and II, the border of geographical and ecological fish distribution range was shifted downstream in the Yugoslav section of the Danube, leaving only 17.4km of the Danube river flow, from the dam of the HEPS Iron Gate II to the mouth of the Timok, for the migrants (Acipenseridae and Clupeidae) reproduction.

The conditions of living for the Danubian fish species were extensively altered. The structure of the ichthyofauna in the Djerdap area constantly changes. The number of autochthonous species decreases, while the number of endangered species increases. The population of Asiatic species are becoming more abundant, and the Black Sea migratory species are decreasing.

## THE CENTERS OF ENDEMISM OF SNAILS IN YUGOSLAVIA

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Yugoslavia is, in view of its geography and climate, the most diverse part of Europe. Its pedologic-petrographic, hydrographic, and floristic compositions allow inhabitation of various species of Gastropoda of various biogeographical origin. Consequently, in addition to the species whose distribution is wide: Holarctic, Palearctic, European, there is an abundance of species with a narrower type of distribution, from Balkan, Mediterranean, Alpine, Carpathian, and Dinaric to the strictly narrow, endemic distribution (the endemites of Serbia, Montenegro, or Yugoslavia).

The high degree of endemism is characteristic markedly of the Mediterranean region. and, to a smaller extent, of parts of Yugoslav territory lying in the continental parts of the Balkan peninsula. Jovanovic (1995) describes the distribution of the endemic fauna of Gastropoda on the territory of Yugoslavia as uneven. The centres of endemism lie in the areas which had been in isolated habitats as regards topography, geomorphology, and hydrography for an adequately long period of time. In Yugoslavia, those centres are the wells and watercourses on the rims of both present-day drainage areas and fossil lakes and seas, e.g., the wells in Prizrenska and Pecka Podgora, on the rim of the ancient Lake of Metohia (*Plagiogeyeria gladilini* Kuser, 1936; *Saxurinator schlickumi* Schutt, 1960; *S. illyrica* Nordsieck, 1970; *Teranigra kosovica* Radoman, 1978); the springs on the verge of Zetski and Bjelopavlicski Basin (*Plagiogeyeria zetaprotogena* Schutt, 1960, *Saxurinator orthoduxus* Schutt, 1960); the neighbourhood of Lake Skadar (*Anagastina gluhodolica* (Radoman, 1973), *Orientalina lacustris* Radoman, 1983); calcareous mountains abounding with caverns, recesses, crevices, underground water (*Speleodiscus obodensis* Bole, 1965, *Virpazaria adrianae* Gittenberger, 1969, *Agardhiella dabovici* Gittenberger, 1975). A large number of endemites is characteristic of isolated wells and short watercourses along the seacoast (*Plagiogeyeria zetaprotogena pageti* Schutt, 1960, *Hauffenia plana* Bole, 1961); the mountains and wells in the east of Serbia (*Balea biplicata balcanica* (Pavlovic, 1912), *Bulgarica moellendorffi* Nordsieck, 1972, *Bulgarica pavlovici* Nordsieck, 1972, *Grosuana serbica remesiana* Radoman, 1973); the mountains in the southwest of Serbia (*Balea biplicata pancici* (Pavlovic, 1912), *Balea urosevici* Pavlovic, 1912, *Herilla zieglerei amalie* Urbanski, 1973).

In conclusion, we may observe that the centres of the most pronounced endemism of snails in Yugoslavia are the following: a large part of karstic Montenegro, with its coastal area and the area of intermittent mountains and valleys; the eastern, Carpathian, and Balkan parts of Serbia, also the southwest of Serbia, notably Kopaonik, Raska, Stari Vlah, and Metohia. There is circa 180 species and subspecies of snails in Yugoslavia.

***Euritemora velox* (LILLJEBORG, 1853), A FRESHWATER CALANOIDA (CRUSTACEA: COPEPODA) - NEW SPECIES IN THE FAUNA OF YUGOSLAVIA**

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During hydrological studies of some waters of South Banat the species *Euritemora velox* (Lilljeborg, 1853) was found for the first time in November 1992 in the plankton of Labudovo Okno (large, permanent pond, overgrown with emergent and submerged vegetation, situated in the close vicinity of the Dunav-Tisa-Dunav channel), which is the first record of this Calanoid (with otherwise boreal distribution) in the fauna of Yugoslavia. Adult males and females along with eggs were found in the sample. The species was established during the cold period of the year, at water temperature of 13.9°C, which is in accordance with literature data contending that it is a stenothermal organism. It was found again in 1993 in the same locality which confirms that the Labudovo Okno is a constant habitat to *Euritemora velox*.

**DISTRIBUTION OF FRESHWATER MEDUSA  
*Craspedacusta sowerbii* LANKESTER IN THE FAUNA OF YUGOSLAVIA**

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The medusa *Craspedacusta sowerbii* Lankester is considered to be one of the most interesting freshwater invertebrates. It is distinguished by the unique biology, unexpected occurrence and mass development. According to literature data, freshwater medusa *Craspedacusta sowerbii* is distributed in temperate and tropic zones. Nevertheless, no data are available on its presence in Africa. It is more frequent in North America than in Europe. In the territory of Yugoslavia *Craspedacusta sowerbii* was first recorded in the plankton of the Rijeka Crnojevicna River, in the immediate vicinity of its mouth into the Skadar Lake, in August 1958. During the same year, in October, it was found in the pond beside the Morava River near the town of Guprija. Its single occurrence was also detected in the plankton of the Danube near Novi Sad. During station studies of the plankton of the Sava Lake (an artificial lake constructed in 1966 by damming an arm of the river Sava near Belgrade) it was recorded for the first time in August 1981. Further plankton studies showed that this rare freshwater medusa inhabits the Sava Lake where its occurrence is unexpected though abundant, during warm period when water and air temperatures are high. Thus, it was recorded in July 1994 and then already next year the medusa stage was found in July and August. The polyp stage has never been recorded in Yugoslavia.

**BIOMETRICAL STUDY ON THE NEMATOCYSTS OF THE SEA ANEMONE *Anemonia viridis* (FORSKAL, 1775)**

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Cnidom is one of the most significant morphological characteristics in the phylum Cnidaria. Additionally, the qualitative makeup of the cnidom, is supposed to be one of the most reliable criteria for the classification of Cnidaria species, in the level of genus & species.



In this study, we demonstrate that in *Anemonia viridis*, only some types of cnidocytes can in fact be used as reliable taxonomic characteristics. Other types of cnidocytes are more or less influenced by body measurements such as biomass and length of column and thus, can not be used as reliable taxonomic characteristics.

## THE CONTINENTAL FAUNA OF AMPHIPODA (CRUSTACEA, MALACOSTRACA) OF GREECE AND ITS ZOOGEOGRAPHICAL RELATIONS

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The continental freshwater fauna of Amphipoda (Crustacea, Malacostraca) in Greece is relatively very rich, but still not satisfactorily studied. The present knowledge of the epigeal and hypogeal freshwater fauna of Amphipoda of Greece reveals the close zoogeographical connections of Greek fauna with that of other parts of the Balkan peninsula and with Asia Minor. The subterranean fauna of some Greek islands show the presence of old Tertiary elements as well as taxa settled on these islands much later. On the other hand, the invasion of the marine amphipodous elements into the epigeal and hypogeal freshwater fauna is well visible and still in process.

## ZOOGEOGRAPHICAL DISTRIBUTION OF THE EARTHWORM (OLIGOCHAETA, LUMBRICIDAE) SPECIES *Allolobophora dofleini* (UDE, 1922)

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The earthworm *Allolobophora dofleini* has been discovered (Doflein, 1921) and described (Ude, 1922) from FYROM. This species is distributed in the greatest part of FYROM and in the northern part of Greece (Sapkarev & Pavlovski, 1984). In the southern part of Serbia it has been already recorded (Sapkarev, 1980; Zicsi, 1980) from: Cemernik, Vlasina, Lebane, Grdelica, Vrnjacka Banja, Niska Banja.

Our recent investigations have revealed new occurrences of the species in the southern part of Serbia: Pasjaca, Vranje, Nis, Vidojevica, Leskovac, Ostrožub, Niska Banja, Vlasina. We found it also at a new locality in central Serbia: Jastrebac.

These new findings could contribute to a better insight of the zoogeography of this species.

## DISTRIBUTION OF THE NORWAY RAT ON THE TERRITORY PREVIOUS AND NOWADAYS YUGOSLAVIA

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Biology and population ecology research on the Norway rat are multiple important and interesting mostly from hygienic - epidemiological and economic aspects. The most important characteristics of this rodent are special possibility of accommodation in different situations and types of environment and euryvalency. That's why it is important to explore the distribution of them. The intention of this work is to supplement to the map of the distribution of Norway rat on the territory of previous and nowadays Yugoslavia.

The investigation includes period from 1978 to 1995. The presence of the Norway rat was registered by founding holes, wastes, making inquiry and using traps. In some cases the material was collected after deratisation. The presence of the Norway rat is shown on UTM grid map which is used for presentation data on national level.

Checking 150 new locations of the Norway rat including literary data that give us a number of more than 300, gives significant supplement to the map of the territory of previous and nowadays Yugoslavia which is shown by Petrov (1992).

This supplement is especially great on the territories of central, west, south - east and east part of Serbia, Slavonia, east and central part of Bosnia and Herzegovina and part of previous Yugoslav Republic Macedonia. The spread of Norway rat is of special interest on the territory of Adriatic coast.

These results and the results of Bulgarian, Italian and Spanish authors disapprove the fact that Norway rat is sporadically spread on the territory of south Europe.

## AGE AND SEX STRUCTURE, FERTILITY AND DENSITY FLUCTUATIONS OF YELLOW-NECKED MOUSE (*Apodemus flavicollis*) IN SOME FOREST ECOSYSTEMS OF SERBIA

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Population characteristics of the species *Apodemus flavicollis* and influence of relevant ecological factors on the populations dynamic of this rodent have been studied during the five-year period. Specimens were caught during three successive days, seasonally, using "Longworth" traps. After morphometric data have been taken, the animals were marked and left free. From dead individuals eye balls were taken out for the preparation of eye lenses. At the same time genital organs were examined in order to check for the presence of the embryos, foetuses and placental scars. Sex of the adults was determined visually and that of the foetuses by dissection and observation under a binocular.

Studies of age structure revealed prevalence of younger age classes up to 2.5 months old comparing to older age classes, during the vernal period. Opposite results were recorded during the autumn and winter periods. Analyses of sex structure showed a sex index of about 1:1 in all three populations, i.e. during all three seasons of examinations. Approximately the same sex ratio was recorded in the foetuses.

Relative number of gestation females ranged from 9.4% and 8.2% to 21.6% and 17.6% depending on the season, climate conditions and population density. The number of both placental scars and embryos per litter averaged 5.04-5/63. females brought forth young's three times at the most, but they usually had offspring only once.

Changes of population density of *A. flavicollis* observed in two different forest ecosystems were found to be directly correlated with plant fruiting, i.e. they strongly depended on the food available to this rodent species.

## AGE AND EYE-LENS WEIGHT IN THE YELLOW-NECKED MOUSE, *Apodemus flavicollis* (MELCHIOR, 1834)

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The Yellow-necked mouse, similarly to other rodent species grows during its whole lifetime. Considering this fact many authors have used body weight, body length, teeth wearing out rate, cephalization index, for colour, condylobasal length, testis diameter and other morpho- and craniometric



parameters as relatively good age indicators. There are also reports concerning eye-lens weight determination, which has been shown as reliable parameter for most small rodents in particular.

The aim of this study is to compare some of the widely used methods for age determination with eye-lens weight method by using yellow necked mice of known age. To this aim, animals from the natural populations ( captured in a forest ecosystems Maljen mountain and forest near Pancevo-Belgrade ) were bred in a simulated natural conditions at the small farm of the Institute for Biological research; animals of known age were sacrificed, subjected to morphometric measurements and eye lenses prepared for measurement of dry tissue weight as described (Nabaglo and Pachinger, 1979).

Assessment of body weight-age, body length-age and body length/weight to age relationships in Yellow-necked mice demonstrated strong correlation with age up to 6.5 months, with  $r=0.87$ ,  $0.89$  and  $0.92$  for respective relationships in males, and  $r=0.90$ ,  $0.90$  and  $0.94$  for relationships in females.

The dry eye lens tissue weight to age relationship was observed in *Apodemus flavicollis* specimens (116 females and 112 males ) from 1 to 11.5 months old. We further found that the dry weight of the eye lens pairs correlated with age from 1 to about 8.6 months, with the following regression curve values for 181 animals (92 females and 89 males):  $Y=11,848 \pm 1.133X$ ;  $r=0.98$ ;  $tr=12.06$ , ( $X$ = age in month,  $Y$ =dry tissue weight of eye lens pairs in mg). Special attention was paid to the weight of eye lenses in specimens aged 2-2.5 months, when more than 75% of animals show sexual activity (adult status). At this age, the dry tissue weight of eye lens pairs equals from 14.11 to 14.68 (real data for specimens aged 2 months is  $14.5 \pm 0.74$  (SD), min. 13.18 max. 16.12 mg).

In conclusion, our data demonstrated higher reliability of eye-lens dry weight method compared to other methods for age determination and pointed its usefulness in terms of applicability for wider range of age. We recommend this method as the additional one to commonly used methods for age assessment of rodents. The use of this method may help in accurate detection of the age structure of natural populations of *A.flavicollis*.

## FAUNA DROSOPHILIDAE (DIPTERA) OF FORMER YUGOSLAVIA

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Drosophilidae fauna researches on the territory of former Yugoslavia have a long history - first information was given probably by Scopoli in 1763, then Frauenfeld (1868), Strobl in a series of papers published from 1893 to 1910, Coe (1959) and many others. Twenty years ago researches of our own started in this area (Kekic & Marinkovic, 1978; Kekic & Bachli, 1981 etc.). More than 50 geographic localities, situated in different biogeographic areas and various habitats, were investigated: Adriatic coast and islands (from Porec at the north to Kupari at the south), mountains in Bosnia and Herzegovina, Pannonian plane, from the Palic Lake at the north, across Serbian and Montenegrinian mountains, to the coast of the Ochrid Lake at the south. More than 200,000 Drosophilidae specimens were collected and 43 species were identified, among them 23 unknown from the area before the start of our research. Taking into account all Drosophilidae fauna researches on the territory of former Yugoslavia, a total of 56 species, grouped in 10 genera, have been discovered so far. It is our opinion that in this part of the Balkans, considering the great biogeographic and ecological variety (Matvejev & Puncer, 1989) and a great deal of unexplored parts, a larger number of Drosophilidae species exist.

THE OCCURENCE OF *Penaeus japonicus* BATE (CRUSTACEA, PENAEIDAE)  
IN THE AEGEAN SEA

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*Penaeus japonicus* BATE, 1888 is recorded for the first time in Aegean Sea. In the samplings that were conducted by trawling along the coast of Rhodes island, four males of *Penaeus japonicus* were caught. Total length of specimens ranged between 116-210mm, carapace length between 22-52mm, and wet weight between 10.6-58.2gr. The prawn is an Indo-Pacific species but it is also present along the south-eastern coast of the Mediterranean, where it has migrated from the Red Sea through the Suez Canal (lessepsian migrant). *P.japonicus* is present along the coasts of Egypt, Israel, Lebanon, Syria, Cyprus and the Mediterranean coasts of Turkey (Alexandretta, Mersina, Attalicia). The species is considered among the 25 most successful Lessepsian migrants in terms of area extension. It is suggested that the presence of *P.japonicus* in Rhodes island is due to its gradual spreading along the Mediterranean coast of Turkey and to its subsequent 'crossing' of the Rhodes Channel.

BIOGEOGRAPHICAL ANALYSIS OF THE DISTRIBUTION OF REPTILES AND AMPHIBIANS  
OF NORTHERN GREECE (MACEDONIA AND THRACE) AND THE NORTHEAST AEGEAN  
REGION

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We present the recent distribution of Amphibians and Reptiles of Northern Greece (Macedonia and Thrace) and the Northeast Aegean region (including the islands of Thasos, Samothrake, Limnos and Agios Efstratios). Distribution maps are compiled from data deriving from museum material, literature and extensive mapping during several field trips in the past ten years.

The influx of different biota (Western Balkan, Central Balkan and Anatolian) in this region is discussed and analyzed by terms biogeography and the influence of ice age changes in the distribution. Human interference with the original biocenose after the ice ages and the massive impact of man in the past 5 to 8000 years will be discussed. This will include aspects of landscape destruction for agriculture in recent times as well as overgrazing by feral goats and the passive dispersal of species in the region.

CHELONIANS OF GREECE - A REVIEW OF SYSTEMATIC AND DISTRIBUTION OF TURTLES  
AND TORTOISES

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Greece and the adjacent regions offer the widest species richness in chelonians of all countries around the Mediterranean sea. The question of systematic diversity was often raised by several authors in former days, but they did not split the known species. With the latest papers by FRITZ, HIGHFIELD and KEYMAR & WEISSINGER (†) and most probably by BOUR the situation changed dramatically. It turned out that not only subspecific diversification occurred during the ice ages and after (*Emys orbicularis*) or may be represented and not yet defined (*Testudo graeca*); a new species, hidden for a long time due to its astonishingly similar appearance to *T. marginata* will be described in the near future.

The known recent distributional limits of each species including the subspecies are given. Data are based on museum collections, literature data and the results of the authors own field experience and mapping in the past 15 years. The context with chelonian systematics and distribution in adjacent regions is discussed.



