Plant biodiversity of Eastern Thessaly

Historical, ecological and phytogeographical aspects

Thomas Raus, Berlin

Botanischer Garten und Botanisches Museum Berlin-Dahlem

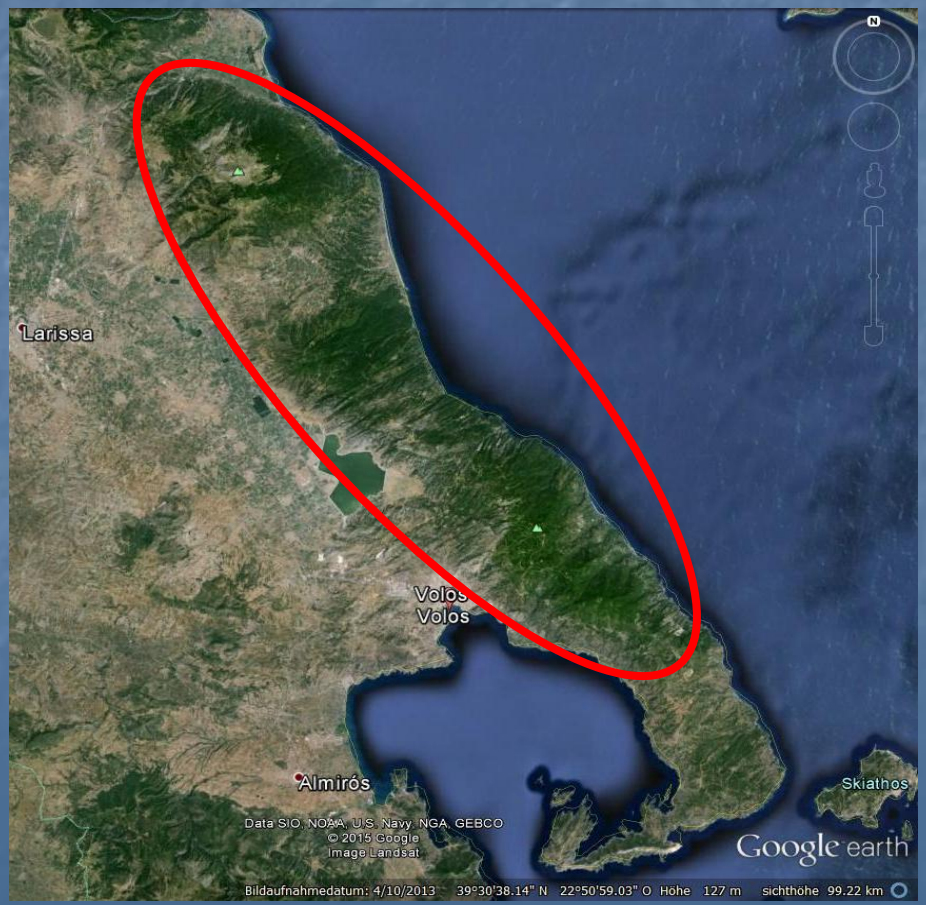
Freie Universität Berlin

Φορέας Διαχείρισης Περιοχής Οικοανάπτυξης Κάρλας – Μαυροβουνίου –Κεφαλόβρυσου – Βελεστίνου (Π.Ο.Κα.Μα.Κε.Βε) Management Body of Ecodevelopment Area of Karla - Mavrovouni – Kefalovriso – Velestino (E.A.Ka.Ma.Ke.Ve)

Plant biodiversity of Eastern Thessaly

Historical, ecological and phytogeographical aspects

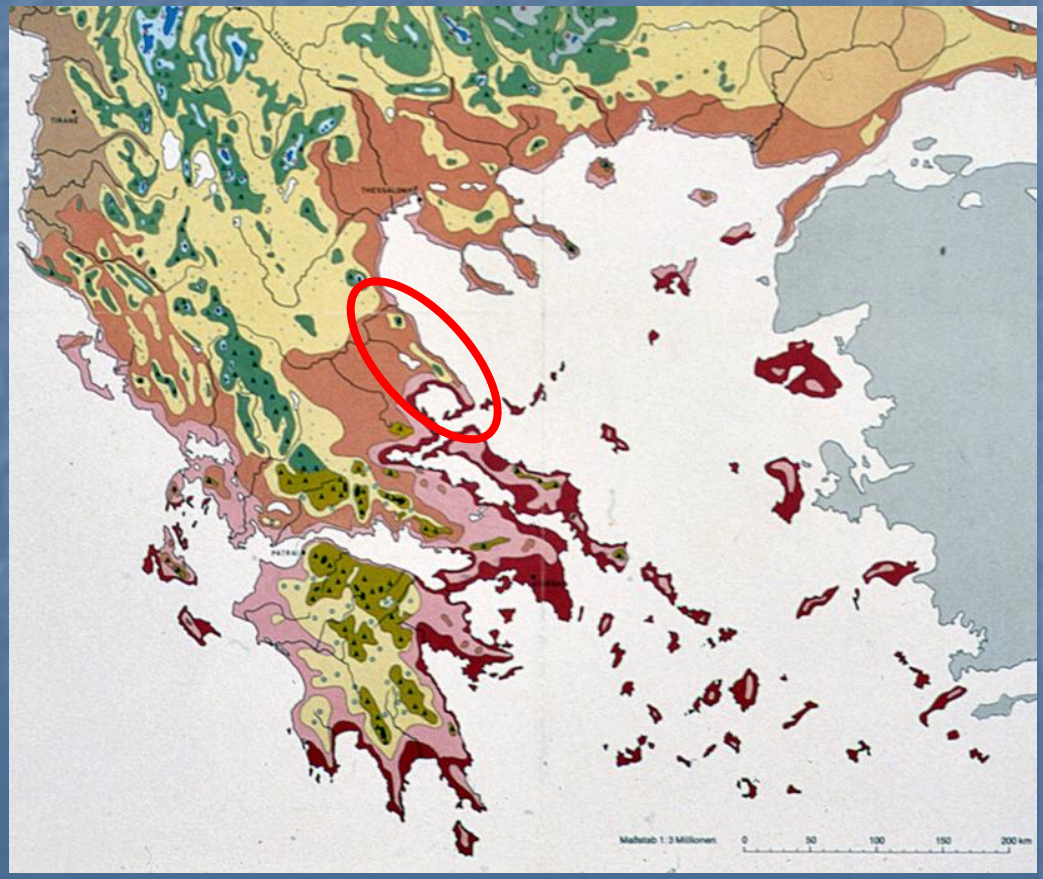
Situated in East Central Greece between the Valley of Tembi and Evvia, and one of the most densely forested areas of Greece



Plant biodiversity of Eastern Thessaly

Historical, ecological and phytogeographical aspects

Steep short-distance relief energy between sea-level and montain summits of 1978 m (Mt Ossa) and 1551 m (Mt Pilion).
Pronounced climatic diversity between the oceanic Aegean side and the continental western slope.
Ecological diversity of several different altitudinal vegetation belts.



