

COMPARATIVE STUDY OF THE SOIL ARTHROPODS OF
THREE ECOSYSTEMS
ON MOUNT HYMETTOS (ATTICA, GREECE)

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Introduction

Mediterranean ecosystems are among the least studied ecosystems, their vegetation being more investigated than their fauna. Only in recent years has there been an interest towards this field. (DI CASTRI 1973).

The fauna of the mediterranean ecosystems of Greece has attracted only taxonomists and zoogeographers since their majority are non-greeks who visit Greece for short periods of study and are unable to carry out long term ecological research (LEGAKIS 1981). The only available works have been carried out on phryganic ecosystems (SGARDELIS et al 1981, SGARDELIS & MARGARIS in pr.).

The present communication consists of preliminary data on the soil fauna of three such ecosystems that exist on Mount Hymettos near Athens.

The sites

Mount Hymettos is the eastern border of the greater Athens area which is also surrounded by M. Pendeli on the NE., M. Parnitha on the NW. and M. Aigaleo on the W. It is approximately 23km long and 5km wide and has an altitude of 1027 m. Its western side faces Athens while its eastern side faces the agricultural plain of Mesogeia that includes some small urban communities.

M. Hymettos used to be covered by a macchia vegetation with some scattered *Pinus halepensis* over much of its area (ZERLENTIS 1965). However, as Pausanias points out in his Attika (150 AD), a large part of it was covered by lower vegetation. Since ancient times and especially during the 2nd World War, the vegetation has suffered much degradation due to fires, grazing and cutting of fuel wood. Today, a part of it has been replanted with *P. halepensis*.

and *P. brutia* while the rest contains mainly *Quercus coccifera* stands and *Thymus capitatus* and other phryganean vegetation.

In order to compare the three most dominant ecosystems, three sites were chosen on the east side and three on the west side. On the east side, one site at 350m elevation was covered with phryganean with *T. capitatus* predominating. The second site contained *Q. coccifera* stands at an elevation of 800m. The third site was covered with *P. halepensis* and *P. brutia* at an altitude of 500m. On the west side, all sites were at 500m. All sites were on the northern part of M. Hymettos.

The density of vegetation was higher on the west side while on the east side, there were numerous patches of bare ground between the phryganean and also between the *Q. coccifera* shrubs.

Methods

From each site, 10 quadrats of 25×25 cm were randomly chosen from under the dominant species (*T. capitatus*, *Q. coccifera* and *P. halepensis*). The litter inside the quadrats was collected and placed on Berlese funnels from where soil animals were extracted and counted.

Collembola, Diplura, Acarea and ants were ignored during counting.

All sampling was carried out from 29.4.83 to 3.5.83.

It must be noted that temperatures were exceptionally high during the whole spring of 1983.

Results and discussion

The results are summarized in table I.

A first comparison can be made between the east and the west side of the mountain. Total number of individuals is higher on the west side in phryganean and macchia while it doesn't differ between the two pine sites. These differences can be attributed mainly to the spiders, pseudoscorpions and centipedes, all of which are predators.

One possible explanation can be the fact that the east side is still heavily grazed while grazing has stopped on the west side many years ago. It is evident from table II that litter deposition is not the same in east and west. The depth of the litter layer is much larger on the west side. Grazing may be removing part of the foliage that otherwise would be deposited as litter. The litter under pine trees where no grazing occurs either in the east or the west, shows no significant difference.

The lower density of predators on the east side is in accordance with the observations of MOLFETAS and BLANDIN (1981) where predators appear to be most easily affected by trampling.

TABLE I. Mean number of animals/m²

	Phrygana E		Phrygana W		Macchia E		Macchia W		Pine E		Pine W	
	\bar{x}	s ²	\bar{x}	s ²	\bar{x}	s ²	\bar{x}	s ²	\bar{x}	s ²	\bar{x}	s ²
Pseudoscorpions	4,8	53,8	25,6	215	8	64	35,2	1679,4	14,4	176,6	20,8	156,2
Spiders	8	64	24	268,8	8	64	16	102,4	14,4	176,6	4,8	53,8
Diplopoda	16	102,4	44,8	3624,9	—	—	4,8	53,8	9,6	215	4,8	53,8
Chilopoda	—	—	8	64	4,8	53,8	4,8	53,8	8	64	20,8	53,8
Thysanura	12,8	348,2	—	—	4,8	53,8	16	102,4	—	—	—	—
Dictyoptera	—	—	—	—	4,8	53,8	4,8	53,8	—	—	4,8	53,8
Hemiptera	8	64	24	268,8	9,6	215	4,8	53,8	16	102,4	19,2	399,3
Embioptera	—	—	14,4	176,6	4,8	53,8	—	—	—	—	—	—
Diptera (larv.)	—	—	—	—	4,8	53,8	—	—	—	—	8	64
Coleoptera (larv.)	4,8	53,8	—	—	4,8	53,8	—	—	16	102,4	—	—
Coleoptera	4,8	53,8	8	64	—	—	14,4	176,6	—	—	16	614,4
Totals	59,2	740,0	148,8	4682,1	54,4	665,8	100,8	2276,0	78,4	837	91,2	1385,1