# DIFFERENCES OF THE BIOLOGICAL CYCLES OF SOME SPECIES OF SUPERFAMILY ACRIDOIDEA BETWEEN NORTHERN AND SOUTHERN CRETE

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Some species of the superfamily Acridoidea present intense differences in their biological cycles between the North and the South of Crete.

Two characteristic examples of important differences in biological cycles are cited below. They concern two species of two different families.

In the first example, the species *Calliptamus barbarus* of the family Acrididae, is absent, during January, from the examined regions of North Crete (Giouchtas mountain, Fortetsa hill by Irakleio, Kalesa). However, at the southern region of Frangokastello these insects have been recorded at the same month. They are kinetically active, they feed and also copulate. The months of courtship in northern Crete are August and September. However, it is possible that during some very cold years they overwinter at the stage of egg, even in the south of Crete.

The second example concerns a species of family Pyrgomorphidae, *Pyrgomorpha conica* which overwinters at the nymphal stage in northern Crete. In the North, the final ecdysis which produces the adult insect occurs during spring. Some of the specimens of this species from Chrysi island in the south of Crete were recorded at the adult stage in early winter.

## A DESCRIPTION OF THE MARINE ENVIRONMENT OF THE NORTHERN SPORADES NATIONAL MARINE PARK BASED ON OCEANOGRAPHIC SURVEYS

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Despite the intensive efforts for the conservation of the monk seal in the park, little is known of its relationships with the marine environment that supports its survival. A general survey in 1985, just before the establishment of the Park, has demonstrated that the Park hosts a variety of habitats of high ecological value. The present study, based on data from surveys carried out during the summer of 1994 and 1995, is the first to follow after that report. Twelve stations distributed all over the park were sampled (Kyra Panagia, Alonnisos, Piperi, Psathura, Gioura, Skantzura and Skopelos). During the surveys both abiotic and biotic parameters were measured and analysed.

These included water column measurements such as temperature, dissolved oxygen, salinity, turbidity, nutrients, photosynthetic pigments, suspended matter and zooplankton, as well as sediment characteristics, organic carbon content and finally benthic animal communities. Priority was given to the benthic community of *Posidonia* meadows because of its importance as the climax environment in the Mediterranean and its possible relation to the monk seal feeding habits. Based on the present results a sampling scheme for the long term monitoring of the marine environment of the Park is proposed.

# DIVERSITY OF THE MACROBENTHIC FAUNA IN THE AEGEAN SEA AND ITS RELATIONSHIPS WITH THOSE OF NEIGHBOURING AREAS: PRESENT STATUS, SIMILARITIES, INFLUENCES

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A description of the biodiversity patterns in the Aegean Sea is attempted on the basis of data collected since 1970, concerning the composition of benthic macrofauna and benthic macroassemblages of the area. Aegean diversity is being compared with that of other Mediterranean and other adjacent areas, after a critical review of the relevant literature. The comparison is based mainly on the degree of affinity among the different benthic faunas, and aims to the clarification of their interactions and the processes leading to them. Special attention is being paid to the problem of Lessepsian immigrants.

From the evaluation of the above data, some considerations on the origin of the benthic macrofauna of the Mediterranean, on its diversity and processes determining the differences in diversity between Mediterranean areas are drawn.

## INHERENT CYCLIC BIOLOGICAL RHYTHMS AFFECT MORPHOGENESIS IN REGENERATING LIMBS OF URODELE AMPHIBIANS

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Nearly 150 years ago it became well established that metabolic and sexual activities of amphibians are subject to seasonal variations. Those observations have been in the meantime carefully analyzed under constant laboratory conditions using as experimental system the regenerating limb of urodeles. Thereby it was concluded that seasonal variations in animal activities might be due to seasonal fluctuations in the production of several pituitary hormones. Since the referred studies deal with physiological functions and properties directly influenced by the intermediate metabolism, a causative connection between the effect of the season and the physiological function seems to be plausible.

Despite the existence of statistically significant seasonal differences in various physiological functions, artificial fertilization at different seasons of the year under constant experimental conditions leads always to the development of animals with normally patterned trunk, head, internal organs and extremities. This observation might be interpreted as seasonal variations not affecting the most mysterious biological procedure, namely morphogenesis. The present study was conducted to test the validity of the above interpretation.

The rationale of the study at hand was to challenge morphogenesis of regenerating limbs by mild interventions. Two hundred *Triturus cristatus*, acclimatized for three months at 12h light cycle and 20°C had both forelimbs amputated at the middle of zeugopodium. Experimental limbs (right ones) were punctured by a needle or injected with 5µl of Leibovitz or DMEM culture media. Limb growth was inspected twice a week. After full development of the limbs, skeletal structure was evaluated by Victoria blue staining and clearing. It was documented that in the Winter series (December to February) 96% of the limbs exhibited normal pattern. In contrast, during Spring (March to May) 100% of the limbs displayed abnormal structure after single pricking. Injection of the culture media in the stumps seems to alleviate the pattern-disturbing effects of the pricking.

It is concluded that under appropriate circumstances which augment metabolic demand even morphogenetic mechanisms are influenced by the season of the year.



## FURTHER INVESTIGATIONS OF ACCOMPANYING FAUNA OF ORCHARD BEES

*Osmia cornuta* LATR. AND *O. rufa* L.

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*Osmia cornuta* and *O. rufa*, newly domesticated bees for pollination of orchards, have been reared in great populations for some time. They are used with great success for orchard pollination and for pollinating some crops in green houses (Krunić et al. 1995; Pinzauti 1992; Kitamura et al. 1969; Torchio 1987; Kristjánsson 1989). Due to the increase of their populations their niches are inhabited by numerous other species. Out of them Arthropoda are the most numerous (Mihajlović et al. 1991). The species of accompanying fauna registered up to date may be divided into the following categories:

- parasites:

*Leucospis dorsigera* F. (Hymenoptera, Leucospidae), *Monodontomerus obscurus* West. (Hymenoptera, Torymidae), *Melittobia acasta* (Walk.) (Hymenoptera, Eulophidae), *Chaetodactylus osmiae* (Duf.) (Acaroidea, Chaetodactylidae), *Anthrax anthrax* Schrk. (Diptera, Bombyliidae)

- cleptoparasites:

*Cacoxenus indagator* (Low.) (Diptera, Drosophilidae)

- predators:

*Trichodes apiarius* L. (Coleoptera, Cleridae), insectivore birds

- nest destroyers:

*Ptinus fur* L. (Coleoptera, Ptinidae), *Plodia interpunctella* Hbn. (Lepidoptera, Pyralidae)

- accidentally inhabited species:

representatives of the families Eumenidae (Hymenoptera) and Megachilidae (Hymenoptera).

Control of certain harmful species of the accompanying fauna is of great importance for the successful management of *O. cornuta* and *O. rufa*.

## ASPECTS ON THE POPULATION STRUCTURE, RELATIVE GROWTH AND ETHOLOGY OF THE SPECIES *Mauremys caspica* (CHELONIA: EMYDIDAE) IN ALMYROS RIVER (CRETE - GREECE). A PRELIMINARY REPORT.

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*Mauremys caspica*, is one of the two terrapin species found in Greece and the only Chelonia species living in Crete. While there is a relatively large number of reports concerning the physiology of *M. caspica*, very few reports on the ecology, biology and ethology of this species have been published. Concerning the dynamics of the populations of this terrapin, there are but a few aspects.

For the present study 283 terrapins were measured, marked and released from May to September 1995. All the data were collected from the extended marsh system along the riverside. An attempt to determine the nature and use of their habitat was done, taking into account the sex and the size of the individuals. Their territory preferences and the way they use the available space was examined.

The first data have shown a population consisting of approximately 3500 individuals, with females outnumbering males, on a ratio of 3:1. The size frequency histograms have shown that the carapace length of the majority of the population ranges between 15 and 20 cm, while that of the males ranges mainly between 9 and 14 cm and that of the females between 15 and 20 cm.

These animals exhibit a preference to the marsh areas beside the river, even though some of these areas show high contamination from sulfur.

## GENETIC VARIATION IN ALPINE NEWT, *Triturus alpestris* POPULATIONS FROM GREECE

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Four populations of the alpine newt *T. alpestris* from Greece were investigated at the isozyme level. Ten enzyme systems, corresponding to 14 gene loci, were studied by starch gel electrophoresis. A high degree of intrapopulation variation was found. The percentage of polymorphic loci ranges from 28.6 to 42.9 and the degree of expected heterozygosity ( $H_e$ ) ranges from 0.096 to 0.140. Furthermore, the interpopulation genetic variation was rather high ( $F_{st} = 0.081$ ;  $P < 0.05$ ). A population which belongs to the subspecies *T. a. veluchiensis* has the highest values of Nei's genetic distance ( $D$ ) and diverged from the rest.

## FORAGING BEHAVIOUR AND TIME-BUDGET OF MIGRATING SPOTTED FLYCATCHERS (*Muscicapa striata*) OCCUPYING TEMPORARY TERRITORIES AT A MEDITERRANEAN STOPOVER

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The Spotted Flycatcher (*Muscicapa striata*) is the commonest and most widespread flycatcher and the largest member of its family in Europe. It is a specialised feeder of flying insects, which are mostly caught by sallying out from a raised perch. As a summer visitor which migrates chiefly to sub-Saharan Africa through the Mediterranean basin on a relatively broad front, it is very common during migration in all parts of Greece (Bateson & Nisbet 1961). The migratory strategy of the species in the autumn consists of a gradual progression southwards, with regular stopover sites where opportunistic feeding and moderate build-up of fat reserves occurs (Moreau 1972). Individual birds stay at these stopover sites from one day up to almost a month and unlike most migrating passerines, they often exhibit temporary territoriality (Simmons 1954). Time-budget of birds at these temporary territories is crucial, as it has to reconcile time and energy spent on aggressive behaviour with the requirement for intense feeding and pre-migratory fat accumulation; very few studies have addressed this issue in detail.

The present study deals with the migrating population in a 17ha area of S-E Attica, Greece divided in two sections: a pine forested valley and an open olive grove with scattered maquis. Observations took place in the period July-October 1992 and a total of 72 different individuals were recorded; of those 30 (42%) stayed for more than two days, the longest being 12 days. Resident birds leave in late July-early August, the first migrants arrived in the third week of August and the last birds left the area in the third week of October. Density showed the characteristic double peak recorded for this species (Isenmann 1989), in the first and last week of September. It reached a maximum of 2.65 ter./ha almost double the highest breeding density recorded in Europe (Cramp & Perrins 1993). Temporary territories concentrated around forest clearings close to a water source and the subsequent very tight spacing in these "hot-spots" resulted in frequent intra-specific aggression, with number of clashes between individuals inversely correlated to the average distance between adjacent territory centres. Foraging was vigorous throughout the period. Birds made mostly short foraging attempts and avoided active chases of larger prey which are energetically costly and often unsuccessful. Feeding activity was concentrated early in the morning and late in the afternoon during late August and early September when territories were occupied for several days. Later birds, of more northerly origin, fed intensively even in mid-day and tended to leave earlier. Although temporary territories were in general defended aggressively, some proximity was tolerated, especially of subordinate individuals, whose prey was occasionally usurped. Within-territory mobility was high and birds changed perch frequently if prey was not detected after a few seconds, or if a highly profitable food source, such as an insect swarm, appeared elsewhere. Perch type varied with availability, but birds chose to forage from low to moderate heights avoiding the high canopy, except when vigilant for conspecifics or during cooler periods, when insect prey was stayed close to the foliage. Results of this study corroborate earlier accounts of temporary territoriality.



and provide new insights on the migratory time-budget and foraging patterns of this long-distance multiple-stop migrant.

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### BIOGEOGRAPHICAL AND TAXONOMICAL INVESTIGATIONS OF ROE DEER (*Capreolus capreolus* L.) POPULATIONS FROM SOUTHERN YUGOSLAVIA.

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For three populations from southern Serbia and Montenegro (Yugoslavia), Lipovica, Ivangrad and Prokletije, as well as a small sample from mt. Tara, population ecological parameters (density, dispersal, age and sex structure, indices of fertility and habitus) as well as craniometric characteristics of the populations were analyzed. Part of the sample was obtained through regular game management activities, while a part was obtained by examination of trophies in private collections.

Variation in 56 measures was investigated in 250 craniums of the roe deer. Craniological variability was analyzed by standard multivariate statistical techniques with respect to the population parameters and localities.

We commented specifically on the protection status of the roe deer populations in light of our results.

Our results are also relevant to the taxonomic status of the roe deer in southern Yugoslavia with regard to the proposed existence of *Capreolus capreolus baleni* MARTINO 1932.

### COMPOSITION OF THE ASSOCIATED FAUNA AND FLORA LIVING ON THE *Microcosmus sabatieri* ROULE 1885 (ASCIDIACEA) IN THE NORTH AEGEAN SEA

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The epifauna and the epiflora associated with the *Microcosmus sabatieri* from Porto Koufo in the North Aegean Sea were examined. The benthic samples were taken from the depth of 5-12 m. The Crustaceans, the polychaetas and the gastropodes were the most common epifauna groups.

The correlations between the fauna and flora with the sizes of the tunicates is described.

# SURVEY OF BATS (MAMMALIA, CHIROPTERA) OF THE ATHENS METROPOLITAN AREA

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The bats of urban areas in Greece have never been studied up to now. No data exist on species present, on the status of populations and on the effects of urbanization on these animals. In order to study the bats of the Athens metropolitan area which is the largest urban conglomerate in Greece, concentrating more than 1/3 of the total human population of Greece, 50 sites were chosen according to several criteria. The sites were surveyed using an ultrasonic bat detector, and roosts, number of foraging bats, vegetation, level of human disturbance and other factors were noted. Although not in large numbers, bats are found everywhere in Athens. The biggest concentrations seem to be around the rock of the Acropolis and in the surrounding district of Plaka, in wooded areas on the fringes of the city and in large parks.

The ultrasounds that were recorded were analysed using a specific computer program. Five species were identified: *Pipistrellus pipistrellus*, *P. kuhli*, *Myotis blythi*, *M. emarginatus* and *Eptesicus serotinus*. The first two species were the most widespread.

The statistical analysis of factors possibly affecting bat presence showed that areas with air pollution, high density of buildings, noise and human presence are avoided. On the other hand, dense vegetation, diversity of habitats, presence of open water and medium light intensity are favourable conditions. The numerous caves in the surrounding mountains are important for hibernation. Pine trees which have been planted extensively in the last 40 years in and around Athens do not seem to be suitable for bats.

## AGE GROWTH AND MORTALITY OF *Aphanius fasciatus* (NARDO, 1827) (PISCES: CYPRINODONTIDAE) IN THE MESSOLONGHI AND ETOLIKON LAGOONS (WESTERN GREECE).

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Age growth and mortality of *Aphanius fasciatus* from Messolonghi and Etolikon lagoons were studied using 1222 fishes. Monthly fish samples were carried out with a small beach seine, from June 1989 to July 1990. Fishes were studied for the two lagoons separately, were observed significant differences between sexes and between lagoons. *A. fasciatus* grows allometrically (slope of length - weight regressions  $> 3$ ). There were no significant differences between sexes at each lagoon, however there were significant differences for fish of the same sex between lagoons, fishes from Messolonghi lagoon were heavier for same length than those from Etolikon lagoon. Age was determined by means of scale reading and the annual ring formation was found to be once a year occurring during February. Back calculated total lengths at age showed there was significant differences between sexes, females were larger than males and fishes from Messolonghi lagoon were larger than fishes from Etolikon lagoon. Growth for each sex were fitted the von Bertalanffy growth equation. The yearly growth rate is greatly reduced after completion of the first year. Females dominated all samples, with an overall males : females ratio 1: 2.44, although seasonal variation was noted; the highest proportion of males, 1:1.3, occurred immediately before the spawning season. Total instantaneous mortality rate of males were also higher than females. Total instantaneous mortality rate of males were also higher than females and mortality rates for both sexes from Etolikon lagoon were higher than from Messolonghi lagoon.



## CONTRIBUTION TO THE STUDY OF THE SEA ANEMONES CNIDOM IN EASTERN MEDITERRANEA SEA

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Cnidom is one of the most significant morphologic characteristics in the Cnidaria phylum. Additionally, the qualitative makeup of the cnidom is thought to be one of the most reliable criteria for the classification of Cnidaria species, in the level of genus & species. This paper brings together all the references concerning the cnidom of the sea anemone species found in Greek seas, in an attempt to construct an updated reference base. The need for such a work was thought to be high, as the last papers that dealt with the subject were those of Carlgren in 1938 and 1940.

## PHENOLOGY OF THE KINETIC ACTIVITY OF MACRO-PEDOFAUNA ALONG AN ALTITUDINAL GRADIENT ON THE LEUKA ORI MOUNTAINS, CRETE, GREECE

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The kinetic activity of the macro-pedofauna (>5mm) has been studied with pitfall traps, for two years. Five sampling areas were defined along an altitudinal gradient on the southern slope of Leuka Ori mountains, at 800, 1200, 1600, 2000 and at the peak of the mountains at 2450m, respectively. Sampling took place on a monthly basis.

The phenology patterns of the kinetic activity of Arachnida, Chilopoda Diplopoda and Isopoda, are presented here, with an attempt towards a comparison of between-altitudes data. Results show the differential effect of the changing of altitude, as a total of interacting parameters. Activity patterns differ within and between altitudes, depending on the group we refer to, the season, or the different climatic conditions between altitudes during the same season. Peaks of activity of different groups vary widely. Additionally, the potential of various microclimatic conditions at each biotope, plays an important role in the phenology of the kinetic activity of different taxa.