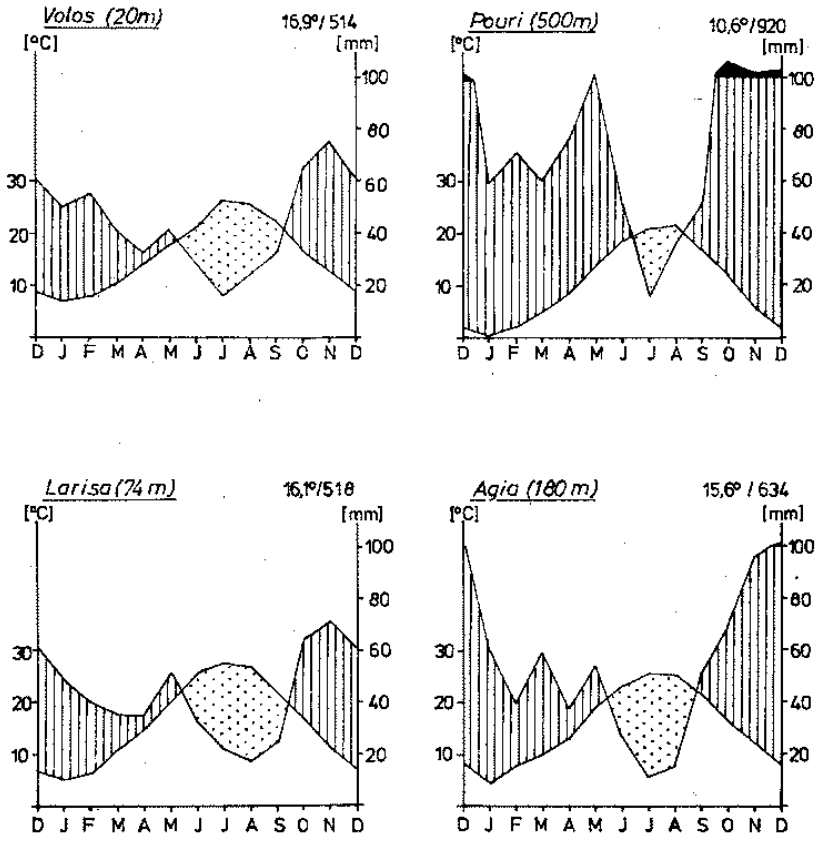
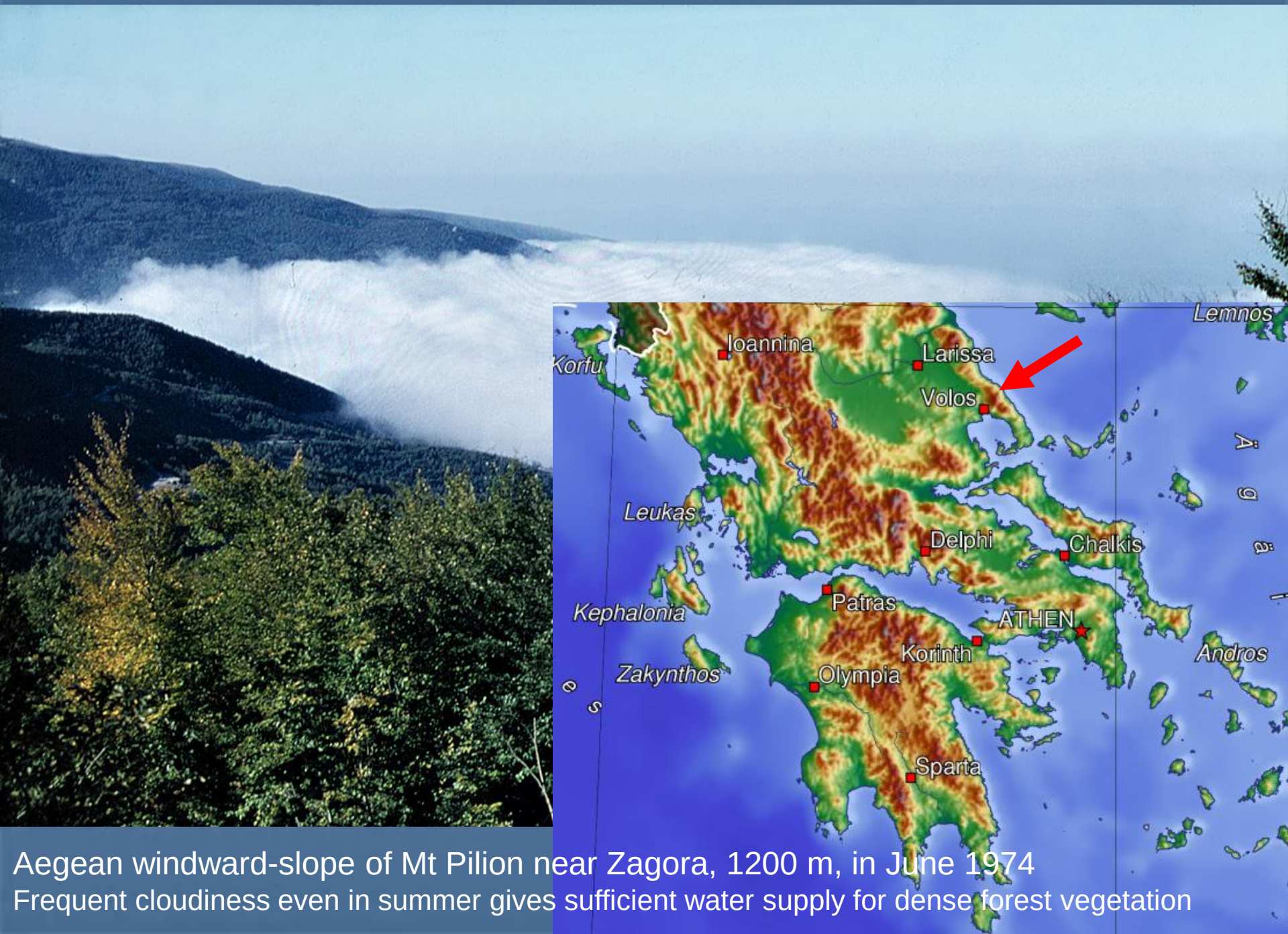


Abb. 2. Klimadiagramme ostthessalischer Stationen (nach WALTER 1955, RODAKIS & TRIANTAFILLOS 1965, MAVROMMATIS 1971 und Climatological Bulletin 1962—1969, Forest Research Institute, Athen). — Abszisse: Monate des Jahres; linke Ordinate: Mitteltemperaturen; rechte Ordinate: mittlere Niederschlagsummen (oberhalb 100 mm auf $^1/_{10}$ reduziert); punktierte Fläche unter der Temperaturkurve: „Dürrezeit"; schraffierte Flächen: humide Zeiten (schwarz: besonders niederschlagreich). Zahlenangaben hinter den Stationsnamen (von links nach rechts): Höhe ü. NN, Jahresmitteltemperatur, jährliche Niederschlagsumme.

Mediterranean-type winterrain climate
with three to five dry and hot summer-months, depending on exposition, and a snow-cover of up to five months on the mountain tops

Aegean windward-slope of Mt Pilion near Zagora, 1200 m, in June 1974



Aegean windward-slope of Mt Pilion near Zagora, 1200 m, in June 1974

Frequent cloudiness even in summer gives sufficient water supply for dense forest vegetation

Geological diversity of substrates, i.e. a mixture of calcareous rock (limestone, marble: hatched) and non-calcareous rock (micaschist and conglomerate: chequered) contribute to the edaphic and hydrological diversity of habitats for plants and animals

