Post-fire lichen colonization in evergreen sclerophyllous ecosystems of Chalkidiki, NE Greece

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Abstract

Zaharopoulou, A. & Arianoutsou, M. 1991: Post-fire lichen colonization in evergreen sclerophyllous ecosystems of Chalkidiki, NE Greece. Bot. Chron. 10: 945-952.

Post-fire lichen colonization has been followed in a series of stands of evergreen sclerophyllous shrubs in Chalkidiki Peninsula, NE Greece. The stands have been chosen on a sequential time scale since last fire, in order to reveal possible successional trends. Early results from a 20 years old burn show that 14 lichen species grow on the bark of the 8 dominant woody plants occurring in the area. 50% of them are crustose, 29% are foliose and 21% are fruticose. The population of *Pistacia lentiscus* and *Quercus coccifera* shrubs show the richest lichen flora (12 and 9 species, respectively), while that of *Anthyllis hermanniae* and *Calicotome villosa* the poorest (3 species only). The most frequent species appear to be *Lecanora strobilina*, showing the greatest relative cover too, while *Caloplaca crenularia*, *Parmelia exasperatula* and *Xanthoria parietina* occur only on the *Pistacia* shrubs. No evidence of retrieval of a certain life form with plant age occurs.

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Introduction

Approximately 40% of the land surface of Greece is covered by natural Mediterranean type ecosystems. In these areas, hot and dry summers alternate with mildly cold and wet winters (Aschmann 1973). The severe summer drought combined with high temperatures leads to a high frequency of fires in this type of ecosystems. The relation of the vegetation of these ecosystems with fire has been noted long ago (Griesebach 1872). It has drawn the interest of the scientists in all the Mediterranean-climate parts of the world: California (Hanes 1971, Biswell 1974, Rundel 1983, Westman et al. 1981), Australia (Specht et al. 1958, Gill et al. 1981), S Africa (Kruger 1977) and Mediterranean Basin countries (e.g. Le Houerou 1973, Naveh 1975, Trabaud 1987, Papanastasis 1977, Arianoutsou & Margaris 1981a, 1982a, Arianoutsou 1984). All these studies have been mainly focused on the effects of fire on the Mediterranean fauna (Fox 1982, Greenslade & Rosser 1984, Sgardelis 1988), soil microorganisms (Dunn & DeBano 1977, Arianoutsou & Margaris 1982b) and nutrient cycling (Gray & Schlesinger 1981, Arianoutsou & Margaris 1981b, Rundel 1983, Kruger et al. 1983). Despite all these studies almost nothing is known

about the epiphytic flora of these ecosystems and more specifically about its fire ecology.

In Greece, the existing literature on lichens so far comes almost entirely from taxonomic work (L'ABBE & MAIRE 1909, STEINER 1919, SZATALA 1941, 1959, DEGELIUS 1956, WILMANNS 1959, WILMANNS & PHITOS 1960, KRAUSE & KLEMENT 1962, KLEINIG 1966). This paper reports on a part of a study designed to provide information about the ecology of post-fire lichen colonization in Greek Mediterranean-type ecosystems with evergreen sclerophyllous plants.

Study sites

All study sites are located in the Chalkidiki Peninsula, N Greece. They have been selected in a way to represent sequential successional stages since last fire, having therefore relatively different vegetation, although of the same Mediterranean-type, that is open and low maquis shrublands, to thick and tall maquis and coastal pine forests. No reafforestation or grazing took place at the sites, at least at the present.

This specific part of the study reports on one site, Xenophon beach (Kassandra Peninsula), which represents a 20 years old burn. The thick maquis vegetation occurs on limestone rocks on western exposure. The slope is $< 10°$, at 50 m above sea level and the climate is typically Mediterranean.

Methods

Detailed description of the vegetation supporting the lichen flora was done during June 1988 in 3 transects of 25 m each, at least 30 m apart each other. The description was based on structural components of the vegetation as well as on its ecomorphological characters, e.g.

— presence/absence of a species
— species density
— species frequency
— canopy height
— stem height at which leaves appear
— stem diameter
— stem lignification
— bark consistency
— bark thickness
— bark shedding-seasonality

Lichen species were obtained from 5 individuals per plant species, which were chosen at random among the population representatives. The main and the lateral stems of each single individual were cut from the crown upwards in segments of 10 cm each, put into plastic bags, labelled and transported to the laboratory for further examination. The plastic bags were periodically inspected for fungal contamination.

Lichen specimens were identified at species level with the aid of identification keys

(DOBSON 1981, JAHNS 1987). In some cases this was not possible and the specimens were identified to genus.