## PRESENCE AND ACCLIMATIZATION LEVEL OF THE INTRODUCED FISH SPECIES IN YUGOSLAVIA

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Fifteen allochthonous freshwater fish species belonging to six families of which nine are introduced in the Danube river basin and the twelve to the Adriatic river basin inhabit the surface waters of Yugoslavia. Also, the three new fish species from three families originating from the Black Sea Basin are found in the Yugoslav portion of the Adriatic Basin.

The introduced fish species belong mainly to the two zoogeographical Holarctic subzones, namely North America (the Sonora subzone) and Far East (Manchurian-Chinese subzone). In the Yugoslav terrestrial waters they have been introduced in various ways, i.e. to increase the total ichthyoproduction, or due to melioration, its role in the biomanipulation processes, as the aquarium fishes, or accidentally. Our knowledge of their faunistical, taxonomic, and ecological aspects is not at the same level, and therefore economically important species have been investigated in most detail.

Today it may be unconditionally stated that the seven species (*Salvelinus alpinus*, *Carassius auratus*, *Pseudorasbora parva*, *Ictalurus nebulosus*, *Lepomis gibbosus*, *Micropterus salmoides* and *Gambusia affinis*), confirmed by their reproduction under the natural conditions, are completely adapted in this part of their extended distribution area. They are important members of the Yugoslav ichthyofauna affecting concurrently in a specific way the autochthonous fish species. Maximum expansion is already recorded in *I. nebulosus*, *L. gibbosus*, *C. auratus gibelio* and *P. parva*. A number of species is characterized by high acclimatization level reflecting in good satisfactory result of total growth (*Oncorhynchus mykiss*, *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix* and *H. nobilis*). It may be expected that certain of this species inhabiting these waters more than three decades, and taking in to consideration their successful acclimatization in particular those from the "Chinese complex", will reproduce soon under the given natural conditions. The other species were found solely or in small numbers (*Salvelinus fontinalis*, *Coregonus peled*, *Megalobrama terminalis* and *Mylopharyngodon piceus*) and may be observed only in certain running and stagnant waters.

Besides these fifteen fish species, three species from the Black Sea Basin (*Thymallus thymallus*, *Tinca tinca* and *Perca fluviatilis*) of which the first two are found only solely while the third species is more frequent, have been introduced in the Skadar lake basin.

### FEEDING ECOLOGY OF *Podarcis peloponnesiaca* (SAURIA: LACERTIDAE) IN SPRING

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*Podarcis peloponnesiaca* is a lacertid lizard species endemic to Peloponnisos (Greece). For the present work, the digestive tract contents of about 100 specimens were examined and the results of their analysis are discussed together with food availability data acquired by using pitfall traps. A comparison is also made between the diet of males and females. The examined material belongs to the herpetological collection of the Zoological Museum Alexander Koenig in Bonn and to authors' personal collections, captured during spring months (March - May) when the activity of the lizards is at its peak.

According to the results of the present study the species concerned feeds mainly on arthropods, and the most frequently encountered prey groups in its diet are Coleoptera, larvae, Diptera and spiders. The same taxa are also found to be numerically predominant in the stomachs.

Our data suggest that *P. peloponnesiaca* feeds on the commonest prey taxa in its habitats, like spiders and Coleoptera.

### INVESTIGATIONS OF ANOSTRACA (CRUSTACEA) IN YUGOSLAVIA AND ADJACENT REGIONS

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Our investigations on fauna of Anostraca revealed the presence of the genus *Branchipus* Schaeffer, 1766 in a few localities of Serbia, Croatia, N.Bosnia and the so called Republic Srpska Krajina. This genus is represented in Europe by several species out of which *B.stagnalis* is the most common. The populations of this species, distributed in various European regions, show certain morphological differences so that the taxonomical relations are not clear yet. The revision of taxonomic value of some of their structural characteristics is necessary. Our investigations may contribute to the better understanding of the significance of structural features to the taxonomy of the genus *Branchipus* and the species *B.stagnalis*.



On the basis of comparative morphological analysis of the discovered populations of this genus, which are related to *B.stagnalis*, it may be concluded that the differentiation of this species into two forms: forma typica and forma *visnyai* is most probably groundless. Bearing this in mind, the revision of the diagnosis of *B.visnyai* Kertesz, 1956, as a separate species should be done. However, in our view the Romanian population of the species *B.stagnalis* (Orghidan, 1953) represents a separate form which seems to have species rank.

## ROLE OF NOMADIC FARMING IN DISTRIBUTION OF GRIFFON VULTURE *Gyps fulvus* ON THE BALKAN PENINSULA

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Considering all *Aegyptiinae* vultures, the griffon vultures (*Gyps sp.*) are the most specialized scavengers in communities of migratory ungulates. Abundant populations of migratory ungulates inhabited South-European grassland communities (steppes, meadows etc.) during the past. The scavenger role of griffon vulture is modified in recent ecosystems, since the large migratory herds of European bison *Bison bonasus*, wild cattle *Bos primigenius*, muflon *Ovis mosimon*, wild goat *Capra agagrus*, tarpan *Equus caballus* and wild ass *Equus africanus* are replaced by domestic herds. Considering Balkan peninsula, the process of wild ungulates domestication started 9000 years ago. The grazing routes of domesticated herds were the same as the migratory routes of wild ungulates.

Analyzing distribution of griffon vulture at the end of 19 century on Balkan peninsula, we revealed that colonies of griffon vulture were usually distributed in gorges, canyons and rocks, near the compressed points of the livestock migration routes. In this article we analyzed three samples of griffon vulture's aggregation on Balkan peninsula: west Serbia, Hercegovina and Crete island and corresponding migration routes of livestock. Knowledge about nomadic farming enables better understanding of present position of griffon vulture on Balkan peninsula and facilitates all activities which are directed at the protection of this species.

## NEW FINDS OF MIOCENE MAMMALS IN GORNJA PREBREZA (TOPLICA, CENTRAL SERBIA)

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In June 1995, after a 30 years break, paleontological excavations were resumed in the locality of Gornja Prebreza, known for its rich "Chios" fauna. Although directed towards discovering the remains of small mammals, the excavation provided significant results for the supplementing of the list of large mammals. Most of these were the representatives of Ungulata that fit quite well into the already known association that inhabited this Miocene swampy area. Correlation with other finding places on the Balkan territory and in the neighbouring regions provides significant conclusions that can contribute to the clarification of the paleoecological circumstances under which this fauna lived. as the excavations and identification are in progress, new interesting results should be expected.

## PLEISTOCENE BAT REMAINS FROM THE VRELSKA PECINA CAVE (SERBIA)

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In the vicinity of the international highway Nis-Sofia, in the very centre of Bela Palanka, above the spring called Vrelo, there is a cave named Vrelska pecina. Paleontological research started there in 1989. It included the excavation of sediments in quadrants determined on the basis of their state of preservation, following the hydrogeological works which had considerably disturbed the stratigraphical pattern of layers. In the upper layers, the presence of usual Upper Pleistocene fauna of large and small mammals was observed, as well as that of birds, reptiles, amphibians, fish and crustaceans. Lower layers contain a very scarce Holocene fauna, micromammals in the first place, brought by water or by predators (namely owls).

However, some 6 meters to the right of the cave entrance, there is a rich finding place of fossil remains, for which the consequent analysis established that they represented a combination of the Middle and Upper Pleistocene fauna. All fossil remains were washed by the water from a filled hollow which dates back to the Middle Pleistocene, so that they were found laying intact on the limestone plate under its opening. It is obvious that the bottom of the hollow gave way after strong torrents had ceased, for the material, though very light for transport, remained in the place where it used to be washed.

In the material, over 40 species of small mammals were identified, whereof 8 are representatives of the order of Chiroptera. Apparently, they represent a quite normal association, such as one finds nowadays in the karst regions in this part of Balkans. However, every species is characterised by more or less evident morphological differences in comparison to recent forms, which is most probably a consequence of different ecological and climatic conditions during the Pleistocene.

## EVOLUTION OF OBEDSKA BARA - A PLAIN-SWAMP IN THE SAVA RIVER FLOODED REGION

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Ecological investigations in the natural reserve of Obedska bara, formed some 2500 years BC by traversing the meander of the Sava River under specific hydrogeological and climatic conditions were performed. They included examinations of phytoplankton as well as ecosystemic studies of other components of the biocoenosis in the open-water of a lacustrine type ecosystem - Krstonosica Okno. Evolutionally, Obedska bara - Krstonosica Okno went through the successively changing states starting as a primary-oligotrophic lake-system that had been gradually (through a long, eutrophicating ageing process) transformed into eutrophic one. During (geological) time, system's production-capacities (determined by autochthonous/ allochthonous nutrient's resources) have been progressively exceeding those of degradation of large amounts of autochthonous/allochthonous organic matter, which resulted in peat-accumulation in the belt of macrophyte-vegetation surrounding water-body. In this way the immediate surrounding of Krstonosica Okno has been transformed from a plain-marsh to a peat-bog system of eutrophic-dystrophic character. As the process of overgrowing progressively proceeded, the water-body of Krstonosica Okno changed into secondary-oligotrophic system with some dystrophic tendencies.



## THE FALLOW DEER, *Dama dama* L., 1758, IN THE AEGEAN REGION

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The European or common fallow deer, *Dama dama* L., 1758, is a faunal element characterized by a late Quaternary subtropical distribution. In fact, as far as it is presently known, palaeontological and archaeological evidence attests to its occurrence almost restricted to the Mediterranean region (southern Europe and Anatolia) during Late Pleistocene and Early Holocene times. *D. dama* is perhaps the taxon of deer whose current distribution has been most influenced by man. There is evidence that man took fallow deer into areas beyond their natural distributions since prehistorical times. Exports of the species are documented on the Aegean islands from Neolithic sites, such as Saliagos near Paros, Kastri on Thasos, Skoteini on Evia, and Kalithies on Rhodes.

Within the Aegean region, the present occurrence of ancient populations of the common fallow deer on islands that originally lacked this form, the role this deer played in redefining the Post-Pleistocene ecological equilibrium, and its place within human economies, all raised zoological, biogeographical, zooarchaeological, and ethnohistorical questions that remain to be answered.

The distribution of the extant populations of fallow deer in the Aegean region (Greece and western Turkey) is given.

## APPLICATION OF GIS METHODS USING THE DISTRIBUTION OF THE REPTILE SPECIES IN GREECE

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The capabilities of GIS and the facilities that the system provides to biogeographical studies are presented in this work.

As an exemplar taxon we use the reptiles, a well - known taxon for which we have plenty of information, some of which dates from the end of the previous century.

On a map of Greece (scale 1:1000000), we digitise data concerning geographical distribution of all the reptile species that are included in Natura 2000, Annex II, and also some endemic Greek species. The data include all the geographical points at which the particular species has been found, and the latest date that the corresponding observation (sampling) took place. On this map, we overlay a 50 x 50Km grids.

Stored information is displayed on various maps:

a). The geographical points are classified into three classes depending on the latest date that the observation has been recorded: The first class includes references from 19th century until 1950, the second class references from 1950 until 1970 and the third class references from 1970 until now.

b). The cells of the grid are distinguished according to the number of species they contain. The richest areas constitute the hot-spots of Greece for the species in question.

## THE SEMI-WILD AINOS PONY OF CEFALONIA ISLAND

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In our days there are four herds of semi wild horses all around Greece. One of them lives in the estuaries of the river Achelloos. The second one lives in the region of Amfilochia in the West Greece. The third one lives on the mountain Paggion in North Greece. The last one wanders on the mountain Ainos in the island of Cefalonia. All these herds of horses belong to the mountain type of Greek horse whose main representative is the breed of Pindos Pony. Many of these herds may be differentiated from the original mountain type of Greek pony to a new breed as the Ainos Pony breed, but more research is needed for the other three herds.

Cefalonia is the largest of the Ionian islands. Its mountain Ainos is of the highest in Greece, with 1629 m height. For long periods during the winter it is covered with snow. On this mountain there is a Greek endemic species of fir (*Abies cefallonica*) and most of it is a National Park. The semi-wild ponies live around the Park. Sometimes they enter it through the barbed wire fence. Until recently there were three herds. Each herd had about 12 animals, one of which was the stallion. There were also some elder stallions which lived alone. Unfortunately these animals have become extinct by the goat shepherds, so nowadays there are only 7 individuals. Last year 5 animals were killed. The characteristics of these animals are: height 1.15-1.30 m, body narrow but with well developed quarters, limbs very strong, hoofs strong, black coloured and narrow, mane and tail sparse. The main colours are bay, gray, brown and black-roan. The ponies are extremely hard and sure footed. They survive on the minimum of food. They have courage and good stamina. Throughout the year they live in the open. There is no cave or other shelter in the mountain to protect them in the winter, while there is only one water spring in the region for the summer. The shepherds allow the ponies to drink from this spring after the watering of their goats. Capturing is a very difficult work, but soon the ponies become calm with a good character. The origins of these ponies are lost in the past but old men all around villages believe that these ponies derive from individuals which belonged to domestic herds which were raised around the mountain some decades ago.

## THERMOREGULATION CHARACTERISTICS OF THE SNOW VOLE *Chionomys nivalis* FROM BULGARIA\*

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Thermopreferenda, daily activity rhythms, body temperature and resting metabolic rate in different ambient temperatures were studied in snow voles. Results of mean body temperature measured between 1-3p.m. was 39.2°C. 24 hours activity amount for voles snow that they were active for about 9 to 11 hours per 24 h. The type of activity rhythm may be considered a nocturnal. Resting metabolic rate (RMR) was measured at various temperatures ranging from 0°C to 25°C. The values of oxygen consumption at 0°C was 3.8 ml O<sub>2</sub>/g-h. The voles oxygen consumption was at 15°C - 2.5 ml O<sub>2</sub>/g-h.

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INVESTIGATIONS ON THE BIOACCUMULATION AND DISTRIBUTION OF HEAVY METALS  
AND CHROMOSOME PATTERNS IN THE MONITORED SPECIES *Apodemus flavicollis*  
FROM NATIONAL PARK RILLA\*

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The level of toxic elements Cr, Fe, Cu, Zn, Sr, Cd and Pb were investigated in the monitored species *Apodemus flavicollis* from three altitudes in Rilla mountain: 1200m - Mala Tzerkva, 1800m - Beli Iskar and Maliovitza and 2925m Moussala.

The levels of the different elements were unevenly distributed. Concentrations of Pb were found in the carcass, bones and livers (from 5 to 10 ppm) of rodents from Maliovitza and Moussala.

The highest concentrations of Cr (from 34 to 94ppm) were found in some organs and bones from M. Tzerkva. The level of Sr in the some animals was also the highest (110 ppm).

The lowest levels of all the toxic elements in the animals were registered in the wood mice from Beli Iskar.

Cytogenetical analysis was carried out on some samples of *A. flavicollis* ( $2n=48$ ); acrocentric chromosomes are very useful (suitable) for the investigation of the changes in the chromosome structure. The presence of structural and numerical aberrations, breaks, exchanges, centromeric fusions, fragments and rings has been shown. The smallest percentage of aberrant mitoses has been found in *A. flavicollis* from Maliovitza (0.8%). This parametre was highest in the samples of the region of Moussala - 7,5 %, B. Iskar - 5,6 % and M. Tzerkva - 6,4%. Using appropriate criteria for small samples, significant differences between the samples of *A. flavicollis* from Moussala, M. Tzerkva and B. Iskar and the sample from Maliovitza have been found.

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ON THE BIOLOGY OF *Phoxinellus stimpbalicus montenegrinus* KARAMAN, 1972.

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*Phoxinellus stimpbalicus montenegrinus* is an endemic subspecies from Montenegro (Yugoslavia) which belongs to a group of small-size cyprinids species inhabiting North Africa, Middle and Near-East Asia and Balkan Peninsula. In the course of a long-term study of fish communities in coastal waters of South Adriatic, numerous specimens of *Phoxinellus stimpbalicus montenegrinus* have been caught in rivers and streams within the investigated region. As the result of our field studies, the distribution of *Phoxinellus stimpbalicus montenegrinus* and its tolerance to environmental conditions in waters of Montenegro are reported. The diet, growth, condition factor and length-weight relationship of a population from the river Mrcevska Rijeka, a small river within the Grbalj Valley, are described.

**ECOLOGICAL AND BIOGEOGRAPHICAL DIFFERENTIATION OF ROE DEER  
(*Capreolus capreolus* L.) POPULATIONS FROM SERBIA (YUGOSLAVIA)**

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For five populations from Serbia (Yugoslavia), two from the lowland area north of the Danube (Bazki Monostor and Zrenjanin), one from central Serbia (Smederevska Palanka) and two from the mountainous region south of the Danube (Jucni Kuzaj and Stara planina), population ecological parameters (density, dispersal, age and sex structure, indices of fertility and habitus) as well as craniometric characteristics of the populations were analyzed. Part of the sample was obtained through regular game management activities, while a part was obtained by examination of trophies in private collections.

Variation in 56 measures was investigated in 300 craniums of the roe deer. Craniological variability was analyzed by standard multivariate statistical techniques with respect to the population parameters and localities.

The biogeographical characteristics of roe deer populations were analyzed according to dominant and characteristic types of ecosystems that is, biomes which roe deer inhabit within the investigated localities (acc. to Matvejev 1961, and Matvejev & Puncer 1989).

We commented specifically on the protection status of the roe deer populations in light of our results.

Deer are among the few groups of large mammals which have been extensively studied during the last decade with respect to genetical and morphological variation. However, in contrast to the other deer, the roe deer - one of the most abundant European deer species - has been poorly investigated, especially with respect to morphological variation.

There are few published results of research on the craniological characteristics of roe deer populations from Central Europe (Markov et al. 1984, 1991, Sokolov et al. 1985, 1986, Petrov et al. 1968).