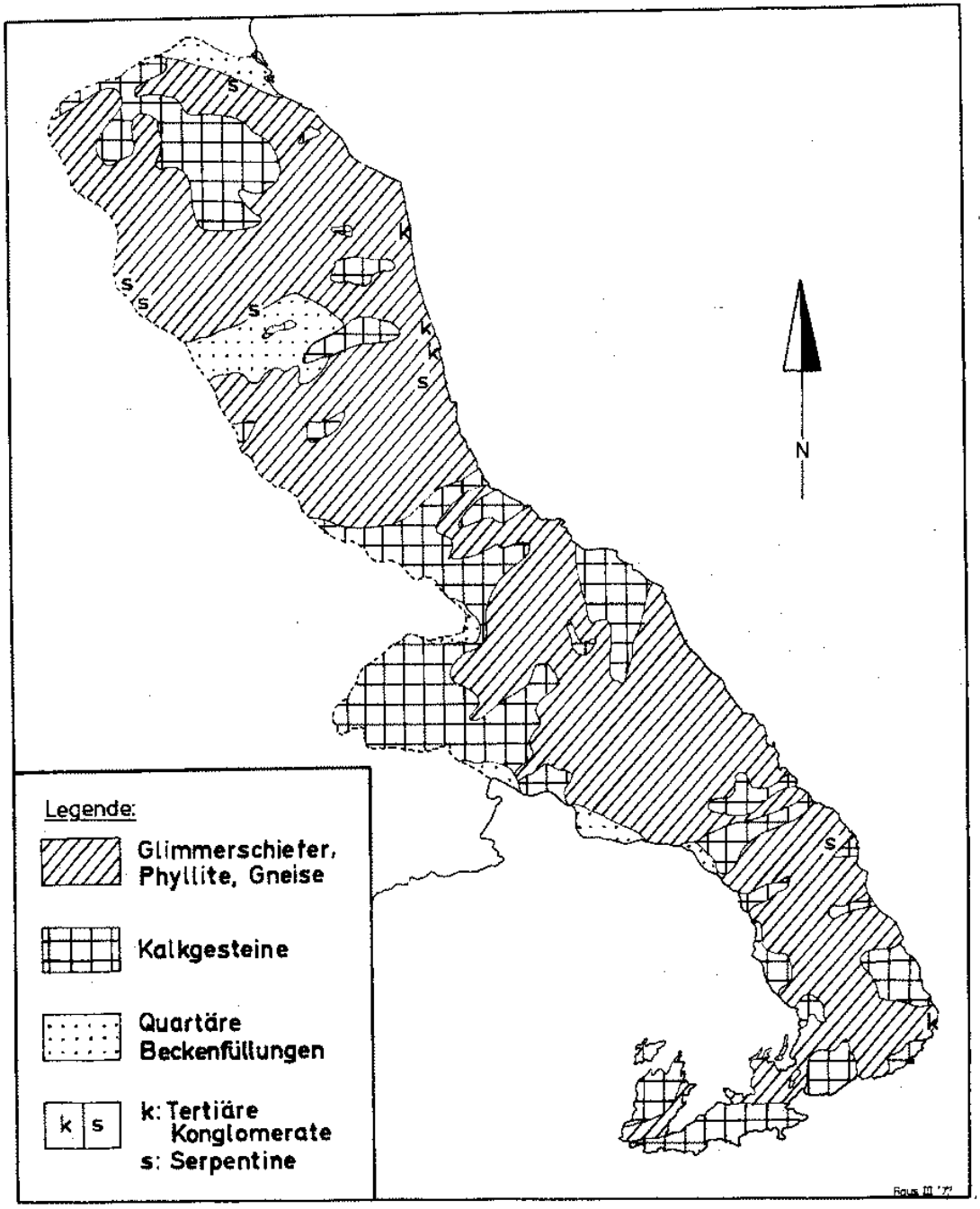
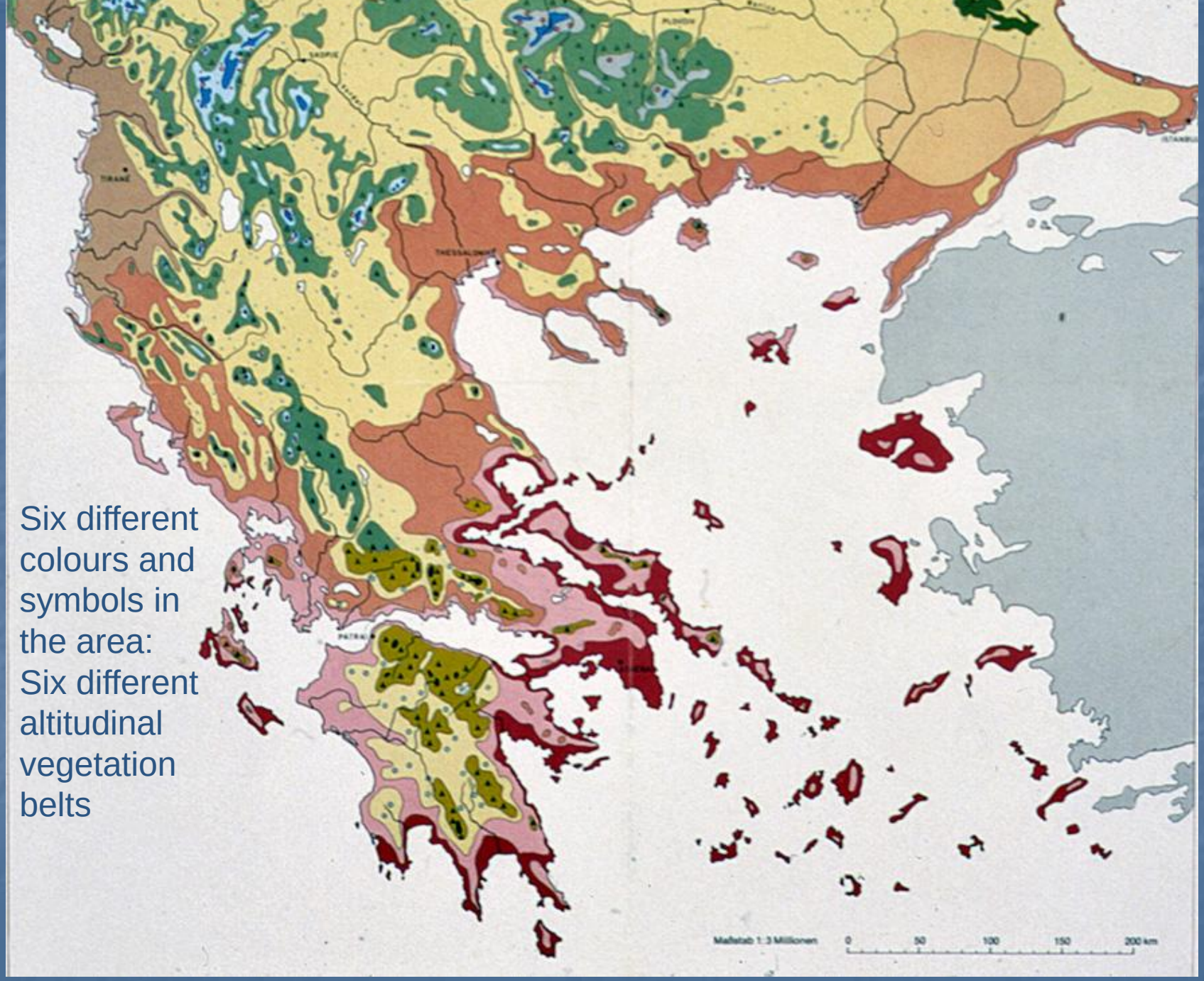
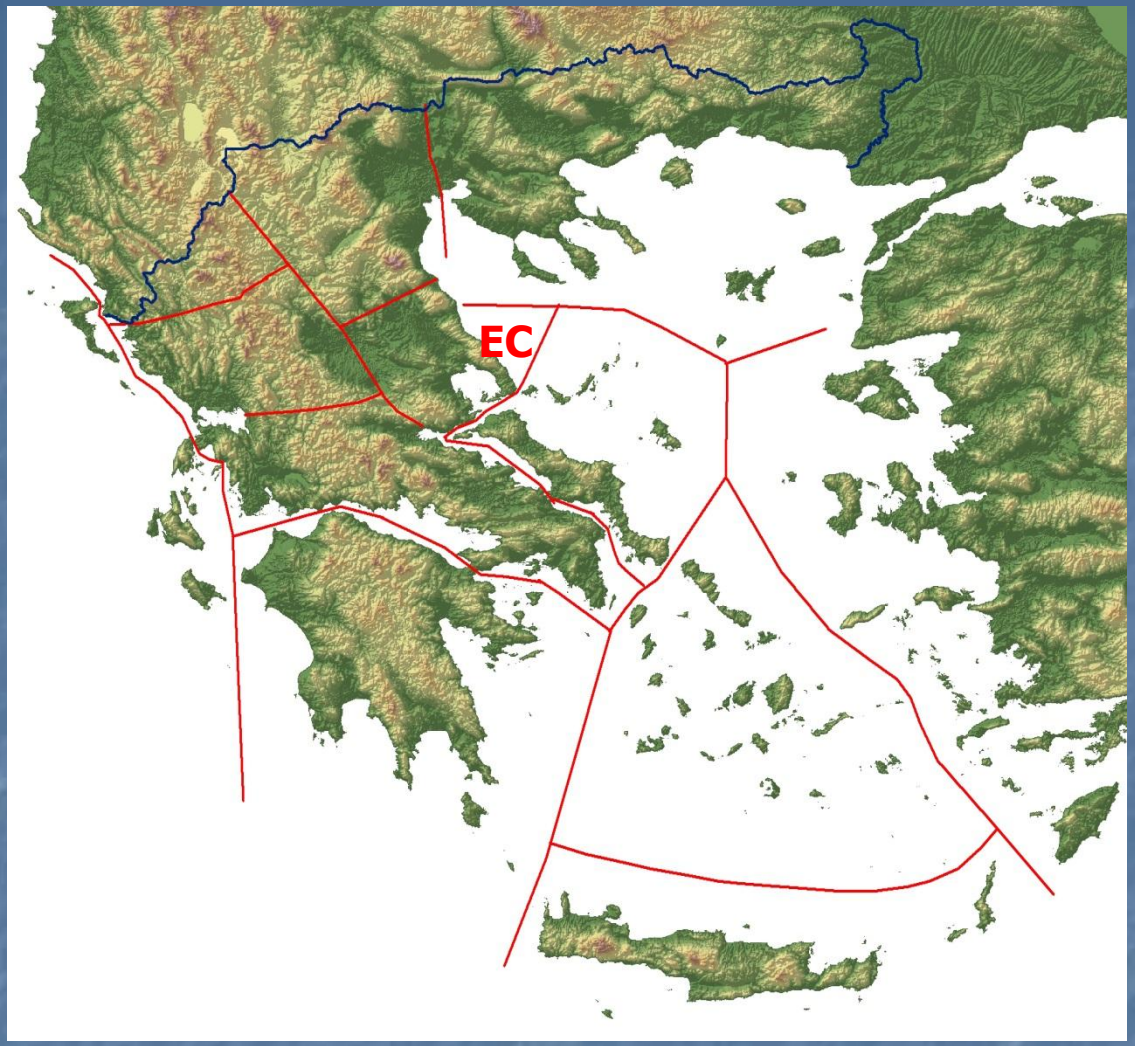


Abb. 3. Geologische Skizze des ostthessalischen Berglandes (nach Angaben von Teller 1880, Philippson 1950 und Mavrommatis 1971).