The form of the lichen thallus (fruticose, foliose, crustose), species coexistence, relative cover and frequency were the growth parameters studied so far.

The results given represent the mean average of all specimens collected.

Results and Discussion

The dominant woody species growing in the site are shown in Table 1. These plants support a lichen flora, the species of which are listed in Table 2. The majority of the species found are crustose (CR) (50% of the total flora), while approximately 29% are fruticose (FR) and 21% foliose (FL).

Table 1. Frequency index of the dominant woody species at Xenophon beach

Species	Frequency
Erica arborea	61,90
Pistacia lentiscus	27,76
Cistus monspeliensis	12,50
Calicotome villosa	11,46
Arbutus unedo	9,16
Phillyrea media	6,00
Quercus coccifera	4,42
Anthyllis hermanniae	2,30

Table 2. List of lichen species growing on the woody plants at Xenophon beach

Species	Thallus Form
Evernia prunastri (L.) Ach.	FL
Ramalina sp. - young thallus	FR
Cladonia sp. - young thallus	FR
Usnea sp. - young thallus	FR
Physcia adscendens (Fr.) Oliv.	FL
Parmelia exasperatula Nyl.	FL
Xanthoria parietina (L.) Th. Fr.	FL
Lecanora strobilina (Sprengel) Kieffer	CR
L. chlarotera Nyl.	CR
Lecanora sp. (new species)	CR
Rinodina exigua Gray	CR
Lecanastis abietina (Ehrh.) Korb	CR
Lecidella elaeochroma (Ach.) Haszl.	CR
Caloplaca crenularia (With) Laundon	CR

The percent contribution of each lichen thallus form in the total lichen cover per plant species substrate is shown in Figure 1. It is obvious that the crustose form is prevailing in all plant species studied. There are no fruticose lichens on the *Cistus monspeliensis* and *Anthyllis hermanniae* shrubs, while *Calicotome villosa* supports no foliose lichens.

Quercus coccifera and *Pistacia lentiscus* shrubs show the richest lichen flora (12 and 9 species respectively) while *Calicotome villosa* and *Anthyllis hermanniae* the poorest (3 species only, Table 3).

Table 3. The lichen species identified per substrate plant species. 1: *Erica arborea*, 2: *Pistacia lentiscus*, 3: *Cistus monspeliensis*, 4: *Calicotome villosa*, 5: *Arbutus unedo*, 6: *Phillyrea media*, 7: *Quercus coccifera*, 8: *Anthyllis hermanniae*

Lichen species	Substrate shrub species							
	1	2	3	4	5	6	7	8
Evernia prunastri	+	+		+	+		+	
Ramalina sp.	+	+					+	
Cladonia sp.	+		+		+	+		+
Usnea sp.	+					+		
Physcia adscendens		+			+		+	
Parmelia exasperatula		+						
Xanthoria parietina		+						
Lecanora strobilina	+	+	+	+	+	+	+	+
Lecanora chlarotera		+					+	
Lecanora sp. (n. sp.)		+	+		+	+	+	+
Rinodina exigua		+					+	
Lecanactis abietina	+	+	+	+	+	+	+	
Lecidella elaeochroma	+	+					+	
Caloplaca crenularia		+						

The most frequent species appears to be *Lecanora strobilina*, while *Caloplaca crenularia*, *Parmelia exasperatula* and *Xanthoria parietina* occur only on the *Pistacia* shrubs.

Lichens occupy a relatively small area on the stem surface, not greater that 20% observed in the *Quercus coccifera* and *Pistacia lentiscus* shrubs. The epiphytic lichen flora of *Arbutus unedo* and *Anthyllis hermanniae* do not count more that 4% of their stem surface (Fig. 2). Among the lichens observed *Lecanora strobilina* shows the greatest relative cover on all the substrate plants examined.

Several of the lichen species found in this study have been reported occurring in various parts of Greece. WILLMANNS (1959) refers *Usnea* sp. growing on *Quercus coccifera* shrubs in a *Calicotometo-Cistetum villosae* stand in Chalkidiki. There are some references for lichen species found in the Greek islands of the Aegean Sea (SZATALA 1943): *Evernia prunastri* growing on *Pinus* sp. (Samos), on *Cupressus* sp.