In this paper we report the variability of a suite of craniometric characters of five populations of Yugoslav roe deer with an intent to summarize and explore the factor structure of deer skulls with respect to sex and age, and if possible, interpret these results from a biogeographical point of view.

**THE "OCEANIC" ISLANDS OF THE AEGEAN ARCHIPELAGO**

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Although the term "oceanic" might sound strange for islands of the Aegean Sea there is enough evidence from their position, their formation, as well as from their physical environment, that convince us for this characterisation.

The islets are located in the southern part of the Aegean Volcanic Arc, off the continental shelf. They are either volcanic cones or remnants of them. More specifically these are the islets and complexes of Ananes, Christiana and Nisyros. The Ananes group comprise of two islets which are found to the southwest of Milos, the group of Christiana of three islets to the southwest of Santorini, while the third group consists of four islets around Nisyros. All of them have been formed between late Pliocene and early Holocene.

The above mentioned islets, which were studied in the frame of a long term project on the Greek islets, have been visited during 1990-1992 by many specialists in order to gather as much data as possible on their geology, vegetation, flora and fauna.

After the phytosociological analysis but mainly after the analyses of the communities of land snails, soil arthropods and reptiles the following results are indicative of the islets' character.



1. Strong disharmony has been observed, which is based on the absence of poor dispersers.
2. Each islet presents unique particularities and differs strongly from the other islets, even from those lying at immediate vicinity.
3. Both flora and fauna are composed by the most common and opportunistic species which are found in the surrounding area.

### **BURBOTS (*Lota lota*) FROM LAKE PLAVSKO (MONTENEGRO): FEEDING HABITS DURING SUMMER.**

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In the course of a recent intensive study of burbot populations in Yugoslav waters (Serbia and Montenegro), a large population of burbot has been found in Lake Plavsko (Montenegro), within the coastal zone of the lake (at depths not greater than one meter), during summer months (end of May and end of July). The majority of the captured adult specimens and fry have been transported to our Belgrade laboratory for physiological studies (Nikcevic *et al.*, 1990), while 61 specimens (54 fry and 7 specimens 1<sup>+</sup> age class) were immediately fixed and subsequently used for stomach content analyses. We report here the results of these analyses.

### **PRELIMINARY RESULTS ON THE STRUCTURE OF THE POPULATIONS OF BIVALVE *Mytilus galloprovincialis* LAM., 1819, IN THE EAST COAST OF THESSALONIKI'S GULF**

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In this paper preliminary results on the study of *Mytilus galloprovincialis* populations, collected from different sites in the east coast of Thessaloniki's Gulf, are presented. No differences were observed on the structure of this populations among the sampling sites during the same season (winter and summer). On the contrary, the populations found to vary significantly between winter and summer. The observed variations are due to both abiotic (mainly hydrodynamic) and biotic factors like immigration, intraspecific competition and predation. Also, the fishery activities in this area should be considered as well.

### **DISTRIBUTION OF THE MEDITERRANEAN MONK SEAL (*Monachus monachus*), IN GREECE: RESULTS OF A PANHELLENIC QUESTIONNAIRE ACTION**

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The total population of the highly endangered Mediterranean monk seal, *Monachus monachus*, is estimated to be comprised of about 400-500 individuals; about half of these live in Greek waters. Unless effective measures are taken promptly, the species will disappear altogether in the next couple of decades.

Since the 80's decade, systematic conservation projects commenced on a pan-european level. Studies have been focused mainly in the N. Sporades archipelago, Aegean Sea where the first Greek

national marine park was established in 1992, and in the Ionian Sea where the establishment of conservation measures are presently under way. Only fragmentary data exist about local populations in other areas of the monk seal's range in Greece.

Within the above frame, an assessment of the seal population and its dynamics was launched on a national level. Main aims were (1) to evaluate the current trends in size and distribution of the population throughout Greece and not only in the two main centres of study, and (2) to improve our knowledge about the distribution of the species and provide the necessary background information for the expansion of conservation efforts to other areas of interest laying the ground for further protection zones. In order to increase the probability of survival of the species it is imperative that a network of conservation areas with strategic distribution throughout the country be established. Questionnaires were sent to local port police authorities throughout Greece in 1982/83, in 1984/85 and in 1990/91 who collected information from the local fishermen about the number of adult and young seals they had observed as also other details and sent back the forms for evaluation. Altogether, over 3,000 answers were received. The evaluation of the data revealed that monk seals still exist almost all over the coastal part of Greece, mainland and islands, and are not concentrated in the area of the N. Sporades or in the Ionian Sea as it often appears. The population's geographical distribution and the trends over the 80's decade are shown on the accompanying map. Reproduction rates seem to be normal. Main factors threatening the population are mortality and loss of habitat.

Our data will hopefully help conservation efforts to include new areas of particular importance for the seals and eventually to establish a network of protected areas throughout Greece.

## INTERACTION BETWEEN SEA TURTLES AND SURFACE LONG LINE FISHERIES IN THE IONIAN SEA, GREECE

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Remarkably little is known about the major threats in the Loggerhead turtle's (*Caretta caretta*) principal habitat, the sea. One major threat for this endangered species derives from incidental catches during fishing with surface long lines or drift nets. In Greece, regular monitoring of incidental catches of turtles in surface long lines was launched in 1989 in the Ionian Sea and continued through to 1995.

Data obtained in 7 consecutive years of monitoring for average annual catch rate per vessel and per fishing trip, average annual number of turtles caught per fishing trip, annual frequency of catches between N-NW. Kefalonia and Ithaca, where no nesting beaches are known, and S. Kefalonia to S. Zakynthos which includes the area with one of the largest concentrations of turtle nestings in the Mediterranean, and monthly frequencies of catches per fishing trip over the 7 years reveal considerable annual variations. A large majority of the caught turtles were juveniles and subadults. In most cases, the sex could not be determined with certainty. None of the caught turtles was tagged. The majority had the hook in the throat, few were hooked in the mouth cavity. Only few had an older hook in the mouth indicating that they had survived a recent interaction with long line fisheries.

Most of the caught turtles were *Caretta caretta*. Only in few cases, the animal may have been a Green turtle (*Chelonia mydas*) but it was not possible to identify the species with certainty although Green turtles as also Leatherback turtles, *Dermochelys coriacea*, have been observed at least once in the study area.

Relatively few turtles are caught annually in the study area compared with the large numbers of catches reported from the rest of the Mediterranean. In the Ionian Sea, a severe threat to the Loggerhead's population and to other marine creatures is posed by drift nets which are heavily used throughout the area, mainly by the Italian fleet. Our data have shown that most of the caught turtles were of relatively small size very much like in the NW. Mediterranean where drift nets were used as well. This might indicate that the fraction of bigger sized turtles has decreased due to deaths in drift nets. All efforts should be made to avoid drift netting in this particularly sensitive area.

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## STUDIES ON TYDEIDAE (ACARI ; PROSTIGMATA) IN GREECE

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Tydeid mites are world-wide in distribution and frequently encountered in moss, litter, soil, humus, cultivated and wild plants as well as in stored products. A nationwide survey of the tydeid mite fauna was undertaken in Greece since 1993. A great number of samples taken from cultivated and wild plants as well as from litter and epiphytes were examined and a number of new records and several new species to science were found. At present, a total of thirty (30) species were identified belonging to eleven (11) genera as follows: fifteen (15) species to the genus *Lorryia*, five (5) to *Tydeus*, two (2) to *Metalorryia*, while each of *Idiolorryia*, *Neoapolonyia*, *Paralorryia*, *Pseudolorryia*, *Pronematus*, *Pronematulus*, *Tydaeolus*, and *Lasiotydaeus* is represented by one (1) species. In Citrus, *Tydeus californicus* (Banks), *Tydeus caudatus* (Duges), *Lorryia formosa* Cooreman and *Pronematus ubiquitous* (Mc Gregor) were the most prevalent species. *Tydeus californicus*, was also frequent in other fruit trees. Most of the species, however, were found in litter and epiphytes. One of the new to science species, *Lorryia oleae* is described and illustrated. It was found on bark of *Olea europaea* L., at Heraeo, Co. Korinthia, Peloponessus, Greece and it can be distinguished from other similar species by the following characters: solenidion  $\omega_1$  on tarsus I characteristically long (as long as the width of segment) and dorsal body setae smooth and dissimilar in length and thickness.

## THE MESOPELAGIC FAUNA OF THE N.AEGEAN SEA

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One fishing cruise was performed in summer 1993 from the 17th till the 28th of July in the N.Aegean Sea, in order to study the mesopelagic fauna of the area. A grid of 9 stations was designed over the whole study area. In each station routine samples were taken from depths of 250, 500, 750 and 1000m. For the sampling, the METHOT midwater trawl with a mouth aperture 2.2m and fitted with a net of 3.0mm mesh at the codend, was used. Towing speed varied between 1.5-2.3 knot. The tow-speed, the temperature and the depth of towing were controlled by a SCANMAR system. A total of 41 taxa were identified in the area from which only fish were identified to species. The highest abundance of invertebrates was observed at the 500 m depth, while the latest one at the 1000m depth. Intermediate values were observed at the 250 and 750m depths, without significant differences between them. Euphausiids, followed by chaetognaths, were the dominant taxa in the area. The proportion of these two taxa did not differ significantly in the various depth zones. About 90% of the total number of the collected specimens were sampled down to the depth of 750m. The abundance of euphausiids at the depth of 250m is low, fact related to their diel migration to deeper water. Gasteropods and sergestids were also well represented in the samples, and ranked third in the abundance scale, while their bathymetrical distribution differed from that of the first two taxa. About 70% of the gastropods were caught at the 250m depth zone, while about 82% of the sergestids were caught at depths >750m. Fifteen species of mesopelagic fish were caught in the area: *Argyroleucus hemigymnus*, *Diaphus metopoclampus*, *Benthoosema glaciale*, *Diaphus rafinesquei*, *Hygophum benoiti*, *Lampanyctus crocodilus*, *Lobianchia dofleini*, *Lobianchia gemellarii*, *Myctophum punctatum*, *Notoscopelus elongatus*, *Chauliodus sloaeni*, *Paralepis coregonoides coregonoides*, *Cyclothone sp.*, *Stomias boa* & *Syngnathus phlexon*. *D.metopoclampus* is reported for the first time in the E.Mediterranean. Moreover, *L.gemellarii* is mentioned for the 4th time in the Mediterranean, *N.elongatus* for the 2nd time in the E.Mediterranean and *D.rafinesquei* and *L.dofleini* are reported for the 1st time in the Aegean Sea. Of these species, 10 belong to the family Myctophidae. About 90% of the specimens sampled were myctophids, which demonstrates the importance of this family in the ecology of the mesopelagic zone in the Aegean Sea. The presence of *S.phlegon* was considered occasional and has been caught in upper waters, while the METHOT trawl was lifted.

Approximately half of the sampled fish (49.2%) were caught at the depth of 750m, while 35% and 10% at depths 500m and 1000m respectively. The differences in the bathymetrical distribution of the various species of the family Myctophidae are well pronounced. Their presence is usual between 300m and 800m, whereas 78% of *H.benoiti* occurred at 750m depth and 60% of *M.punctatum* were found at 500m depth. The relatively limited data on the abundance of the rest species did not allow the extraction of similar conclusions.

## A FIRST INSIGHT ON BREEDING AND MIGRATORY PASSERINE AVIFAUNA OF THE NORTHERN DODECANESE ARCHIPELAGO : PRELIMINARY RESULTS OF THE 1995 HOS EXPEDITION

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Eighty-eight islands and islets in the Northern Dodecanese were visited in spring, early summer and autumn 1995, resulting in a full coverage of the land mass of the area. This work presents field data on the breeding and migratory status and distribution of the passerine avifauna. A total of 54 species were recorded, 17 of them being confirmed breeders, seven of which were summer visitors in the Archipelago. Sardinian Warbler *Sylvia melanocephala* was the most widespread breeder and Tree Pipit *Anthus trivialis* the most widespread migrant. Some aspects of the ecology and biogeography of the passerine bird communities, as well as conservation hints are discussed. In general, the composition of the breeding passerine avifauna is largely determined by long-term human activities and grazing pressure. For migratory birds, the importance of the tiny rocky islets, as staging and refueling areas, should be stressed.

## THE CAVE ORTHOPTERA OF CRETE

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The fauna of the cavernicolous Orthoptera of Crete consists of three species which were known to inhabit 24 caves. *Discoptila lindbergi* was known from 17 caves, *Dolichopoda paraskevi* from 3 caves and *Troglophilus spinulosus* from 11 caves). The taxonomic status of the *Troglophilus* and *Dolichopoda* species has been doubted for a long time.

During the last 8 years an extensive biospeleological survey has been carried out on Crete and more than 300 caves and potholes were sampled. Cave Orthoptera have been observed and collected in 57 sites (40 caves and 17 potholes). In this contribution, the previous knowledge on cave orthoptera of Crete is reviewed and new data from 16 caves and 17 potholes are provided. *D. lindbergi*, *D. paraskevi* and *T. spinulosus* are recorded from 13, 13 and 19 new sites, respectively. The current geographic distribution of each species is presented and discussed along with some ecological remarks. From the examination of several samples, the existence of only one species of *Troglophilus* (*T. spinulosus*) is further supported while the existence of a second species of *Dolichopoda* (*Dolichopoda* sp.2 Boudou-Saltet, 1973) is rejected.



## THE ALTITUDE PREFERENCE OF BATS (MAMMALIA, CHIROPTERA) IN YUGOSLAVIA

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The central part of the Balkan Peninsula is characterised by a large variety and a mosaic arrangement of habitats. Regions of medium altitude, consisting of the karst areas, prevail. It is in these regions that the bat fauna has been mostly explored, so that data on lithophile species are numerous. However, phytophile species were insufficiently explored, i.e. data concerning these species are relatively scarce.

Due to the specific climate, relief and European distribution, but also due to insufficient data on some species (such as *N. leisleri*, *P. nathusi*, *P. kuhli*, *P. savii*, *B. barbastellus* - predominantly phytophile species) on the territory of the Federal Republic of Yugoslavia, four groups can be discerned:

- species of lowlands
- species of lower hilly areas
- species of higher hilly areas
- species of mountains

In recent years attempts were made to solve the problems concerning the vertical distribution and seasonal vertical migrations of the bat in Yugoslavia by marking specimens of all age groups. This is also the reason why we consider this paper a basis for further, more detailed, ecological analyses.

## NEW SPECIES IN THE MAMMAL FAUNA OF SERBIA - KUHLMAN'S PIPISTRELLE *PIPISTRELLUS KUHLI* KUHL, 1856 (CHIROPTERA, VESPERTILIONIDAE), WITH REVIEW ON ITS BALKAN DISTRIBUTION RANGE, ECOLOGY AND STATUS

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*Pipistrellus kuhli* is characteristic for the Mediterranean and sub-Mediterranean regions of Europe and corresponding regions in Asia. Its northern area boundary coincides with the boundary of the continental climatic region. It is known primarily as an anthropophile species.

In the Federal Republic of Yugoslavia until recently only one locality was known - the southernmost spot of the Montenegro coast. In September 1994 the first find in Serbia was recorded - in the centre of Belgrade, its capital. Seven specimens of both sexes and different ages were caught on that occasion. On the basis of the time of their finding, characteristics of their locality and morphoanatomical characteristics of the voucher specimens, as well as on the basis of the literature data, a survey was made on the distribution, ecology and status of this species in the Balkan countries.

## CONTRIBUTION TO THE KNOWLEDGE OF THE LATE MAY ASPECT OF CURCULIONIDAE (INSECTA, COLEOPTERA) IN DOJRAN-LAKE ZONE (MACEDONIA)

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The zone of Dojran-lake is biogeographically very heterogeneous. The elements of the three provinces are mixed here. Province of the Mediterranean semideserts and its elements (Aegean-Anatolic) is the base into which Eastern parts of Province of the Circum-Mediterranean evergreen woodlands and maquis and Province of the European mainly deciduous forests (subprovince of the Submediterranean-Balkan forests) are built. (Matvejev, 1961)

This combination of plant-associations represents an interesting and very rich base of living for the phytophagous family Curculionidae. Field practice for students from Faculty of Sciences Kragujevac in that zone was realised in 1986, 1988-91 in the last days of May and at the beginning of June. At that time, on the localities Star Dojran, Toplec, Dedeli (near Valandovo) and artificial lake Paljurci, the adult weevils were collected from plants (by beating and moving techniques) and under stones. 163 individuals (66 males, 97 females) were found and 44 species, belonging to 22 genera (13 subfamilies) were identified.

These preliminary results suggest the necessity of continuation of investigations in this interesting zone.

## NICHE STRUCTURE IN AN EAST MEDITERRANEAN HEMIPTERAN ASSEMBLAGE

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Central to any observed pattern in ecological community organization is the concept of ecological niche. Niche concept unified the study of species coexistence and resource partitioning. It became a fundamental ecological entity amenable to sophisticated statistical analysis and testing only after its quantification as a subset of the  $n$ -dimensional hypervolume corresponding to various combinations of environmental factors that affect species presence/absence and performance. In this way the ecological niche of a particular species or population served as a criterion for its assignment to particular guilds. This situation substantially departs from the expectations of the originator of the guild concept who associated niche to the habitat requirements of a species and guild to the more or less uniform functional role of a group of species. However, this differentiation seems to be the natural extension of the niche concept of which the geometric character together with the multidimensional nature of the hypervolume, gave it the strength of a mathematical property that is necessary and sufficient to account for an observed arrangement of an animal assemblage on a set of environmental axes.