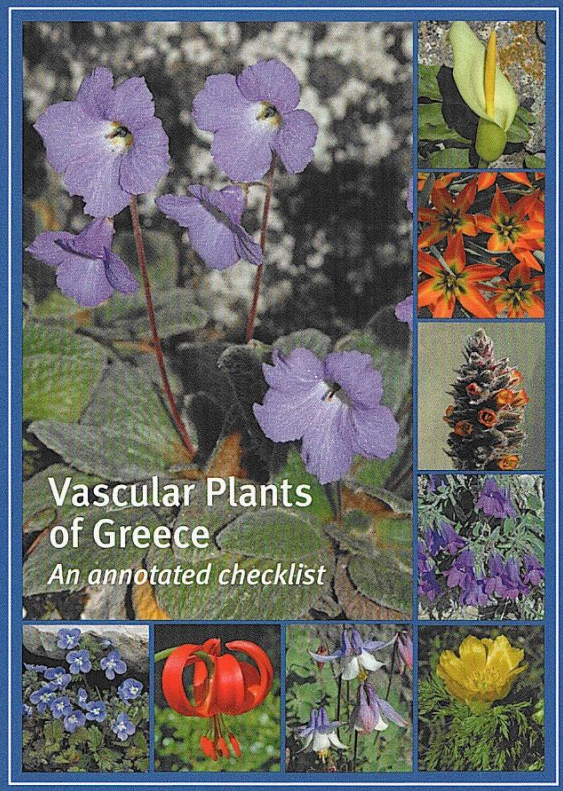


Six different colours and symbols in the area: Six different altitudinal vegetation belts

Horvat, Glavac & Ellenberg 1974



Eastern Thessaly (including Mt Othris) forms a Greek floristic region of ist own: East Central (**EC**)



Vascular Plants of Greece
An annotated checklist

Dimopoulos P., Raus Th., Bergmeier E., Constantinidis Th., Iatrou G., Kokkini S., Strid A. & Tzanoudakis D. - Berlin 2013

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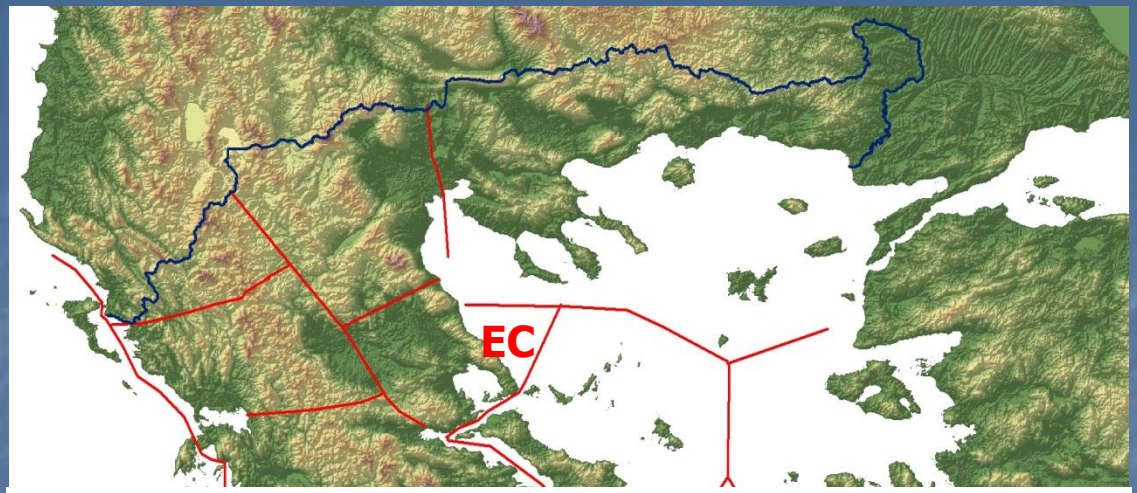
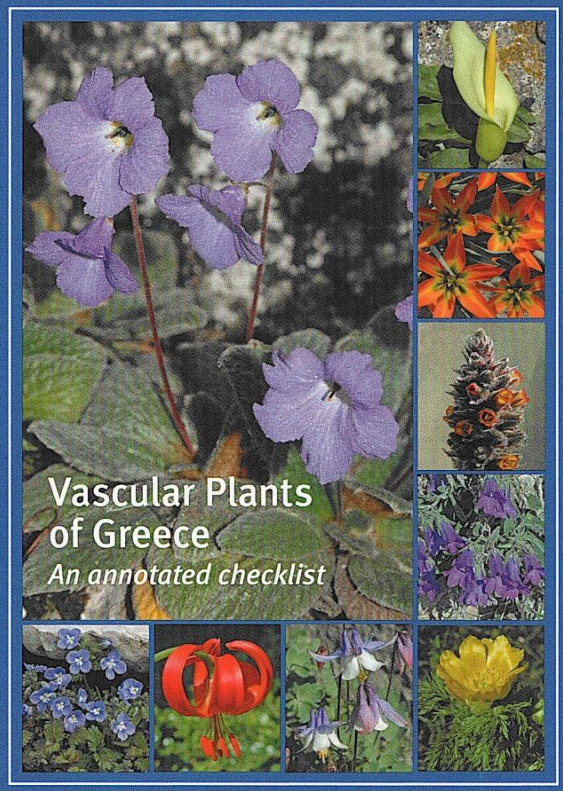


Table 5. Numbers of vascular plant families, genera, species, subspecies and taxa in each of the 13 floristic regions of Greece.

Floristic region	Families	Genera	Species	Subspecies	Taxa
IoI	146	696	1932	493	2027
NPi	146	743	2570	791	2756
SPi	155	798	2665	780	2836
Pe	159	858	2970	873	3208
StE	160	861	3114	930	3360
EC	144	713	2087	527	2160
NC	158	823	3113	966	3383
NE	164	869	3263	1002	3557
NAe	145	677	1926	456	2004
WAe	146	695	2031	550	2136
Kik	136	620	1659	435	1768
KK	146	705	2093	547	2240
EAe	151	754	2383	624	2541



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Comparably high floristic biodiversity of Eastern Thessaly results from its narrow phytogeographical contact between the SE European mainland with further contact to Central Europe, and the E Mediterranean Aegean area with further contact to SW Asia.

Side-by-side occurrence of mediterranean, balcanic-submediterranean-subcontinental, euro-siberian and boreal floristic elements.