TABLE II. Depth of litter layer in cm.

	Phr E	Phr W	Mac E	Mac W	Pine E	Pine W
Horizon L	1,0	1,67	1,62	1,75	2,25	2,37
Horizon F	0,5	2,0	1,62	2,87	2,00	1,75
Horizon H	0,5	1,17	1,25	3,37	1,75	1,62
Total	2,0	4,84	4,49	7,99	6,00	5,74

The exposure to the sun is the same in both sides because of the north-south orientation of the mountain while prevailing winds are north and south having the same effects on both sides.

In order to compare the arthropod fauna of the three ecosystems, the west side was chosen since it shows more characteristics of an undisturbed area.

Comparison of the total number of all groups shows that a significant difference exists only between the phrygana and the pine trees. It is generally known from the literature that pine litter has a lower pH that affects negatively some groups of the soil fauna. The difference is mainly due to the spiders that are significantly more in the phrygana. It is expected that more differences will exist at the species level but since determination did not reach that level, it is not possible to arrive at such conclusions.

Looking at the characteristic groups of each ecosystem, we observe that the phrygana are characterized by the relative abundance of pseudoscorpions, spiders and Hemiptera, the macchia of *Q. coccifera* is characterized by the presence of pseudoscorpions, spiders, Thysanura and Coleoptera while the pine trees are characterized by the presence of pseudoscorpions, Chilopoda and Coleoptera.

Summary

A comparison is made between the soil arthropod fauna of three ecosystems on Mount Hymettos in Attica. The ecosystems under study are a pine forest, a macchia forest and an area with phrygana vegetation. Also, a comparison is made between the east and the west side of the mountain. Total number of arthropods is higher on the west side and also higher in phrygana and macchia than in the pine forest. These differences are attributed to the heavier grazing on the east side and to the unfavourable conditions (f.e. pH) in the pine litter.

Περίληψη

Γίνεται σύγκριση μεταξύ της πανίδας των έδαφικών άρθροπόδων τριών οικοσυστημάτων του Ύμηττου. Τά οικοσυστήματα είναι ένα δάσος πεύκων, μιά μακκία και φρύγανα. Γίνεται επίσης σύγκριση ανάμεσα στην δυτική και την ανατολική πλευρά του Ύμηττου. Ο συνολικός αριθμός των άρθροπόδων είναι μεγαλύτερος στην δυτική πλευρά καθώς και στα φρύγανα και την μακκία σε σύγκριση με τά πεύκα. Αυτές οι διαφορές πιθανώς να οφείλονται στην μεγαλύτερη βόσκηση στην ανατολική περιοχή καθώς και στις άκατάλληλες συνθήκες (π.χ. όξυτητα) στην στρωμνή του πευκόδασους.

REFERENCES

- DI CASTRI F. (1973) – Soil animals in latitudinal and topographical gradients of mediterranean ecosystems. In: *Mediterranean type ecosystems*. F. di Castri, H. Mooney (eds.), Springer Verlag, pp. 171-190.
- LEGAKIS A. (1981) – Recent trends in the study of the greek fauna. *Proc. 2nd int. Congr. Zoogeogr. Ecol. Greece*, Athens.
- MOLFETAS S., BLANDIN P. (1981) – The effects of trampling on the fauna of a forest floor II. Macroarthropods. *Proc. VII. int. Coll. Soil Zool.*, Syracuse, USA: 213-225.
- SGARDELIS S., MARGARIS N.S. (in press) Seasonal activity of soil fauna in a phryganic (East Mediterranean) ecosystem.
- SGARDELIS S., STAMOU G., MARGARIS N.S. (1981) – Structure and spatial distribution of soil Arthropods in a phryganic (East Mediterranean) ecosystem. *Rev. Ecol. Biol. Sol* **18**(2): 221-230.
- ZERLENTIS C. (1965) – *Contribution to the flora of Hymettos*. Athens, 32pp. (in greek).

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