The capacity of the niche to include objective measures of composite environmental factors or resources through the use of multivariate procedures, such as discriminant analysis or factor analysis circumvents several problems associated with the application of the hypervolume niche concept: [1] the correlations between environmental factors are minimised because within the factor and discriminant spaces the axes are orthogonal that means mathematically uncorrelated; [2] resource or environmental axes are composite, that means a great deal of the existing habitat variation is summarised in a few -and for this meaningful- linear trends; [3] the study of the importance of interspecific competition in species guilds, though in the past demanded for the existence of only a few -less than six- participant species, now in terms of niche hypervolume it becomes relatively easy to study its role as a shaping factor of ecological communities involving several guilds with an arbitrary number of species; [4] as genuine geometric entity niche hypervolume can be adequately handled as a Euclidean entity in arguments involving triangle inequalities, which are essential in ordering species, or the extension of overlap between two or more niches, and the position of niches in the community overall niche space.

The present study demonstrates the application of the niche concept in the search for structure and the analysis of the structuring forces of a Hemipteran (Heteroptera and Auchenorrhyncha) insect assemblage in an east-Mediterranean ecosystem. Mediterranean ecosystems are characterized by rich insect faunas and relatively high endemism, in a similarly taxonomically diverse vegetation scenery of morphoanatomically convergent and chemically diverse plant species. This is mainly due to a multitude of palaeo-geographical, palaeo-climatic and ecological factors. Rich faunas are expected to pose difficulties in any attempt designed to show the existence of functional organization in guilds consisting of large numbers of species. The Hemiptera comprise a rather compact guild of plant sucking insects while they include some predatory species which are still depended on plant tissues or organs for water balance maintenance, shelter, or as perch or hunting sites for insect prey.

More specifically, the questions addressed here are: [1] what is the most appropriate biotope descriptive variable set that best accounts for the parameters of niche hypervolumes of Hemiptera species; [2] what are the main features of the niche organization in this insect assemblage and in what



way they are related to the plant taxonomy and texture within the plant community; [3] what is the relative participation of the various structuring forces such as competition, coevolution or chance, that permit the coexistence of a large number of species within the plant sucking guild.

### MORPHOLOGICAL VARIABILITY OF *Triops cancriformis* (BOSC, 1801) (CRUSTACEA, NOTOSTRACA) IN YUGOSLAVIA

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Morphological variability, especially of those characters used in the systematics of the genus *Triops*, as well as those used in the separation of subspecies of *Triops cancriformis* was analysed.

Most populations exhibit clearly characteristics of a type subspecies *Triops cancriformis cancriformis* (Bosc) with the exception of a dorsal organ which is frequently of triangular appearance and the presence of a number of small spines on the lateral sides of the telson.

However, in some populations a number of carinal spines is much greater than in a type subspecies reaching up to 34 as in *T. cancriformis mauretanicus* Ghigi.

A structure of telson is also peculiar in some populations. Namely, beside a row of 1-4 median spines a variable number (sometimes large) of small scattered spines in a mid - dorsal region can be present. In specimens with a large number of these additional small spines a great number of small spines on the lateral sides of telson is also present. Thus, as in the species of *T. granarius*, a trachyaspid form can be distinguished.

### MULTISPECIES COEXISTENCE OF LARGE BRANCHIOPODS (ANOSTRACA, NOTOSTRACA AND CONCHOSTRACA) IN YUGOSLAVIA

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Our investigations on large Branchiopods in 108 ephemeral ponds in Federal Republic of Yugoslavia are presented.

One species was present in 63,89 % of ponds, while 36,11 % of ponds contained more than one species of large Branchiopods. The maximal number of species found in the same habitat was four. Two species were found in 23,15%, three in 9,26 % and four species in 3,70 % of ponds.

In ponds with only one species Anostracans were most frequent. They were present in 72,46 % and Conchostracans in 26,09 % of ponds. Notostracans are very rarely a single inhabitant (1,45 %).

In ponds inhabited with two species in 20,83 % only Anostracans were present. In the rest of the ponds representatives of two different orders were found; among them 50% were inhabited with one Anostracan and one Conchostracan species.

In ponds inhabited with three species only mixed populations were found. Anostracans were most frequent; they were present in all these ponds. In 60 % of habitats species belonging to all three orders were found.

In ponds inhabited with four species Anostracans were also always present. Most of these ponds (83,33 %) were inhabited with representatives of all three orders. Only in one case three species of the same order were found ( three Conchostracans).

Ephemeral ponds with more than two species were always inhabited with mixed populations. In the ponds inhabited with more than one species Anostracans were most frequent; they were present in 91,66 % of ponds with two species and in 100 % of ponds with more than two species.

## BIODIVERSITY OF LARGE BRANCHIOPODS (ANOSTRACA, NOTOSTRACA AND CONCHOSTRACA) IN YUGOSLAVIA

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Our investigations on large Branchiopods in Federal Republic of Yugoslavia during the last 18 years are presented. Literature data are incorporated too.

Branchiopods have been found in 176 localities in which 19 species (10 Anostracans, 2 Notostracans and 7 Conchostracans) have been found. This makes 26,03 % of species inhabiting Europe. Anostracans are the most frequent making 62,21 % of Branchiopods found. Conchostracans are much less common (28,47 %), while Notostracans make only 9,35 % of the populations.

*Branchipus schaefferi* is the most frequent species (24,80 %). *Leptesheria saetosa* and *Chirocephalus diaphanus* are approximately half as frequent (14,23 and 13,01 %). *Cyzicus tetracerus*, *Triops cancriformis*, *Streptocephalus torvicornis* and *Chirocephalus brevipalpis* are appearing in 9,35 - 6,91 % of the populations. The other species are rather rare (0.41 - 3.25 %); they inhabit a restricted area or even a single locality.

A species diversity measured as Shannon's entropy  $H$  is 1.016 and the evenness of their frequency distribution ( $R$ ) is 0.795.

Regarding a biodiversity of Branchiopods two regions in Yugoslavia can be distinguished, one being north of the rivers Sava and Danube (i.e. the south part of the Pannonian Plain) and the other south of these rivers.

In the Pannonian part of the country 18 species have been registered (9 Anostracans, 2 Notostracans and 7 Conchostracans). The most frequent one is *Branchipus schaefferi* (30,27%), followed by *Lepesheria saetosa*, *Streptocephalus torvicornis*, *Chirocephalus brevipalpis* and *Cyzicus tetracerus* (15,68 - 8,65 %). Other species are rare. *Branchipus serbicus*, *Limnadia lenticularis*, *Imnadia cristata* and *Imnadia banatica* have been found in a single locality. A species diversity is 0.993, and the evenness of their distribution is 0.791.

In the second region only 10 species have been found (6 Anostracans, 2 Notostracans and 2 Conchostracans). The most frequent species is *Chirocephalus diaphanus* which makes even 40,98 % of Branchiopods. *Triops cancriformis*, *Cyzicus tetracerus*, *Leptesheria saetosa* and *Branchipus schaefferi* are rather frequent (16,39 - 8,20 %) while other species are rare. *Artemia salina* and *Branchinecta ferox* have been found in only one locality. A species diversity is smaller (0.784) and the evenness of distribution is approximately the same (0.874) as in the Pannonian region.

### SOME REMARKS ON THE ORGANIZATION OF THE SOCIETY AND THE BIOLOGY OF *Cataglyphis aenescens* NYL. (HYMENOPTERA, FORMICIDAE)

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These investigations have been carried out in the locality "ardak (Deliblatska peczara (Deliblato Sandy Area) (Serbia), about 70km northeast from Belgrade.

*C. aenescens* inhabit arid habitats. Deliblatska pe{ara, as an "oasis" of such habitats, offers optimal conditions for inhabiting of *C. aenescens*. Due to artificial afforestation of Deliblatska pe{ara, such habitats are small and rare today. Therefore *C. aenescens* is an endangered species in that area.

The society of *C. aenescens* is monogynous and relatively small, consisting of several hundreds up to about 2.500 workers. The body length of workers ranges from 3.10 to 8mm, of the queen ranges from 8.24 to 10.00mm and of the male ranges from 7.66 to 9.96mm.

Alatae queens and males appear in the society at the end of May and the beginning of June. A real swarming was not observed. Alatae queens and males wandered mostly over the ground within very short flying distances. Mating occurs on the ground.



In the nest, the queen is nearly always surrounded by several hundreds of workers. The activity of society begins in spring (March, April), and the maximum is reached in July and August. Workers begin their outsideneast activity half an hour or one hour after the sunrise, when the temperature of soil is about 20°C. Maximum activity is reached at noon or early afternoon when the temperature of soil reach 50-60°C.

*C. aenescens* builds monocalic nest. The nest is constructed of smaller aboveground part like a bulwark and the bigger subterranean one.

*C. aenescens* undertakes foraging trips individually. Doing foraging trips, it shows site-fidelity, by going always in the direction chosen by the first exit. The maximal distance that it reaches by exits is about 10 m.

*C. aenescens* is a diurnal scavenger, foraging on dead arthropods (cheafly insects). Plant material and plant saps account for smaller portion of dietary resources of *C. aenescens*.

Taking fruits of *Rhamnus catartica*, *Centaurea arenaria*, and seeds of *Thymus glabrescens*, *Festuca vaginta* and other plants, *C. aenescens* contributes to the dispersion of plants, as well as to the binding of drifting sand.

*C. aenescens* overwinters in an adult stage. A queen together with workers was found in 2-3 chambers at the depth of about 70-80 cm and the temperature of 7-8°C.

## CETACEANS IN THE IONIAN SEA: RESULTS OF AN OBSERVERS' NETWORK

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Very little is known about cetaceans in the eastern Mediterranean Sea. In the Ionian Sea, Greece, a network for the collection of cetacean sightings has been launched since 1988 in order (1) to collect information on cetacean biodiversity in that poorly studied area, and (2) to involve local people as also visitors in conservation activities. Additionally to occasional sightings, sightings of cetaceans are regularly collected since 1990 by the captains of swordfish vessels during the whole fishing season. Main contributors to the network are fishermen, crews of ferry boats and tourists visiting the area on leisure boats. Other local people have also contributed substantially.

The number of involved persons who regularly record sightings, their position and other details and take photographs whenever possible is growing fast. This fact proves that the network is a particularly effective tool for sensitizing the public but also for collecting data since quite a large area is being covered both in time and space. Up to the present time, a total of five cetacean species has been positively identified: Bottlenose dolphins (*Tursiops truncatus*), striped dolphins (*Stenella coenuloalba*), common dolphins (*Delphinus delphis*), Risso's dolphins (*Grampus griseus*), Cuvier's beaked whales (*Ziphius cavirostris*), and fin whales (*Balaenoptera physalus*). The existence of Risso's dolphin, *Grampus griseus*, in the Ionian Sea was first stated by records and photographs obtained through the observer's network.

Additionally to the above species, sperm whales (*Physeter catodon*), have often been reported in the Ionian Sea as also sporadically pilot whales (*Globicephala melana*) and killer whales (*Orcinus orca*). These three species could not be identified with certainty yet. However, their existence in the the deep open waters of the study area is very probable.

The biodiversity in cetacean species is particularly high in the Ionian Sea. The above list includes two highly endangered species, *Tursiops truncatus* and *Delphinus delphis*. A main threat to the cetaceans in the area is fishing with drift nets, mainly used by the Italian fleet. Epizootics have affected the populations of dolphins in summer 1991, and, probably, also that of the beaked whales in 1993. Pollution by PCB's and heavy metals does not seem to play a significant role at the present time but may prove to be important in the future. It is strongly recommended to design and implement effective protection measures in the coastal and pelagic zones of the Ionian Sea aiming at the conservation of the rich cetacean fauna.

# BALKAN SHORE LARK *Eremophila alpestris balcanica* REICHENOW, 1895 IN SERBIA AND FORMER YUGOSLAVIA - DISTRIBUTION, HABITAT AND POPULATION

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Balkan Shore Lark populates the mountains of the south-east part of the Balkan Peninsula. It is a sedentary species. On the territory of former Yugoslavia it populates republics of Bosnia - Herzegovina, Serbia, Montenegro and F.Y.R. of Macedonia. To the west, its habitats spread to mountain Dinara (16° 30' longitude); to the north, to 44° longitude, over mountains (Cincar, Vranica, Bjelasnica, Jahorina, Ozren, Goc, Rtanj and Stara Planina. The average distance of its south-western area border is 50km from the Adriatic Sea, while in the south-east its area spreads to Albania and Greece.

In former Yugoslavia 3 global zones of distribution can be discerned : 1. Dinaric (western : Balkan ; southern : Sar - Pind) ; 2. Moesian - central (mountain Kopaonik) ; 3. Eastern Balkan (Balkan - Rodopian).

In Serbia there are 8 centres of insular distribution of this species, situated in the southern part of the country and grouped around mountains : Ozren, Prokletije, Kopaonik, Sar-planina, Rtanj, Suva Planina, Stara Planina and Besna Kobila.

The species populates only those mountain peaks and high mountain pastures where there is no shrub vegetation, and where grass vegetation does not exceed 10 cm. Vertical breeding distribution covers the altitudes of 1.210 - 2.550 m and is dependent on the height of the mountain, its exposition, degree of erosion, rock unit, the presence of cattle breeding etc. The optimal nesting zone ranges from 1.700 - 2.300 m above sea level. As the height of the mountain range increases, the vertical zone populated by the species expands - from 30 m on the peaks ranging from 1.200 - 1.400 m, over 350 m on the mountains of medium height, to the zones of 600 m on the mountains over 2.500 m.

A considerable part of the population in Serbia can be found on the silicate rock unit (76%), while serpentine hosts 21%, and limestone only 3 %.

In former Yugoslavia the population is estimated at 2.000 pairs at most. In Serbia, where a thorough research was carried out, some 500 pairs nest. The density of the population increases as one goes from the north to the south and from the west to the east, as well as with the increase in the height of the mountain range. Most pairs live on mountain Sar Planina (160), Stara Planina (110) and in the region of Besna Kobila (105). Fewer pairs populate Prokletije (around 60) and Kopaonik (45), while the fewest are found on Suva Planina (12), Ozren (5) and Rtanj (2).

In Serbia there are no evident signs that the species is endangered and its population status has been rather stable in the last decade. Cattle breeding has a positive effect on the distribution and population status of this species, while negative factors include the building of hotels, ski slopes and relays in mountain tops, as well as the afforestation of bare tops with coniferous trees.

## POPULATION DYNAMICS AND SYSTEMATIC DATA ON DIPLOPODA (MYRIAPODA) FROM TWO GREENHOUSES NEARBY TIRANA (ALBANIA)

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The present paper deals with the population dynamics of Diplopoda (Myriapoda) during a 2 years period of research (1991-1992) in two greenhouses' soil. Both places are quite exploited as agricultural land. Data on soil humidity, fertilizers and pesticides are compared to the density and frequency of different species of Diplopoda. The dynamics of Diplopoda population will be shown and two species are reported for the first time in Albania, one of which for the first time in the whole of Balkan peninsula.



## TAXONOMICAL AND BIOGEOGRAPHICAL SURVEY OF SPHECID WASPS (INSECTA: HYMENOPTERA: SPHECIDAE) IN YUGOSLAVIA

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There are nearly 8000 species of sphecid wasps (classified in 250 genera) known in the world. The sphecid wasps are most abundant in tropic and subtropic regions, with particular preference for arid and semi arid habitats.

The number of species inhabiting the Mediterranean subregion is about 400, while the number of species inhabiting The Central and Northern Europe varies between 150 and 200.

Several authors conducted taxonomic and faunistic researches of these wasps in Yugoslavia: Germar (1817), Korlevic (1890), Zivojinovic (1950), Vogrin (1954, 1955), Grozdanic (1957), Cinigovski (1960), Gradojevic (1963), Rafajlovic and Selesi (1963), Radovic (1976), Radovic, Kronic, Brajkovic (1982) and Radovic (1987, 1991).

This paper presents taxonomical and zoogeographical analyses of sphecid species found in Yugoslavia, with comments on particular species distribution.

According to the literature data and our researches 322 sphecid species are known in Yugoslavia, approximately 4/5 of the total number of sphecid wasps recorded for the Mediterranean zoogeographical subregion.

Both Mediterranean and central European species are present in Yugoslavia, showing great diversity and richness of sphecid fauna, mostly due to diversity of habitats.

This paper also gives a contribution to the knowledge of sphecid wasps in Northern Greece, on the basis of author's collecting in July, 1976.

## THE CARNIVORES OF THE ISLAND OF CRETE (GREECE)

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Like many other islands of the Mediterranean basin, Crete was characterized by Quaternary endemic faunas almost lacking carnivores. As far as is presently known, only one species of the Lutrinae subfamily, *Lutrogale cretensis* Symeonidis & Sondaar, 1975, has been documented from the Pleistocene fossiliferous layers of the large South-Aegean island. In contrast, four taxa of carnivores are currently reported from Crete and have been taxonomically described as geographical subspecies: the weasel, or 'nifitsa' (*Mustela nivalis galinthias* Bate, 1906), the beech marten, or 'zourida' (*Martes foina bunites* Bate, 1906), the badger, or 'arcalos' (*Meles meles arcalus* Miller, 1907) and perhaps the wild cat (*Felis silvestris cretensis* Haltenorth, 1953). There is evidence that all these carnivores derived from continental ancestors imported by man since prehistorical and protohistorical times.

The aim of this paper is to confirm the presence of the already mentioned representatives of Mustelidae on Crete, and to outline their distribution, as well as to discuss the still uncertain occurrence of the wild cat.