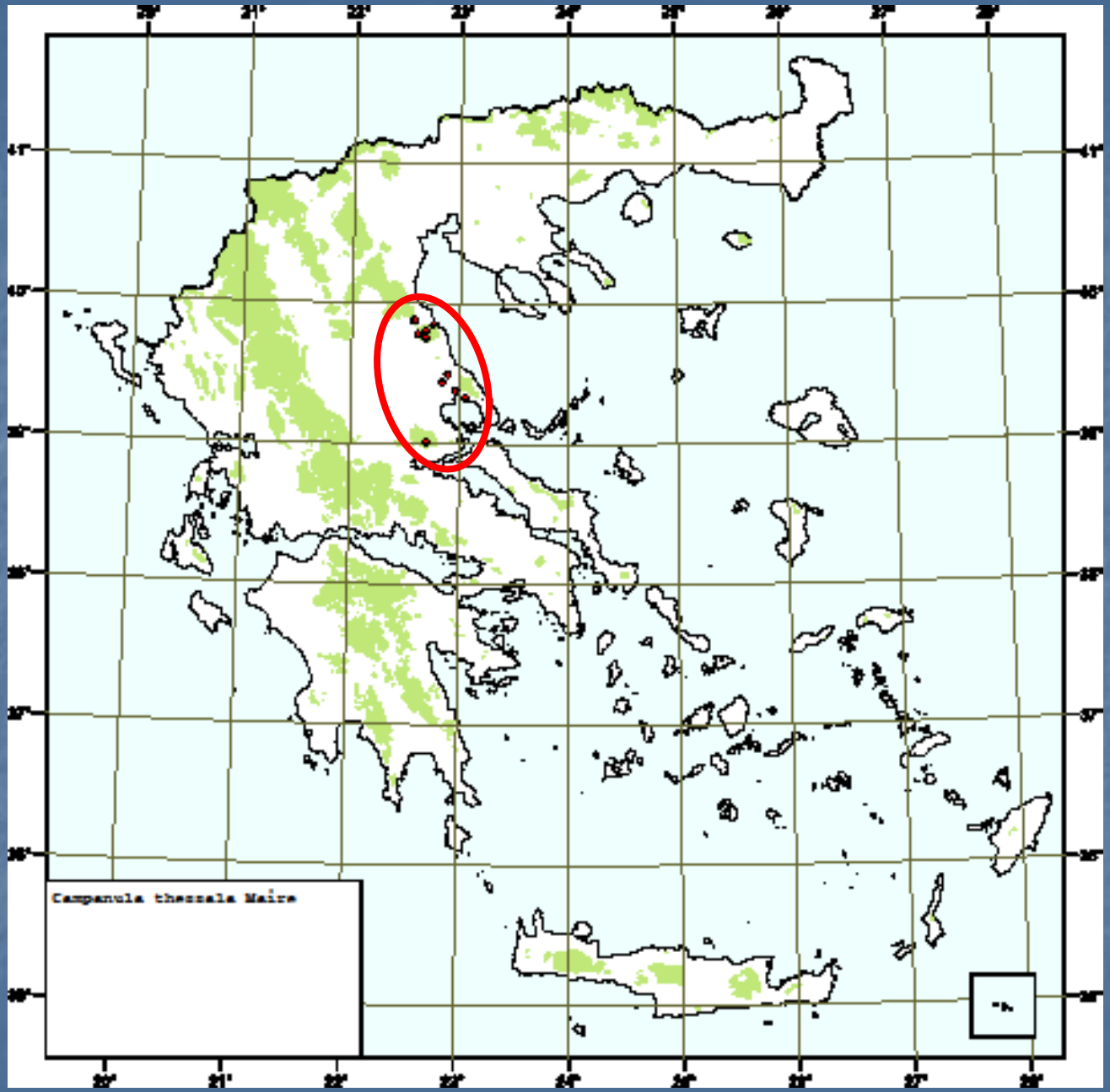
"Northern" plants such as *Aegopodium podagraria*, *Allium ursinum*, *Carpinus betulus*, *Lamium galeobdolon*, *Milium effusum*, *Orthilia secunda* and *Prenanthes purpurea* reach their southern distribution limit in the area.

In Mt Pilion and the Magnisia Peninsula, the local populations of the boreal *Vaccinium myrtillus* and the thermo-mediterranean *Euphorbia dendroides* co-exist in an amazingly short distance of c. 30 km.

In the absence of prominent evolutionary isolation processes only a few endemics occur in Eastern Thessaly and its nearer surroundings such as *Campanula incurva*, *Campanula pelia*, *Centaurea ossaea*, *Soldanella chrysosticta* subsp. *pelia*, *Verbascum aphentulium* and *Viola rausii*.

Campanula pelia (syn. *C. thessala*), endemic to E Thessaly, extending to Kato Olimbos.

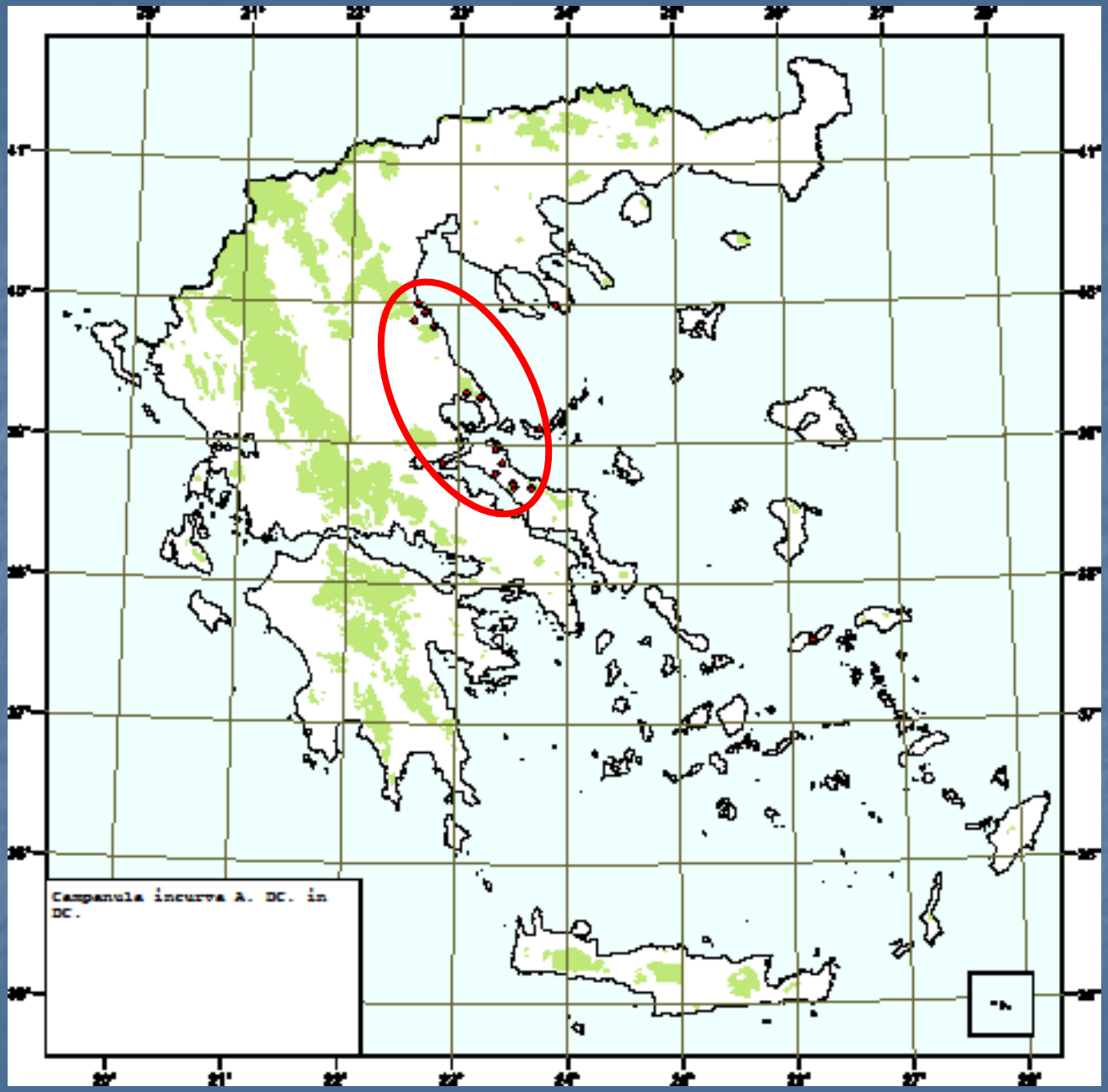
Mt Ossa, near Spilia, June 2015



Campanula pelia Hausskn. ex Bedd. (*C. thessala* Maire)

Campanula incurva, endemic to Eeast Central Greece (Olympus, Pilion, Evvia).

Mt Pilion, near Tsangarada, June 2015



Campanula incurva A. DC.

Viola rausii (Erben 1985), endemic to the summit areas of Mts Ossa and Pilion, June 2015

Viola rausii and its eponymee - Pilion, Pourianos Stavros, 16 May 2008

History of botanical exploration I

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- VOLIOTIS, D. 1976: Die Gehölzvegetation und die Vegetationszonierung des nordgriechischen Gebirgszuges Voras - Vermion - Pieria - Olymp - Ossa. – Bot. Jahrb. Syst. **97**(1): 120-154.