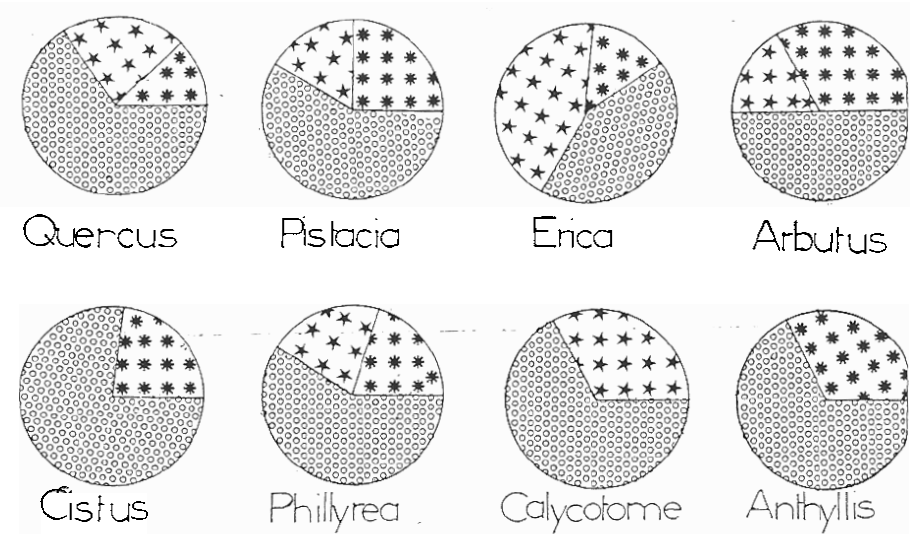

Fig. 1. Contribution percentage of each lichen form in the total lichen cover on each substrate plant species, i.e. crustose (circles); fruticose (stars); foliose (asterisks).

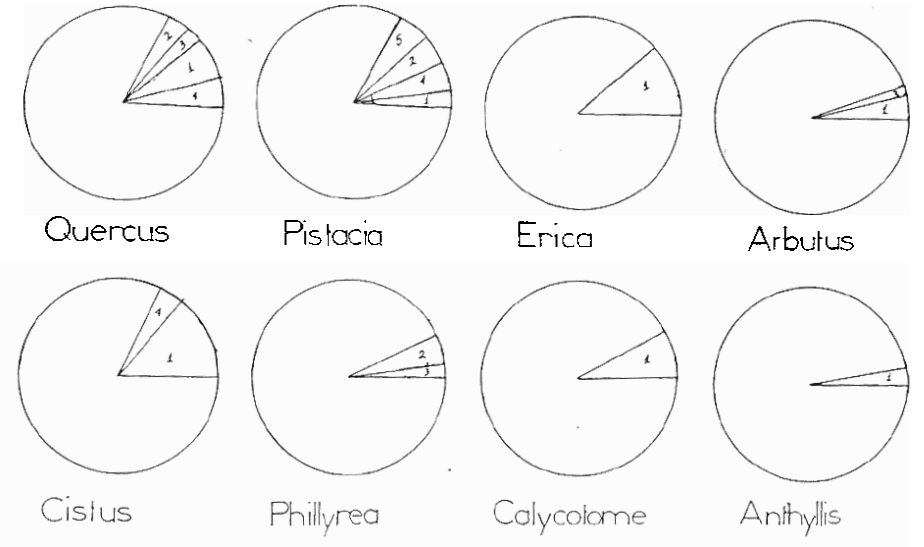

Fig. 2. Lichen species with relative cover greater than 1%: 1 = *Lecanora strobilina;* 2 = *Lecanora chlarotera;* 3 = *Lecanora* sp. (—); 4 = *Lecanactis abietina;* 5 = *Lecidella elaeochroma.*

and *Phillyrea* sp. (Rhodes), on *Q. coccifera* (Crete); *Xanthoria parietina* in Lemnos, Lesvos, Rhodes, Crete, Amorgos, Ios; *Physcia adscendens* in Lemnos and *Usnea foliacea* in Skyros, Lesvos, Rhodes, Karpathos, Crete, Tinos, Naxos, Amorgos,

Pholegandros, Thera. WILLMANNS & PHITOS (1960) found *Lecanora chlarotera, Evernia prunastri* and *Xanthoria parietina* growing on the *Abies cephalonica* trees of Mt. Parnis in Attica.

Although the analysis of our results is in early stages we can detect some similarities between the Greek lichen flora of the maquis species and that of the Californian chaparral (TUCKER & JORDAN 1979). So, *Evernia prunastri, Physcia adscendens, Parmelia exasperatula, Xanthoria parietina, Lecanora chlarotera, Lecanastis abietina* and *Lecidella elaeochroma* have been reported for the Californian chaparral.

— A lot of data on hand are to be analysed and presented. Neither the time nor the space available permit us to do so at present. What we can say is that this work claims to open a new perspective in lichens study in Greece contributing to the fire ecology of Mediterranean-type ecosystems knowledge status at the same time.

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