## SPATIAL DIVERSITY OF YUGOSLAV MAMMAL FAUNA.

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Distribution data from several sources was compiled (incl. unpublished. data) for the 96 species of Yugoslav mammals and mapped in order to analyze distribution patterns and identify centers of diversity. The analysis was twofold: a) UTM grids (50\*50km) were used to map species occurrence according to available data, emphasizing mosaic distributions and real occurrence within ranges; b) The regional geographic division of Yugoslavia was used with species density as variable, providing a broader scope of analysis, since both the administrative as well as the major zoogeographical units of Yugoslavia were accurately represented. We identified a base mammal fauna for the major regions by extrapolating distributions of species whose occurrence is certain within a region thus compensating for deficiencies arising from lack of detailed distribution data for certain widespread species.

The analysis was performed by least squares contour mapping of the species' distributions of each order of mammals. Centers of (high and low) diversity and major gradients, if any, were recognized. The correspondence to various factors determining species diversity, especially those responsible for faunal impoverishment within a region were analyzed.

Two major zones of high species diversity are evident, eastern and western, situated in an N-S direction along the borders of Yugoslavia. The eastern zone is under the influence of the main Carpathian and Balkan mountain ranges and comprises all of pericarpatic and peribalkanica Serbia west to the Morava river alluvial plain. The western zone ranges from the Danube in the North, up the Drina river valley, and expands into a plateau encompassing the southeastern Dinarids. A central zone of low diversity situated between these zones is comprised of three subzones, each with a different complex of factors responsible for faunal impoverishment. In Montenegro a gradient of declining diversity is observed from the mountainous to the coastal regions.

We consider the relevance of our results to major issues of biodiversity conservation in Yugoslavia. Specifically we stress the importance of integral and strategic measures and planning for such groups as mammals, since the scope of existing measures are, in our opinion, inadequate to ensure a sustained species richness of mammals.

## CONTRIBUTIONS OF BIOACOUSTICS TO THE TAXONOMY OF PALEARCTIC WATER FROGS

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The mating call of male anurans is a very characteristic feature with specific biological functions. Because of its high specificity it also is very useful for solving taxonomic problems.

The distribution and the composition of the water frogs (genus *Rana*) in the Mediterranean region seemed to be very simple. The lake frog, *Rana ridibunda*, was supposed to occupy a very large area extending from western Europe to Asia and also to the Nile delta and the Arabian peninsula. Based on the analyses of mating calls this picture changed decisively.

In western Greece and southern Albania a new species has been found, *Rana epeirotica* (Epeirus frog) which occurs in the low lands and prefers still or low flowing waters with abundant but low vegetation.

A comparative bioacoustic study of lake frogs in southeastern regions (western Turkey, Israel, Nile delta) revealed marked differences compared with those in Greece. After the study of the typical lake frog *Rana ridibunda* PALLAS, 1771 at Guryev, Kazakhstan, it was obvious that neither the southeastern water frogs nor those inhabiting the main part of Greece represent the typical *Rana ridibunda*. The southeastern and the southwestern form represent two species which have been established in the mean time: *Rana*



*levantina* (Levant frog) in Israel and the adjacent regions and *Rana balcanica* (Balkan frog) in Greece and Albania.

Furthermore, discriminant analyses also demonstrated that *Rana ridibunda* and *Rana balcanica* are sibling species, whereas *Rana levantina* is part of another line of evolution. This line extends through northern Africa, for *Rana levantina* and *Rana perezi* are sibling species as well. *Rana perezi* inhabits the Iberian peninsula and parts of southern France. By means of the bioacoustical method its occurrence in Tunisia has recently been demonstrated. This suggests that *Rana perezi* is a species native to Africa and not related to *Rana ridibunda* as previously assumed. Its occurrence on the Iberian peninsula is the northern extension of its range of distribution.

## ECOLOGICAL CHARACTERISTICS OF AQUATIC ECOSYSTEMS IN THE AREA OF PREVIOUS VLASINA PEAT (SERBIA)

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Flooding up of Vlasina peat (1949) and the formation of the accumulation lake destroyed a great deal of the autochthonous flora and fauna of the area. During a three years research period (1991-1993), the ecological and zoogeographical characteristics of the newly created and remaining aquatic ecosystems and their mutual relationships were studied, as well as the consequences of flooding. Benthic and planktonic communities were monitored under the new conditions.

On the basis of research results, somenegative consequences were noticed, especially in the newly created accumulation. Signs of eutrophication were observed, as well as dominance of cosmopolitan species in the structure of planktonic and benthic fauna, something not characteristic in aquatic ecosystems of peats.

## ECOLOGICAL MONITORING OF RUNNING WATERS IN SERBIA, ON THE BASIS OF MACROZOOBENTHOS (BALKAN-ECOLOGICAL INDEX)

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During the period of 1992-1995 samples of macrozoobenthos were collected from heterogeneous aquatic ecosystems in the area of Serbia. At the same time a comparative analysis of the physico-chemical characteristics of the researched locations was carried out (water velocity, bottom structure, water temperature, pH, oxygen concentration, BPK<sub>5</sub>, salt concentration of N and P).

Taking into account the ecogeographical and climatic circumstances in the researched areas, and the specificity of macrozoobenthos in relation to that of Middle and Western Europe, a new Balkan-ecological index has been defined which gives a clear picture of the aquatic system bonity on the one hand and the water quality on the other.

In the basis of this index, the ecological structure of the macrozoobenthos is expressed in terms of constancy, dominance and *a* and *b* diversity. By processing data in the statistical software STATISTICS FOR WINDOWS, key groups (orders, families, genera and species) were separated, whose presence is indicative of the biotope conditions and water quality, in accordance with the above mentioned elements.

The Balkan-ecological index is highly adjustable, so that it may be applied easily to other geographical regions. Its properties and value were compared to those of other known indices for the assessment of water quality, such as the Trent biotic index (Woodiwis, 1964) and the Rivaud index (Lang, 1989).

# THE GROWTH OF PIKE (*Esox lucius* LINNAEUS, 1758) IN THE RESERVOIR 'GRUZA' (SERBIA)

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The results of the studies on the growth rate of pike (*Esox lucius* L., 1758) in the reservoir 'Gruza' are presented in this article. This reservoir is relatively new, dating from 1984 when it was created for the needs of supplying with water. The surface area of the reservoir covers 9.34 km<sup>2</sup>, with a volume of 54X10<sup>6</sup> m<sup>3</sup>. Outstandingly marked eutrophic features have been observed in this area. The reservoir is populated by 17 fish species belonging to 5 families. The pike has been observed to represent the biggest predator within the fish community. After a commercial catch in March, 1991, 54 specimens of pike were detected. These aged from 5+ to 7+. Upon the retrospective evaluation of the growth-in-length rate, the following values were recorded (lt/lc): l<sub>1</sub> - 176/156mm, l<sub>2</sub> - 298/264mm, l<sub>3</sub> - 386/342mm, l<sub>4</sub> - 519/460mm, l<sub>5</sub> - 587/520mm, l<sub>6</sub> - 644/571mm and l<sub>7</sub> - 680/602mm. The length growth rate has been found to be moderate within the juvenile period of life, and to have reached a considerable increase at the time of full sexual maturity (age 4+ and older).

## COMPARISON OF SCALES, OPERCULAR BONES AND VERTEBRAE FOR AGE DETERMINATION OF TENCH, *Tinca tinca* (L., 1758)

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Samples of Tench, *Tinca tinca*, were taken from Lake Vegoritida, Northern Greece (40°45'N, 21°47'E). Fish age was determined after comparing different skeletal elements (i.e. scales, opercular bones and vertebrae). Several methods were employed for the preparation of the vertebrae. The best method was found to be oven-drying at 200°C for 3h. Age determinations obtained from the opercular bones and vertebrae were more accurate than those obtained from scales. Therefore, the determination of the age of Tench using scales is not recommended for unexperienced researchers unless the annual rings for the ages >3yr are compared with those of the opercular bones and vertebrae.

## PELAGIC COPEPODS OF THE SARONIKOS GULF

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The study of pelagic copepods of the Saronikos Gulf was based on samples collected monthly or seasonally between 1984 and 1989, at stations positioned in the four distinct areas of the Gulf (Elefsis Bay, Inner Gulf, Outer Gulf and Western Basin) and at different layers between 0 and 400m. The analysis revealed a total of 117 species and among them 65 were restricted in the near surface layer (0-2m). The increased number of species compared to that of previous studies (83), should be related to the sampling in the whole water column occupied by a large number of species as well as to recent changes in the bibliography of copepod taxonomy. All species occur in the Mediterranean Sea and in the Aegean Sea (coastal and offshore waters). The occurrence of coastal as well as of pelagic species in the gulf is due to the variety of environment: semi-closed area (Elefsis bay) and coastal area (Inner Gulf) more or less influenced by human activities, coastal areas periodically (Western Basin) or largely (Outer Gulf) influenced by the Aegean Sea water masses. This water is more expanded in the Gulf during the cold period (November-March), resulting to an enrichment of the copepod fauna by epi- and mesopelagic species.



## TAXONOMIC STATUS OF THE YELLOW-BELLIED TOAD, *Bombina variegata* (ANURA, DISCOGLOSSIDAE), IN GREECE. I. ELECTROPHORETIC ANALYSIS

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According to available information, the subspecies *Bombina variegata scabra* occurs in Greece. However, working on the distribution of this species in Greece, we have observed differences in many aspects among the populations of different regions. The aim of this work was to find out whether genetical variability really occurs. Through analysis of several loci by means of vertical acrylamidic electrophoresis we clearly detected two different types and narrow hybrid zones in the overlapping regions. The status of the species and subspecies is discussed.

## MORPHOLOGICAL AND GENETIC VARIATION AMONG ALPINE NEWT POPULATIONS OF GREECE

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According to literature, the Greek Alpine newt populations belong to the subspecies *T. alpestris veluchiensis*. The present study was undertaken in order to assess levels of morphological and genetic variation and differentiation within and among certain Greek populations, expecting to re-evaluate their taxonomic status.

Variation patterns of 12 morphometric as well as 5 other morphological characters were examined. Considerable levels of morphological variation were found within and among these populations.

Furthermore, genetic variation and differentiation were examined by means of starch gel electrophoresis of allozymes. 15 enzymes were selected for the study, and the average heterozygosity, average number of alleles per locus, proportion of polymorphic loci, Nei's genetic identity and genetic distance were calculated in order to estimate the genetic variation as well as the amount of genetic differentiation within and among Greek *Triturus alpestris* populations.

## THE LIFE CYCLE AND GROWTH OF *Cepaea vindobonensis* IN NORTH GREECE

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*Cepaea vindobonensis* is one of the four living European species of the genus *Cepaea* distributed in the central and eastern Europe. Very little is known about its biology, ecology or ecological genetics.

Here are reported results from a study of the life cycle, and growth of *C. vindobonensis* from Logos region of Edessa (Greece), which lies about 100 km north-west of Thessaloniki. The climate of the region is of the humid mediterranean type, characterised by prolonged rainy periods in mid-summer.

Snails became adults two years after hatching when their largest shell diameter (D) exceeded 21 mm but they layed eggs only the third year. Sexual maturity was indicated externally by the thickening of the peristome edge which covered the small umbilicus. Examination of the external features of the shell and the genitalia of 15 snails ( $20.00 \text{ mm} < D < 24.00 \text{ mm}$ ) showed that genitalia were fully formed only when the peristome edge was thickened. Gonad maturation was histologically examined along with the genitalia in 31 snails with  $9.00 \text{ mm} < D < 22.00 \text{ mm}$ . It was found that small oocytes were first found in the gonad when D reached 10 mm. Also from the examination of the genitalia it was found that at a size

of about 14-15 mm the digitiform glands appeared as a small swelling while they started branching at a size of about 17.50 mm.

The peak of egg-laying was noticed in mid May. Hatching took place about 18 days after egg-laying. During summer the snails did not aestivate. Hibernation started at the end of October to the beginning of November. Exit from hibernation took place at the beginning of March.

According to von Bertalanffy's method *C. vindobonensis* needs 7 years to attain its maximum size in the field. The study of relative growth of  $D$  in relation to  $d$  showed that it was faster in juveniles than in adults.

Mortality rate was very high during the first year of life, while life expectancy was higher during the second year of life and decreases afterwards. Per capita rate of increase ( $r_c$ ) was equal to 1.

## POSSIBLE APPLICATION OF FUZZY SYSTEM SIMULATION MODELS FOR BIOMONITORING SOIL POLLUTION IN URBAN AREAS

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The life history traits of soil arthropods are considered useful for biondication purposes in urban sites. In order to model the pollution in these sites by using life history parameters, highly complex and overmathematized models are needed. As an alternative, fuzzy system simulation techniques can be applied. In this paper a fuzzy theory based model, involving temperature and pollution levels in a Mediterranean city, is developed. The model was built upon hypotheses drawn from laboratory evidence. Oscillating temperature and pollution is driving the type of the response of the life history parameters and determine the magnitude of these responses. A qualitative layout of the simulation model is presented.

## GEOGRAPHICAL AND ALTITUDINAL VARIATION OF *Carabus banoni* DEJEAN, 1829 (COLEOPTERA : CARABIDAE) ON THE CRETAN AREA, USING MORPHOMETRIC DATA.

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In this study we examine the geographical and altitudinal differentiation on body size and shape of some populations of the carabid beetle *Carabus banoni* Dej., 1829 (Coleoptera : Carabidae) on the island of Crete.

*C. banoni* is endemic to Crete with wide distribution on the island. It belongs to the higher level of soil surface predators. Because of its abundance in almost every habitat of the island, its role seems essential to the structure of the soil fauna communities. Furthermore, it is of great biogeographical interest due to its endemism to the Cretan area and its phylogenetic relationships to other congeneric species of Cyprus and Asia Minor. Worthy to mention is that no related forms has been found on the island group between Crete and Asia Minor (Kasos, Karpathos and Rodos) where greek, aegean or endemic forms of *C. coriaceus cerisyi*, *C. trojanus oertzeni* and *C. graecus morio*, occur.

Samples from several sites on Crete and the surrounding islands were collected and 27 body measurements were taken from each individual. The data were analysed with multivariate analyses, in order to estimate body differentiations among populations.

We believe that ecological, rather than biogeographical, factors must be responsible for the following results:



- Body size is negatively correlated with altitude. Body differences between males and females (sexual dimorphism), are also minimizing with the altitude.
- Individuals from satellite islands appear to be larger in size than those from Crete. Extreme case of this trend is the endemic subspecies *Carabus banoni taborskyi* Maran, 1947 of Gaydos island, an animal with double the size of the nominative form.
- There is no evidence of geographic differentiations among the populations on the island of Crete, while east-west differentiations are prominent for other carabid genera on the same island (on subspecific level).

## TAXONOMIC, FAUNISTIC AND ZOOGEOGRAPHICAL CONSIDERATION OF THE CHILOPODA FAUNA OF GREECE

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The 88 species of Chilopoda which have been studied in Greece, are listed in this paper and an overview of the main taxonomic problems and the geographical distribution of the Chilopoda fauna of Greece is presented. Some general comments and new data on their distribution (especially of Scolopendromorpha and Lithobiomorpha) and their taxonomic status are also given. This catalogue includes a critical version of all literature reports, as well as recently collected unpublished data. Moreover, the specimens in the collection of the Museum of Natural History of the University of Athens have been compared with the type series of the critical species and the specimens previously published. Some zoogeographical remarks, particularly on Mediterranean and Anatolian districts are also given.

## ECOLOGICAL RESTRICTIONS IN *Ophisops elegans* (SAURIA: LACERTIDAE) OF MAINLAND GREECE

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In the Greek province of Evros the snake-eyed lizard, *Ophisops elegans*, reaches the westernmost part of its mainland distribution. In search of possible causes for this limit we compared habitat selection, densities and ecological niche overlap with other lizards in northeastern Greece and in a place more to the centre of its distribution area, along the southeastern Mediterranean coast of Turkey. For this we used field data from two studies, both carried out in a river delta and the lower parts of adjacent mountains. In Greece it concerned the Evros delta with the southeastern spurs of the Rodopi mountains, in Turkey the Gökusu delta with some adjacent spurs of the Taurus mountains. The lizard community in the Evros area consisted of 11 species, of which 7 lacertids and only one scincid; in the Gökusu area it contained 14 species, of which only three lacertids and five scincid species. In Greece *O. elegans* formed 5.4% of all lizard captures (n=2948), in Turkey this was nearly ten times more (52.3%, n=2825). In Greece *O. elegans* was found only on open, hot and dry spots in a small zone at the base of the hills, at an altitude of 100-500 m; in Turkey it occupied nearly all different habitats present, from sea-level up to the highest plots studied (1000 m). In Greece it reached densities of 10-20 n/ha, with peak densities of 45 n/ha in optimal habitats, in Turkey densities up to >500 n/ha were found.

In Greece substantial niche overlap existed with the lacertids *Podarcis taurica* and *P. erhardii*. The first replaces *O. elegans* in all open habitats under the 100 m line and on grassy, open places above 500 m. *P. erhardii* replaces both species on the stony, open places above the 500 m line. Both *Podarcis* species were active at significantly lower environmental temperatures than *O. elegans*. In the Gökusu delta *O. elegans* coexisted with the scincid lizard *Mabuya vittata*.

# GREY PARTRIDGE (*Perdix perdix*) BREEDING AND WINTER HOME RANGES AND HABITAT USE IN NORTHERN GREECE

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Pair (n=12) and covey (n=17) home ranges of grey partridges (*Perdix perdix*) were determined in a cereal farming area near Thessaloniki, Greece, by the use of radiotelemetry, pointing dogs and observations. Pairs were followed from egg-laying (late March) through hatching (early June), while coveys were monitored from late October till the beginning of pair formation (January). Mean pair range was 1.5 ha (range 0.6-2.6 ha). Mean covey range was 2.6 ha (range 1.7-5.9 ha). Habitat features and availability (analysed by GIS), as well as use, will be discussed.