History of botanical exploration IV

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- RAUS, TH. 1979b: Die Vegetation Ostthessaliens (Griechenland). II. Quercetea ilicis und Cisto-Micromerietea. – Bot. Jahrb. Syst. **101**(1): 17-82.
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Bot. Jahrb. Syst.	100	4	564—601	Stuttgart, 29. Oktober 1979

Die Vegetation Ostthessaliens (Griechenland)

I. Vegetationszonen und Höhenstufen*

Von

Thomas Raus

Mit 10 Abbildungen und 1 Tabelle im Text

Abstract

Raus, Th.: Die Vegetation Ostthessaliens (Griechenland). I. Vegetationszonen und Höhenstufen. [The vegetation of E. Thessaly (Greece). I. Vegetation zones and altitudinal belts.] — Bot. Jahrb. Syst. **100:** 564—601. 1979. — ISSN 0006-8152.

The present horizontal and vertical arrangement of vegetation zones in E. Thessaly, between Káto Olimbos and the island of Evvia (i. e., on Mts. Ossa, Mavrovoúni, Pílion and the Magnisía and Tríkeri Peninsulas), is described and mapped. E. Thessaly forms a mountain range with a high relief energy and exhibits a pronounced climatic diversity due to altitude and to a strong contrast between weatherside and leeside. Owing to this and to its twofold nature as a segment of the Aegean coast and a direct extension of the C. Balkanic mountain area, it participates in 7 different, altitudinally vicarious S.E. European vegetation belts: Oleo-Ceratonion zone, Quercion ilicis zone, Ostryo-Carpinion orientalis zone, Quercion frainetto zone, Fagion moesiacae zone, *Abies* transition zone, and Daphno-Festucetalia zone. It is shown that the observed vegetation pattern results from the combined influence of natural and anthropic environmental factors. The marked modification of the original zonal arrangement by human exploitation, particularly by extensive grazing of nomadic sheep and goat flocks through many centuries, is emphasized. The region has indeed been continuously inhabited by man since the Neolithic period, sometimes with very high population densities.

Bot. Jahrb. Syst.	100	4	564—601	Stuttgart, 29. Oktober 1979

Die Vegetation Ostthessaliens (Griechenland)

I. Vegetationszonen und Höhenstufen*

Bot. Jahrb. Syst.	101	1	17—82	Stuttgart, 18. Dezember 1979

Die Vegetation Ostthessaliens (Griechenland)

II. Quercetea ilicis und Cisto-Micromerietea*

Von

Thomas Raus

Mit 7 Abbildungen und 8 Tabellen im Text

Abstract

Raus, Th.: Die Vegetation Ostthessaliens (Griechenland). II. Quercetea ilicis und Cisto-Micromerietea. [The vegetation of E. Thessaly (Greece). II. Quercetea ilicis and Cisto-Micromerietea.] — Bot. Jahrb. Syst. 101: 17—82. 1979. — ISSN 0006-8152.

The second part of this comprehensive account of the vegetation of the E. Thessa-

Bot. Jahrb. Syst.	100	4	564—601	Stuttgart, 29. Oktober 1979

Die Vegetation Ostthessaliens (Griechenland)

I. Vegetationszonen und Höhenstufen*

Bot. Jahrb. Syst.	101	1	17—82	Stuttgart, 18. Dezember 1979

Die Vegetation Ostthessaliens (Griechenland)

II. Quercetea ilicis und Cisto-Micromerietea*

Bot. Jahrb. Syst.	101	3	313—361	Stuttgart, 8. Oktober 1980

Die Vegetation Ostthessaliens (Griechenland)

III. Querco-Fagetea und azonale Gehölzgesellschaften*

Von

Thomas Raus

Mit 4 Abbildungen und 13 Tabellen im Text

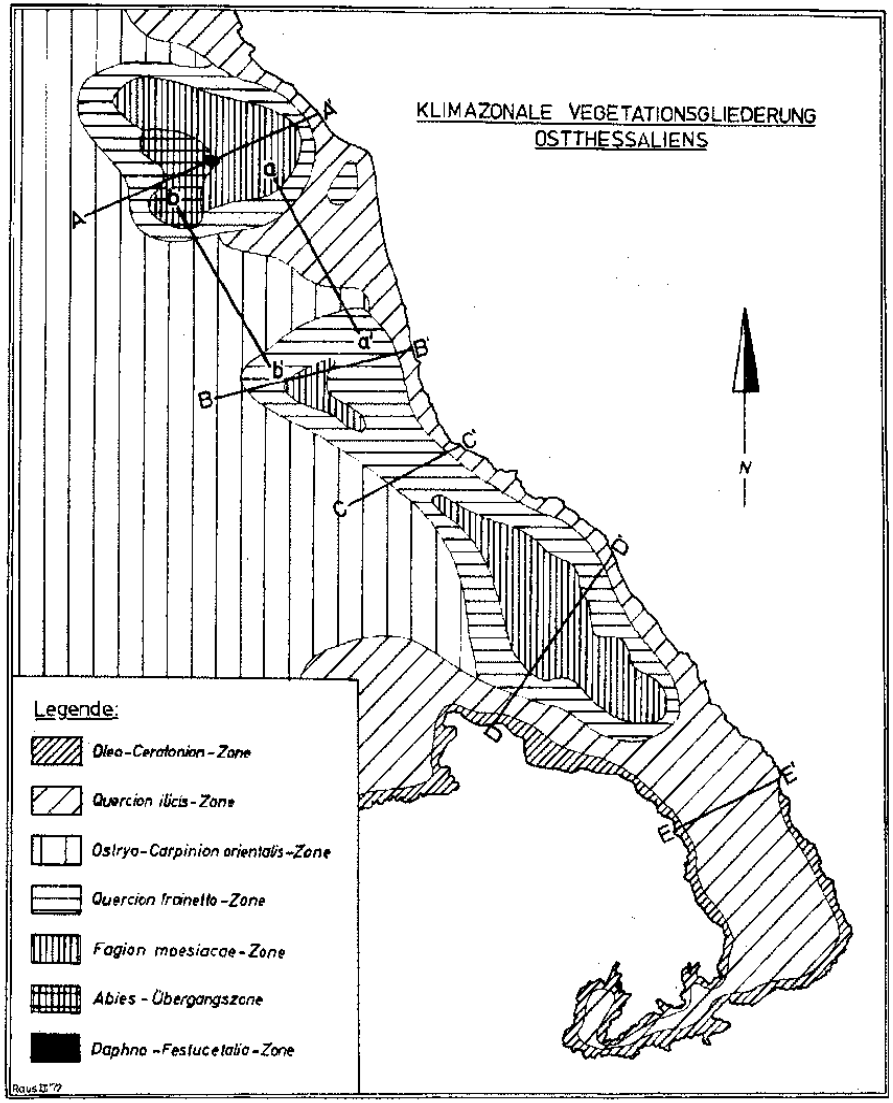


Abb. 4. Die klimazonale Vegetationsgliederung Ostthessaliens (nach Horvat et al. 1974, verändert). A—A', B—B', C—C', D—D', E—E', a—a', b—b': Lage der Profile der Abb. 5 und 6.

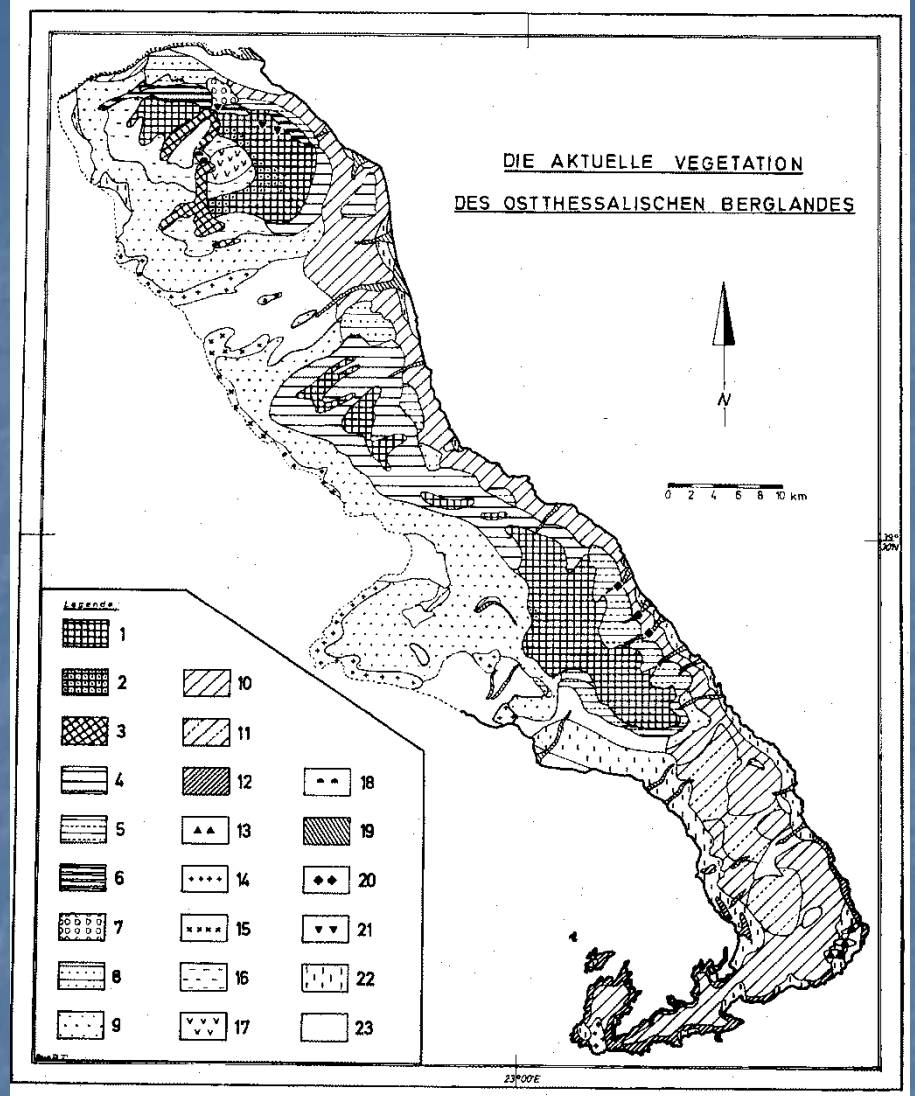
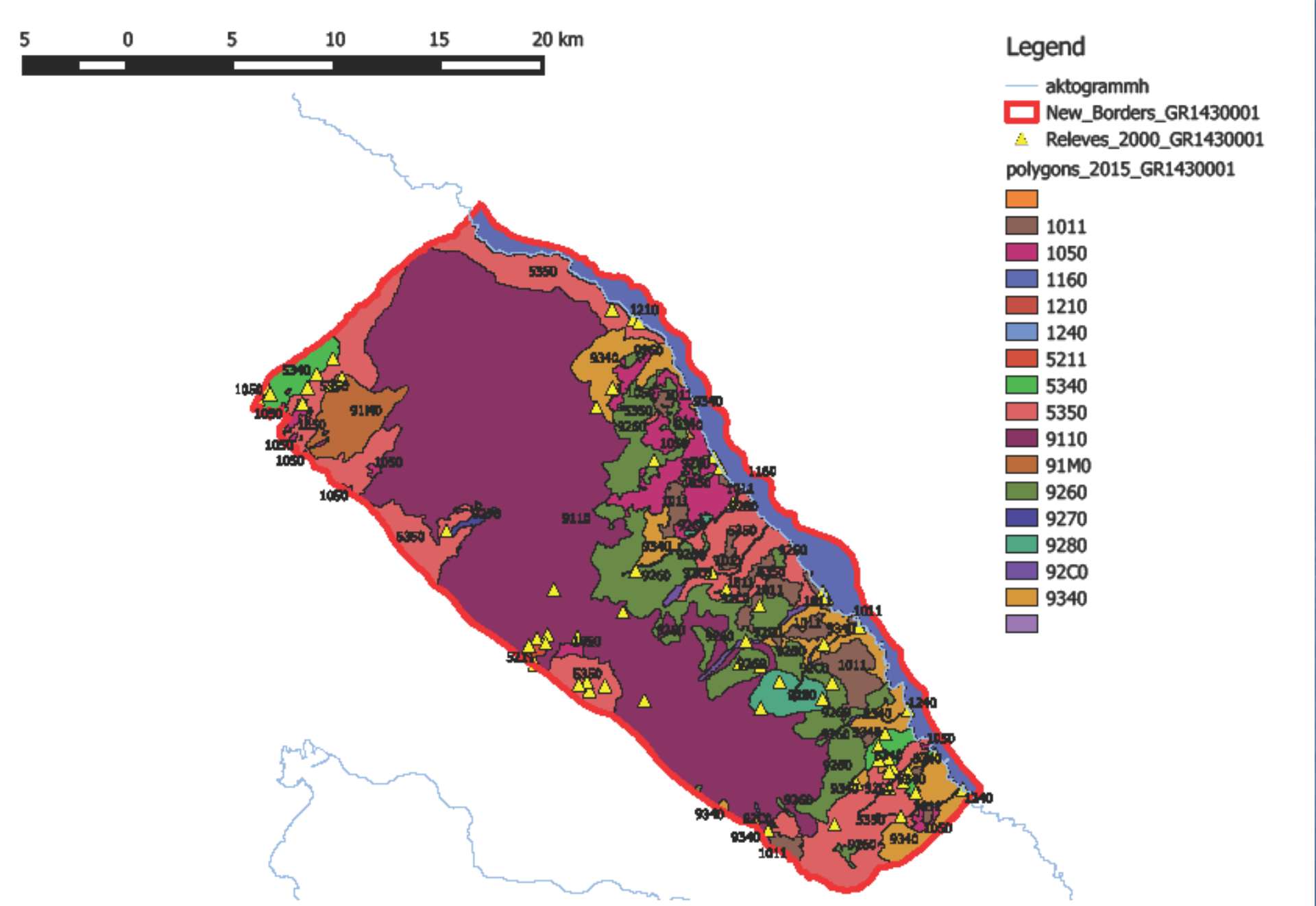


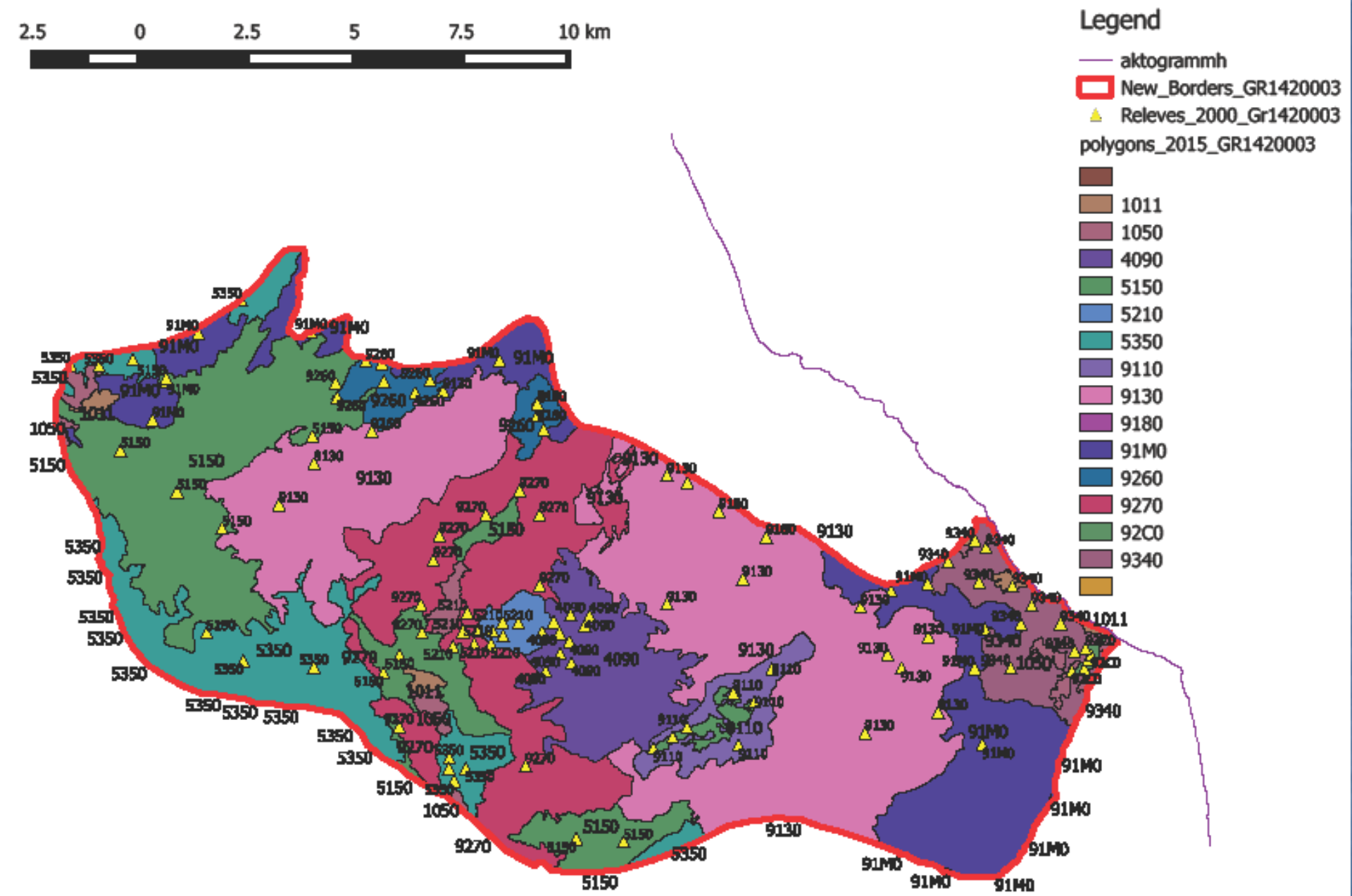
Abb. 7. Die aktuelle Vegetation des ostthessalischen Berglandes. — 1, *Fagus*-Wälder; 2, *Fagus*-Wälder mit *Abies borisii-regis*; 3, *Abies*-Wälder (nur Ossa); 4, *Quercus frainetto*-Wälder; 5, *Castanea sativa*-Wälder (Selven und Palinen); 6, *Quercus dalechampii*-Wälder (nur Ossa); 7, *Tilia tomentosa*-Laubmischwälder (nur Ossa); 8,