## ZOOGEOGRAPHIC AND FAUNISTIC CHARACTERISTICS OF APHIDIID FAUNA (APHIDIIDAE, HYMENOPTERA) OF YUGOSLAVIA

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First data on aphidiid fauna of FR Yugoslavia were reported in papers by Graeffe (1908) and by Fahringer (1924). Vukasovi} (1928) published data on aphidiid fauna of Serbia. Later investigations dealt with parasitic complex of certain economically significant species of aphidiids (Mitic-Mucina and Srdic, 1977 and Petrovic, 1992). The first systematic study of aphidiids was carried out by Brajkovic (1990-91) and Brajkovic et al. (1995).

Hadci (1935) divided the territory of present Yugoslavia into four zoogeographic zones: southern and middle (plains), central (mountains) and mediterranean.

According to our investigations, the fauna of aphidiids of FR Yugoslavia encompasses the species from several faunistic complexes.

The species of Eurasian Steppes are mostly present in southern and middle zoogeographic zone, from where along the vallies of the big rivers (Drina, Morava) penetrate central mountainous zone. The typical ones are the following species: *Aphidius ervi* Hal., *A. funebris* Mack., *A. rhopalosiphi* DeStef., *A. uzbekistanicus* Luz., *Lysiphlebus fabarum* (Marsh.), *Praon gallicum* Stary, *Trioxys complanatus* Quil.

The species of European Deciduous Forests are mostly present in the central mountainous zone, although many species penetrate two plain zones on the north, where they are present in forest oases and forest steppes. The typical species are the following : *Ephedrus persicae* Frogg., *E. plagiator* (Nees), *Aphidius rosae* Hal., *Praon volucre* Hal., *P. abjectum* (Hal.), *Trioxys angelicae* (Hal.). The species *E. persicae* and *E. plagiator* also occur in the faunistic complex of Far Eastern Deciduous Forest.

The species of the genus *Pauesia* are characteristic for the faunistic complex of West Euroasian Coniferous Forest.



## APHIDS - PARASITOIDS - HYPERPARASITOIDS RELATION BETWEEN WHEAT AND LUCERNE AGROECOSYSTEMS IN SERBIA

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Over the period 1989-1995 we investigated the aphids, their parasitoids and hyperparasitoids in different wheat and lucerne agroecosystems in Serbia. We reared different aphid species and obtained several hundreds parasitoids and hyperparasitoids species.

We registered the following three species of the aphids on the lucerne: *Acyrtosiphon pisum* (Harr.), *Therioaphis trifolii* Mon. and *Aphis craccivora* Koch. In different wheat agroecosystems, we registered the following aphids: *Sitobium avenae* Fab., *S. fragariae* (Walk.), *Metopolophium dirhodum* (Walk.), *Rhopalosiphum padi* L., *R. maidis* (Fitch), *Schizaphis graminum* (Rond.), *Sipha maydis* Passer., *Sipha elegans* del. Guer. and *Diuraphis noxia* (Mordv.). We reared the aphid species associated with lucerne and obtained the following species of parasitoids: *Aphidius ervi* Hal., *A. eadyi* Stary, *A. picipes* Nees, *Praon barbatum* Mack., *Lysiphlebus fabarum* Marsh., *Lipolexis gracilis* (Forst.), *Trioxys complanatus* Quil. and *Praon exoletum* (Nees). We also reared different species of the cereal aphids and obtained the following species of the parasitoids: *Aphidius ervi* Hal., *A. rhopalosiphii* DeStef., *A. uzbekistanicus* Luz., *A. picipes* Nees, *Praon gallicum* Stary, *P. volucre* Hal. and *Adyalitus ambiguus* Hal.. The following species of the hyperparasitoids were registered from both agroecosystems: *Pachyneuron aphidis* (Bonehe.), *P. concolor* (Forst.), *Asaphes suspensus* (Nees), *A. vulgaris* Walk., *Syrphophagus aphidivorus* (Mayr), *Dendrocerus* sp., *Charips* sp., some species from the family Scelionidae and subfamily Alloxytinae (Cynipidae).

The species of the parasitoids *A. ervi* and *A. picipes* are common for both agroecosystems. The lucerne, being a perennial plant, represents a reservoir of these parasitoids for neighbouring wheat agroecosystems.

## THE INFLUENCE OF HEAVY METAL FROM INDUSTRIAL DUST ON THE ULTRASTRUCTURE OF MOUSE THYMIC CELLS IN AN ECOTOXICOLOGICAL EXPERIMENT\*

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The effect of polymetal dust, a waste product of the Pb/Zn industry, on the ultrastructure of the thymic cells at the 15-th, 40-th, 60-th day of treatment was investigated.

The electron microscopic studies of materials taken from the thymus gland on the 15-th day after the treatment showed no apparent changes of the organ structure. Investigating the histological deviation from the normal thymus structure did not established. Lymphocyte and stromal subpopulations were unaffected by administrated treatments.

The thymus preparations studied on the 40-th day after treatment with heavy metals showed changes in lymphoid and epithelial compartments of the organ. Data were given about dearrangement in chromatin structure, chromatin desintegration and nucleolar segregation in the thymocytes. Pathological changes in the form and structure of the endoplasmic reticulum, as in heavy degenerative and necrotic processes were defined in the epithelial cells. The qualitative and quantitative pathological changes, concerning Golgi complex and lysosomes, were viewed in processes of autophagia in the some cells.

Elimination of T-lymphocytes and frequent appearance of epithelial cysts and Hassal's bodies were observed. The number of the IRC was increased. An increase in the extracellular matrix network and the fat cells (the adipose connective tissue) was detected, too. The ultrastructural characteristics of the lymphoid and epithelial compartments persisted in the thymus on the 60-th day after treatment. These data suggest that oral polymetal administration induces changes in thymus structures which can be

associated with a T-lymphocyte deficit and an inadequacy of T-cell immune system in experimental animals.

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## BIOACCUMULATION OF HEAVY METALS AND CHROMOSOME ABERRATIONS IN SMALL MAMMALS FROM INDUSTRIALLY POLLUTED REGION IN BULGARIA\*

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Food chain transfer and bioaccumulation of Copper, Zinc, Lead and Cadmium in small mammals from industrially polluted region in Bulgaria has been studied. Tissue distribution was described in the insectivorous white toothed shrew (*Crocidura leucodon*) in the omnivorous house mouse (*Mus macedonicus*) and in the herbivorous (*Microtus subarvalis*). The comparison of obtained data show that the level of Zn in all the species is similar. Metal contamination levels in smallmammals followed the order *Crocidura leucodon* > *Mus macedonicus* > *Microtus subarvalis*. The highest concentrations of the most toxic element Cd were found in the kidney and liver (2,6 and 2,0 mg/kg) of the white toothed shrew. The highest concentration for lead was found in bones (about 90 mg/kg) also in the white toothed shrew.

The lowest concentrations of all the metals were found in the internal organs of the *Microtus subarvalis*. The metaphase analyses of bone marrow cells of *M. macedonicus* and *M. subarvalis* demonstrate that metaphases with aberrant chromosomes were presented in almost all of the observed animals. The aberrations of chromatide type dominate in all samples.

The unichromatide deletions have been prevail followed by chromosomeintrachanges and interchanges. The isochromatide breaks and pair-fragments were rarer. Statistically significant differences have been accounted between thepercentage of aberrations in bone-marrow cells of wilde small rodents and labratory mice strain BALB/c used as a control. High level correlation between the lead bioaccumulation and the chromosome changes has been found.

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## BIODIVERSITY AND ZOOGEOGRAPHY OF THE SOUTH AEGEAN ISLAND ARC. A COMPARATIVE ANALYSIS OF THE GROUND BEETLE FAUNA (CARABIDAE AND TENEBRIONIDAE).

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The south Aegean arc is an island landbridge extending from the southeast coast of Peloponnisos to the southwest coast of Asia Minor. The larger islands of the arc are Crete, Rodos, Karpathos, Kythira and Kasos (ranging from 8,261 to 65 km<sup>2</sup>). Antikythira, Gavdos, Dia and Saria range between 30-10 km<sup>2</sup>, while there is a rather large number of satellite islands with an area less than 1 km<sup>2</sup>. Only on Crete, Rodos and Karpathos the mountains exceed 1000 m of altitude. There are no large lowland areas, except the Messara plain on central Crete. Still or running waters are scarce all over the island arc.

The present study deals with the ground fauna of Carabidae and Tenebrionidae through the arc. The animals were collected by pitfall traps and by hand, for the last ten years on the majority of the islands, while bibliographic data were used for the surrounding areas.



The species composition of the largest islands is analysed for both families. The results are presented by comparing faunal elements between islands, while the influence of the surrounding areas is also given.

The zoogeography of the area is considered in order to reveal ecological or historical causes of the present distribution of Carabidae and Tenebrionidae on the island arc. Presence - absence (qualitative) data matrices were constructed for both families and analysed with similarity indices. The similarity matrices were clustered by UPGMA and dendrograms of the study area are given for each family, as well as for taxa of various distributional categories. A preliminary zoogeographic analysis of the island of Crete, is also proposed.

## TESTING THE INSECTS-ANGIOSPERM COEVOLUTIONARY DOCTRINE AT THE CLASSES LEVEL

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Insecta and Angiospermophyta are considered as the most successful coevolutionary story at any examined taxonomic level. Their coevolution suppose to started at the species level and continuous up to the class one. At any given chronological consecutive intervals therefor, the two classes diversities or diversities fluctuations (differences) should be related-correlated to a significant degree. If such a correlation is found then we may argue that a coevolutionary process was in operation between the two groups.

For our study we used the clades diversities diagrams provided by Sepkoski and Hulver (1985). The two classes have an 70 myrs coexistence running into 17 intervals with fluctuation differences at least in one of them. This provide us with 17 pairs of diversity changes or 16 pairs of diversity change differences to be tested. It is also evident that ranking correlation can be estimated. Since time lang responses may exist i.e. An increase diversities in angiospermophyta at the interval 1 would influence the insect diversity at a latter interval that of 2 or 3 etc. and vice versa, on a continuous process.

To our surprise no significant correlation between the diversity differences (fluctuations) of the two taxa have been found in one to one or ranking analysis performed. This argues that no strong coevolutionary pattern can be clearly stated. Of course there are limitations in our data and analysis performed as well as the cases were in parallel coevolution genetical constrains may provide limits to the upward continuation of the phenomenon (Levin and Lenski, 1983).

Inspite of all these we thought that the phenomenon of coevolution would be a strong one in continuous operation and at least clear(evident) in the case of taxa tested here, Insecta-Angiospermophyta. Unfortunately our study showed that coevolutionary process between Insecta-Angiospermophyta can not be argued.

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*\*Tsakas S. dedicates this work to the memory of his overseas Professor Motoo Kimura.*

## BIOGEOGRAPHY OF THE ISLAND GROUP OF KARPATHOS BASED ON LAND SNAILS.

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For this biogeographic study we chose the island group of Karpathos as study area and land snails as the biological tool. The studied area comprises only the larger islands of the group, which, in order of size, are Karpathos, Kasos and Saria. They are situated in the south Aegean Sea between Kriti and Rodos. Geologically they belong to the outer aegean arc.

The first bibliographic data concerning the land snails of the area date back to the 19th century and since then sporadic data are being presented. In total 42 species have been reported from all three islands. We must note that in some cases taxa had been misinterpreted. After our thorough study of the islands we found out that 54 species of land snails are distributed in the area. In addition to recent material, fossil shells have also been collected.

Based on the distribution of the land snails, extant and extinct, the principal conclusions are summarized as follows:

- species belonging to the Mediterranean and the Aegean element dominate on the islands.
- The islands of the group have had a related geologic history.
- Kasos and Saria could be considered as recent satellite islands of Karpathos
- Karpathos seems to have had a close relation with Rodos until the Quaternary.

## BIOGEOGRAPHY OF THE SOUTH AEGEAN ISLAND ARC BASED ON COLEOPTERA AND MOLLUSCS

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This contribution deals with the biogeography of the land molluscs and ground coleoptera (Carabidae, Tenebrionidae) in the larger islands of the south aegean island arc. These islands are, from west to east, Kythira, Antikythira, Crete, Kasos, Karpathos and Rodos. The arc is, geologically, considered as a tertiary landbridge between Greece and Asia Minor.

The principal aim was to reveal the zoogeography of the area based on ground, low dispersed invertebrates (different rate of dispersal and degree of endemism for each group).

175 species of land snails and 361 ground coleoptera (226 Carabidae and 135 Tenebrionidae) are distributed in the area. Qualitative data matrices (presence - absence) were constructed and analysed with three different similarity indices. Cluster analyses were carried out in order to reveal the effect of the historical factors that affect the species' distribution in the island arc.

The main conclusion from the analyses is that the islands are grouped in three subgroups: one subgroup consists of the western islands (Kythira, Antikythira), the eastern islands of Kasos, Karpathos and Rodos form a second subgroup while Crete remains apart forming the third subgroup. The three subgroups remained the same for both invertebrate groups in almost all the clusterings.

## REGIONAL ASPECTS OF THE DISTRIBUTION OF BALKAN BIRD POPULATIONS

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All Balkan ornithologists, from the great Othmar Reiser to Sergije Matvejev and more recent Simeon Simeonov and Tanyo Mitchev, feel the Balkan peninsula as a natural entity, a geographical



frame where bird populations are distributed within in various ways. A distributional analysis of the bird diversity presented in Thessaloniki 1992 at the 6th International Congress on the Zoogeography and Ecology of Greece and adjacent regions showed the obvious border effects both in the western and eastern corners of Balkan peninsula, caused by the influences of different, zoogeographically transborder bird faunas.

However, in the recent international projects on the conservation of birds one will hardly find a Balkan peninsula mentioned as a regional unit in bird population or distribution analyses. Balkan states are usually roughly placed in Eastern Mediterranean or divided between it and so called Black Sea basin. Moreover, some of Balkan states often appear in the Eastern European region, sometimes together with Central European countries, in both cases probably more due to the political than zoogeographical reasons. Opening of this problem is not a matter of mere scientific puritanism. The question of zoogeographic regional boundaries is crucial for the scientific as well as technical and practical understanding the processes in the field of bird (and any other) conservation. It is far to be unimportant what one compares and what compares to. The number of various examples stress out the need of more regionally aspect in population and distribution assessments of Balkan birds. However, no one sees Balkans as an island. It stays strongly tied with adjacent zoogeographical regions.

## SYSTEMATIC DATA COLLECTED FROM THE BENTHOS OF HIMARA REGION (IONIAN COAST OF ALBANIA)

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In this paper the recently collected data on the benthos of Himara region are presented. This area was very poorly investigated until now. The main body of information is related with Crustacea (Decapoda) and Mollusca groups. Most of the species found are first records for the Albanian marine fauna.

## STUDY OF THE PHYLOGEOGRAPHY OF *Cyrtopodion kotschy* SAURIA: GEKKONIDAE) IN ISLAND POPULATIONS OF THE AEGEAN (GREECE) USING ANALYSIS OF mtDNA

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In this study, we examine the phylogeography of *Cyrtopodion kotschy* (SAURIA: GEKKONIDAE) in the Aegean islands, where this species is widely distributed.

Samples from several islands and islets were collected and their mtDNA was analysed by the RFLP method (Restriction Fragment Length Polymorphism) and by amplification with PCR (Polymerase Chain Reaction). The results were used to estimate the genetic differentiation of the populations and to determine their phylogenetic relationship.

We observed quite high genotypic diversity among the populations of the different islands, which could be attributed to founder effects and population bottlenecks, caused mainly by the turbulent geographic history of the Aegean (changes of the sea level, tectonic movements etc). On the contrary, there was low polymorphism among the individuals of each island, which suggests small effective population size.

It is possible that *Cyrtopodion kotschy* will prove to be a quite useful system for understanding the mechanisms of the evolution of mtDNA in species with small populations and limited dispersal ability.



# CONSERVATION STATUS OF SEA TURTLES IN NORTHEASTERN MEDITERRANEAN

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The Loggerhead turtle *Caretta caretta* not only is capable of migrating 10.000 km., across the Pacific but also has migrated into an "anti-ecological" era, and is now threatened with extinction. Together, with *Chelonia mydas* they have become endangered due to habitat degradation caused by humans or by direct contact killing. Zakynthos, has the largest nesting colony of Loggerhead turtles in the Mediterranean and also has become one of Greece's major tourist resorts. The tourist industry has decreased a 9 km., nesting Bay to 3.9 km. by destroying the sea turtles' natural habitat. Legislation together with various Ecological Organizations have encouraged the turtle conservation. Nevertheless, powerful legislation has yet to be implemented. Other important nesting sites in Greece face similar problems like Zakynthos does. Specifically Lara (Cyprus) faces the same problem. In the past 18 years several nesting beaches, on other parts of the island, have been lost due to tourism. An additional threat to the sea turtles is the predation by foxes, crows, hawks and coast crabs. Struggling to keep a balance in nature, Lara hatchery releases about 40.000 hatchlings into the sea every year. This is approximately 3-4 times the number that would normally reach the sea if nests were not transferred. On the other hand, in Northern Cyprus we have encouraging results. Beaches in N. Cyprus have essentially lost any imminent tourist threat. Since 1991 the area has been subject to research and monitoring by the Turtle Conservation Expedition Project (Glasgow University) with the support of the local turtle Conservation Society (KKKKD). N. Cyprus as well as Turkey hold the largest known number of Green and Loggerhead turtles in the Mediterranean. The southern Turkish coast has physically suitable beaches for turtle nesting. The beach of Dalyan was identified as vital importance. Thanks to the national and International NGO's campaigns since 1986 Dalyan and it's turtles have become a prominent international conservation issue.

In conclusion for the establishment and management of protected areas for the sea turtles, various recommendations are issued by Medasset.

## HOMOGENEITY OF PICAREL POPULATION (*Spicara smaris* L., 1758) ON THE AEGEAN SEA (GREECE)

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The aim in fisheries biology is the estimation of the population dynamic parameters of a given species and its stock assessment. For the above estimations it is essential the knowledge of the population structure and its stability in space and time. Such information can be obtained by discrimination analysis of potentially different stocks within an exploited species. In this study we examined the homogeneity of the population of the picarel (*S. smaris*) in six areas of the Aegean Sea, in order to recognise the existence of different stocks. For this purpose we examined only the variability of phenetic characters (morphometric and meristic characters) in fishes caught in the Aegean Sea. Data were subjected to Canonical Variate Analysis (C.V.A.) and differences between samples were detected by MANOVA. The results from the Multivariate Analysis in 14 morphometric and 6 meristic characteristics per individual, showed no difference between the two sexes. Only morphometric characters were able to show the indispensable variance for the analysis. Analysis of these characters did not reveal clear discrimination of populations between all six areas examined. However, we can discriminate two major population groups. The first group includes the populations of the North Aegean (Kavala, Alexandroupoli and Thessaloniki) and the second group includes the populations of the South Aegean (North and South Crete and Cyclades). The phenetic tree of Mahalanobis distances showed that populations of picarel caught in neighbouring areas appear relevant. The phenetic characters are the composite effect of the genotype and the environment and they are under the influence of natural



selection. Therefore, phenetic differences may reflect genetic differences of the examined populations or environmental differences between the examined localities. There exist a difference on the environmental factors between the two major areas (hydrographic characteristics of the sea, primary production etc.) which is reflected on the biota of those areas and on the composition of the fishery production. On the other hand, no data are yet available on the genetic homogeneity of the populations examined, but results of the analysis of meristic characters could give an idea of the expected genetic homogeneity. The genetic relation between populations of different localities should be more or less proportional to the efficiency of the interpopulation exchange, which seems to be proportional to the geographic distance of the loci. The efficiency of the interpopulation exchange, is proportional to the swimming ability of the individuals within the population, which is related to the duration and the velocity of swimming and therefore to the condition of the individuals within the population. Male individuals, according to the protogynous hermaphroditism of the species, are greater in age and size. Therefore, due to their size and swimming ability, they may be responsible for the phenetic homogeneity of the population between the areas examined.

### RECENT OBSERVATIONS ON THE AVIFAUNA OF KEFALONIA (IONIAN ISLANDS, GREECE)

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Until recently, the avifauna of Kefalonia island in the Ionian Sea, Greece, has poorly been studied. The relatively high rainfall and the existence of large tracts of semi-natural habitats make this island important both for breeding and as a transit stop for migrants. The habitats range from typical Mediterranean scrub, deciduous woodland and an ancient mountain forest of Greek Fir (*Abies cephalonica*) in the Mount Ainos national park, to bare mountain tops and, in the littoral, from degraded marshland and shallow enclosed bays to sand dunes.

237 bird species are known to have occurred on Kefalonia. Of those, only 37 are permanently resident but an additional 21 summer visitors breed on the island. 84 of the total are passage migrants of regular occurrence, and 57 are scarce migrants or vagrants. 28 species are principally winter visitors. The remaining 10 species include 10 non-breeding seabirds, one irruptive species (*Loxia curvirostra*), 6 species of uncertain status (*Gyps fulvus*, *Aquila chrysaetos*, *Strix aluco*, *Picus viridis*, *Dendrocopos bucotos*, and *Locustella naevia*) and one introduction/escape (*Phasianus colchicus*). 26 other species which have occurred elsewhere in the Ionian Sea and are likely to visit Kefalonia are also listed here.

Only since the mid-80's tourist development and the stabilized number of inhabitants have begun to threaten the relatively unspoiled areas of semi-natural habitats that still cover large parts of the island. Other threats to the island's avifauna include overgrazing by goats, spraying of pesticides, land clearance and fire. The regular occurrence in spring of one of the most endangered Greek bird species, the Glossy Ibis (*Plegadis falcinellus*) in the area of Livadi underlines the importance of special protection measures for the most important coastal wetland in Kefalonia.

## BIRDS (AVES) AND AMPHIBIANS (AMPHIBIA) IN MEDVEDCE RESERVOIR IN NORTHEAST SLOVENIA

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In the Medvedce (dry) reservoir with a total area of 155ha, on the Dravko polje (Drava field) in the Northeast Slovenia, some unique habitat types can be found. Numerous damp and swamp meadows with their hedges are of special ecological importance. This is actually one of the rare preserved areas in the lowland Slovenia.

In 1993, a territory mapping of the nesting birds was made. 32 species of the nesting birds were detected. 13 of them belong to the Red List of the endangered nesting birds in Slovenia. The Meadow Pipit (*Anthus pratensis*), which was thought to have become extinct, also builds nests in the swamp meadows in the dry reservoir.

In very short time we found in the reservoir also ten species of amphibians. The most important find is Moor Frog (*Rana arvalis wolterstorffi*) which is very rare in Slovenia.

Due to the constant threat of immersion, the reservoir is being endangered as the living space of the numerous rare flora and fauna, especially for marsh plants, amphibians and birds of course.

## THE SELECTIVE EFFECT OF PARAQUAT (HERBICIDE), OZONE AND UV RADIATION ON THE VIABILITY AND RECOMBINOGENICITY OF *D. MELANOGASTER* IN RELATION TO ITS SOD POLYMORPHISM

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The toxic effect of ozone, paraquat and UV radiation are thought to be due to the intracellular generation of oxygen free radical species. Toxicity and recombination of these agents in *D. melanogaster* (*D.m*) has been postulated, however, the mode of action of these agents has not been evidently attributed to radicals. In addition, it is not certain whether the natural Superoxide dismutase (Sod) polymorphism of *D. m* (an enzyme which scavenges oxygen free radicals play a major role in the intracellular defence against oxygen radical damage to aerobic cells) will affect the pathological events resulting from such agents.

To understand the in vivo relationship between the natural Sod polymorphism and oxidative injury to biological structures in *D. m*, caused by the former agents, we used *D.m* strains differing in quantity and quality of Sod. Strains with the three alleles, Slow, Fast, which are present with variable frequencies in natural populations and Null were undergone paraquat, ozone and UV radiation application. Paraquat exposure was achieved by feeding larvae or flies on standard corn-meal medium or sugar solution with paraquat, whereas a new, very efficient technique for ozone application was used and is demonstrated.

Viability and recombination (mitotic and meiotic) were tested. Recombinogenicity was tested (a) by estimating the frequency of somatic crossing over spots on y+/+f female tergites in flies having been treated by the above free radical generator agents in their larva stage, (b) by checking and scoring the induction of chromosomal recombinations in germ cells of heterozygous dp, b, cn, bw /+, +, +, + males.

The results show that Sod polymorphism is involved in the resistance of *D.m* material against paraquat, ozone and UV radiation, as concerning its viability and recombination. The protection is greatest when homozygous flies carry the S or F alleles and lowest when they are homozygous for N, possessing 3,5% activity in comparison to the FF ones.



These results give a strong evidence that paraquat, ozone, and UV radiation create free radicals operating as selective factors on Sod locus polymorphism and point toward a possible adaptive function of Sod polymorphism found in natural population of *D.m.*

## INTERMITTENT STREAMS. THE TYPICAL RUNNING WATER ECOSYSTEMS OF CRETE - THEIR PRESENT STATUS

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Intermittent streams are the typical running water ecosystems in the island of Crete and in other East Mediterranean areas due to climatic conditions and calcareous rock sediments. Despite their important role to the hydrological equilibrium of these areas, a great number of them can be characterized today as degraded due mainly to anthropogenic activities.

Three intermittent streams of Crete, with similar physicochemical characteristics but differing in discharge and in the period of time the water remains into their channels, have been studied. The changes in their community structure due to pollution and the resistance and resilience of these communities are commented in this work.

Benthic aquatic macroinvertebrates have been used for the aim of the study. Their number of species and their degree of sensitivity to pollution showed that the fauna of many intermittent streams in Crete has changed in structure due to pollution. Moreover the resistance and resilience of these stream communities are influenced mainly by the quantity and quality of pollution loads and also by the stream water purification capacity.

## THE BALKAN PENINSULA AS A CENTER OF SPECIATION FOR SOME HOVERFLIES GENERA (DIPTERA: SYRPHIDAE)

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The Balkan Peninsula is a region where the influences from many biogeographical territories are confronted. Frequent changes of the global ecological conditions during the geological history have greatly contributed to the occurrence of exceptionally heterogeneous fauna. It has made this area a center of speciation for many groups of organisms. A number of endemic species are registered in this territory as a result of this process.

This paper points out some genera of family Syrphidae with the species of local or highly narrow distribution, examples of subspecies, semispecies and superspecies.

## SOME POPULATION PARAMETERS *Mus musculus* LINNAEUS, 1758

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During these research morphometrical parameters, growth structure, sexual structure and fertility of populations *Mus musculus* in the wider area of Belgrade were examined.

Morphometric parameters that were examined are: body weight (BW), body length (BL), tail length (TL), hind foot length (HFL) and ear length (EL). Condylbasal skull length (CBL) was measured by the craniometric parameters.

Results were presented by the growth categories (mostly based on the BL and CBL parameters) both sexes together and for each one separated.

Parameter BW of the adult species (both sexes included) was in the range from 12,0 up to 19,5g (MM  $x = 15,30 \pm 2,32$  and FF  $x = 14,23 \pm 2,44$ ), BL from 69,0 up to 83,0 mm (MM  $x = 74,65 \pm 4,76$  and FF  $x = 73,57 \pm 3,33$ ), TL from 55,0 up to 74,0 mm (MM  $x = 66,76 \pm 3,88$  and FF  $x = 62,02 \pm 15,75$ ), HFL from 15,1 up to 17,8 mm (MM  $x = 16,41 \pm 0,81$  and FF  $x = 16,03 \pm 0,45$ ), EL from 11,4 up to 13,9 mm (MM  $x = 12,50 \pm 0,61$  and FF  $x = 12,55 \pm 0,65$ ) and CBL from 19,2 up to 21,6 mm (MM  $x = 20,49 \pm 0,85$  and FF  $x = 20,3 \pm 0,51$ ).

By analysing of growth structure it was found that the members of the population with adult status are making about 30% of the total population. Considering the whole, the growth structure of the house mouse population is a progressive type.

Relation between the sexes was nearly equalised (FF/MM = 1,13). From the total number of cough 58 females, littering or in the phase of gestation were 26 (44,8%), with totally 30 litters making that average 1,15 by a female. Mostly there were female with one litter, and only four with two litters. Average number of embryos was  $4,5 \pm 1,31$ , and placental scars  $5,3 \pm 1,27$  (average number of embryos and placental scars was  $4,96 \pm 1,32$ ).

Comparing with the Reichstein's research (1978) and analysing certain populations parameters, can be concluded that populations of house mouse in the wider Belgrade area (period 1994 -1995) are relatively young.

## DISCOVERING A NEARLY UNKNOWN COUNTRY IN EUROPE: THE NON - MARINE MOLLUSCS OF ALBANIA

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Albania's borders have remained closed for about 35 years, so that both the country and its scientists were almost completely isolated. Until 1992, 90 % of what was known about the Albanian mollusc fauna derived from published results of zoological expeditions undertaken many years ago, between 1900 and 1960.

The situation has been changing since 1992. Now international scientists are allowed to visit Albania and to work in the country, and research on its non-marine molluscs is expected to increase in the future. Currently, a bibliography and a preliminary (10x10 km UTM) atlas of the Albanian non-marine molluscs is being prepared in order to present the complete published knowledge on the subject. This should serve as a basis for studies in future.

The country is not completely unknown. Until recently, approximately 250 species of non-marine molluscs have been mentioned for Albania, but exact localities are known only for 200 species. The occurrence in Albania for the remaining 50 species still needs to be confirmed. 35 of the 200 confirmed species are freshwater Gastropoda, 10 are Bivalvia, the other species are land snails, most of them Pulmonata. 30 species of Clausiliidae are known from Albania, 20 species belong to Zonitidae. Pupilloidea, Hygromiidae, *Helicigona*, slugs, *Cochlostoma* and *Poiretia* are other important groups of Albanian land snails.



Northern Albania has been much more thoroughly investigated than the southern region. 100 of the 200 species have been found exclusively in the north, while 20 are known exclusively from the central region. Only 10 species are restricted to the south. The North Albanian Alps host a number of species which are found nowhere else in Albania. Due to the insufficient knowledge of the South Albanian mollusc fauna, however, it is quite possible that many species which have only been found in the north, may also live in some areas of the south, especially in the mountains. So far, 40 species have been found throughout Albania.

Several species were found for the first time in Albania during investigations undertaken in September 1995. The occurrence in Albania was confirmed for the first time in respect of some other species which have been found. These species have been mentioned in the literature, though without any exact indication of localities. We may assume that quite a number of species still remains to be found. There are many white zones in the map of the country, especially in the south and east, where molluscs have never been collected. A great deal of information still remains to be discovered.

### 1x1km DISTRIBUTION MAPS FOR THE *Albinaria* SPECIES IN CENTRAL CRETE (GASTROPODA : CLAUSILIDAE)

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The genus *Albinaria* belongs to the best researched land molluscs in Crete. However, the exact areas of dispersal of its species have never been well known. Central Crete between Agia Galini and Chersonisos covers 3100 km<sup>2</sup>. In this area we find 12 *Albinaria* species: *A. cretensis*, *A. ariadne*, *A. spratti*, *A. violacea* and *A. ulrikae*, *A. idaea*, *A. hippolyti*, *A. terebra*, an undescribed species discovered near Kali Limenes, *A. corrugata*, *A. praeclara* and *A. teres*.

*Albinaria* usually live in calcareous, rocky areas. They have difficulty living on plains without any rocks, such as the Mesara or the Padiadas. Moreover, they rarely live on non-calcareous metamorphic rocks. In Psiloriti, *Albinaria* were not found in over 1700m altitude.

With some experience in the field, it is possible to state that a 1x1km square is not inhabited by any *Albinaria* species. Generally, the declaration of such "empty squares" takes more time than collecting a few specimens: all potential *Albinaria* habitats within 1km<sup>2</sup> have to be examined. The cartographic marking of these "empty squares" is very important, as they may act as a barrier to dispersal in nearly the same way as water does.

The species have different areas of dispersal. Usually one species lives in one area, but sometimes two species may occur sympatrically. Only in very rare cases, 3 *Albinaria* species have been found living at the same rocks. The observation of sympatrically living species is taxonomically important: the existing subdivision of the genus *Albinaria* into many species has largely been confirmed during these studies by finding sympatrically living species in many areas of Central Crete. It is not yet clear whether *A. ulrikae* and *A. violacea* are conspecific, since they live in disjunct areas of dispersal.

*Albinaria* species have been collected in 1589 1x1 km squares in Central Crete. The material is available in the Haus der Natur, Cismar (collection V. WIESE). It was established that *Albinaria* did not live in 280 squares. Of these squares, 158 squares belong to the Mesara Plain.

*A. ariadne* and the species discovered near Kali Limenes live in extremely small areas; the other species live in more extended regions.

The distribution of the *Albinaria* species may be explained by considering the historical geology of the South Aegean Island Arc. Large areas of Nomos Irakliou were covered by the sea during the Miocene, while other areas (Psiloriti, Dikti, Asterousia) remained land in the form of islands. It may be assumed that, when the land was lifted during the Pliocene and Pleistocene, some *Albinaria* species began to immigrate into the newly appearing land between the islands. *A. cretensis*, *A. terebra*, *A. corrugata*, *A. praeclara* and *A. teres* belong to these species. Other species did not ingress into the new habitats, but, it seems, remained living in the mesozoic calcareous areas where they had lived for millions of years. *A. spratti*, *A. idaea*, the species discovered near Kalz Limenes, *A. violacea* and *A. ulrikae* belong to this group of species.

## HABITAT SELECTION OF BIRDS OF PREY IN THE DADIA RESERVE, EVROS

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Habitat preference of Black vulture (*Aegypius monachus*), Griffon vulture (*Gyps fulvus*) Egyptian vulture (*Neophron percnoptens*), Golden eagle (*Aquila chrysaetos*), Lesser - spotted eagle (*Aquila pomarina*), Short-toed eagle (*Circaetes gallius*) and Buzzard (*Buteo buteo*) was investigated in the Dadia reserve during Summer 1993. Dense woodland, partially forested areas, cultivated land, open habitats and wetlands are the major habitat types in the area where 249 observations were made concerning these species. For each sighting, habitat type beneath raptor in flight or overlooked by perched individual was recorded from vantage points with good view over the reserve or by following line transects. Data were statistically analysed using a chi - square method, 90% Bonferoni's confidence intervals and an index of preference in order to test the null hypothesis that birds of prey utilize each habitat type in exact proportion to its occurrence in the area. Overall it appears that all these raptorial species show a strong preference for open habitats such as grassy fields, pastures, cliffs, rocky hill tops and small openings inside the forest with scattered trees and shrubs.

Furthermore the Buzzard uses arable fields at the forest edge and the Lesser - spotted eagle freshwater stream margins.



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