Zonal [potential natural] vegetation
driven by climate, substrate and geomorphology

Actual [real] vegetation
driven by antropo-zoogenic factors (landuse)



NATURA 2000 GR1430001 OROS PILIO KAI PARAKTIA THALASSIA ZONI



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Thermo-mediterranean belt

(*Oleo-Ceratonion* zone)

Euphorbia dendroides community, Trikkeri Peninsula, March 1974
Winter is the time of assimilation and flowering

Euphorbia dendroides community, Trikkeri Peninsula, July 1974
Summer is the time of dormancy

Euphorbia dendroides, Trikkeri Peninsula, May 1974

„autumn-coloured“ foliage

Winter flowering in the Mediterranean belt: *Arisarum vulgare*, Aegean coast, 16 January
[on top of Mts Pilion and Ossa we have simultaneously several meters of snow-cover]

Meso-mediterranean belt

(*Quercion ilicis* - zone)

Winter-green
Quercus ilex

near Argalasti 1974

Leading forest tree of the meso-mediterranean zone

Old-growth *Quercus ilex* climax forest, SO-Peloponnisos, Mt Parnon near Leonidion, c. 900 m a.s.l.

Secondary (anthropogenic) *Erica arborea*-*Arbutus* maquis, Magnisia peninsula near Argalasti 1974.

(replaces destroyed primary *Quercus ilex*-forest)

Coppicing maquis shrubs and trees for domestic livestock, Tsangarada/Pilion 1974

Secondary *Cistus salviifolius* garrigue on schist, replacing cleared maquis
Magnisia peninsula, May 1974

Cistus creticus, Magnisia peninsula, May 1974

Arbutus unedo, *Pistacia lentiscus*,
Resprouting from dormant basal buds after fire, 1982

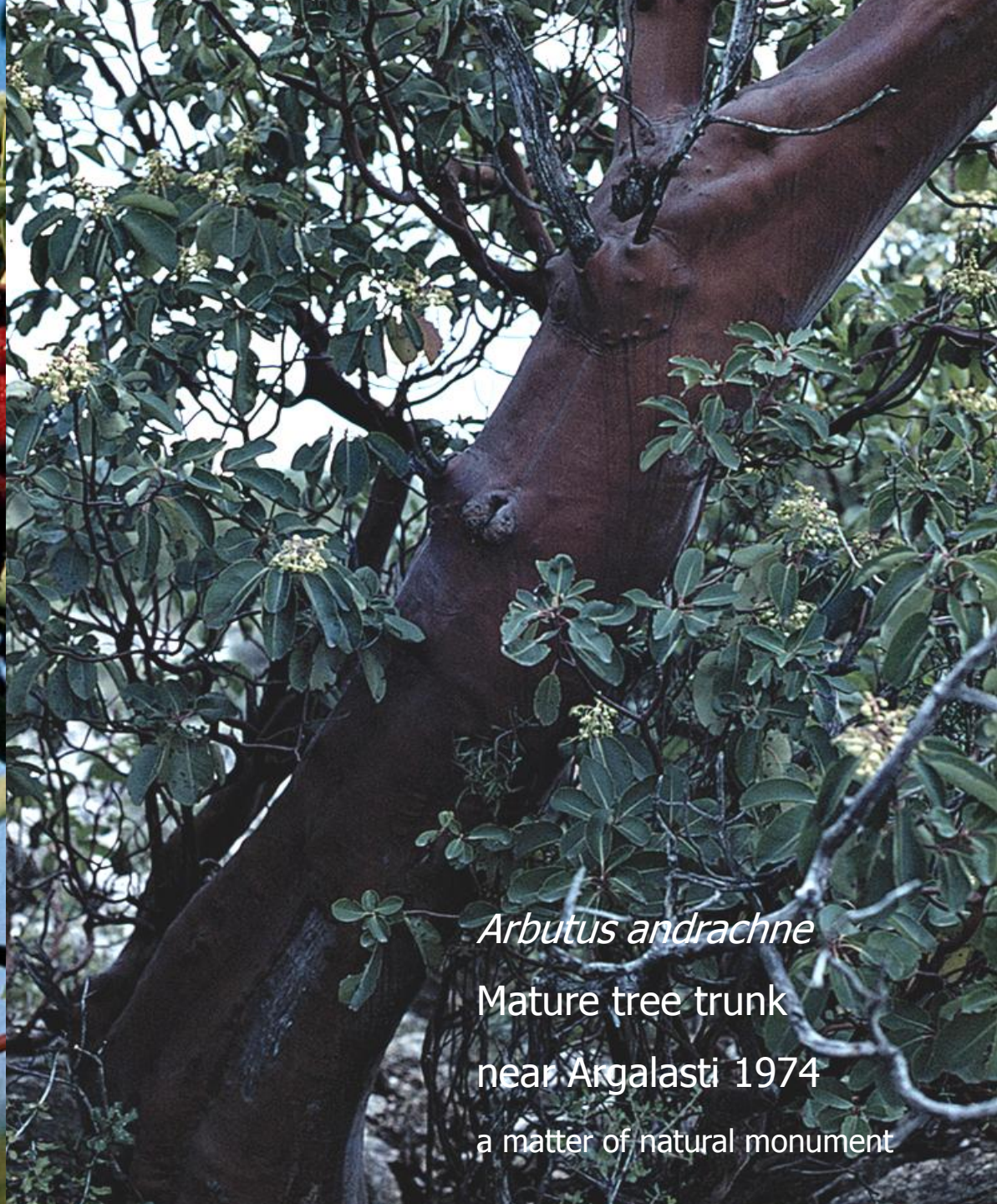
Secondary *Erica arborea-Arbutus unedo* maquis regenerating,
already quite inpenetrable c. two years after fire, near Xorichtion, SE Pilion, June 2015

Western Strawberry Tree *Arbutus unedo*, simultaneously flowering and fruiting

January 1975, Magnisia peninsula near Argalasti

Eastern Strawberry tree
Arbutus andrachne,
Flowering in May
Magnisia peninsula

Arbutus andrachne, fruiting in autumn



Arbutus andrachne

Mature tree trunk

near Argalasti 1974

a matter of natural monument

Arbutus andrachne mature tree, Samsun-Dag, Anatolian coast opposite the island of Samos

Quercus ilex regeneration at valley bottom with sufficient groundwater supply

(in April: the young shoots and leaves are silky-hairy thus easily visible from far)

Quercus ilex regeneration
Attiki, April 1972

Quercus ilex regeneration, advanced growth,

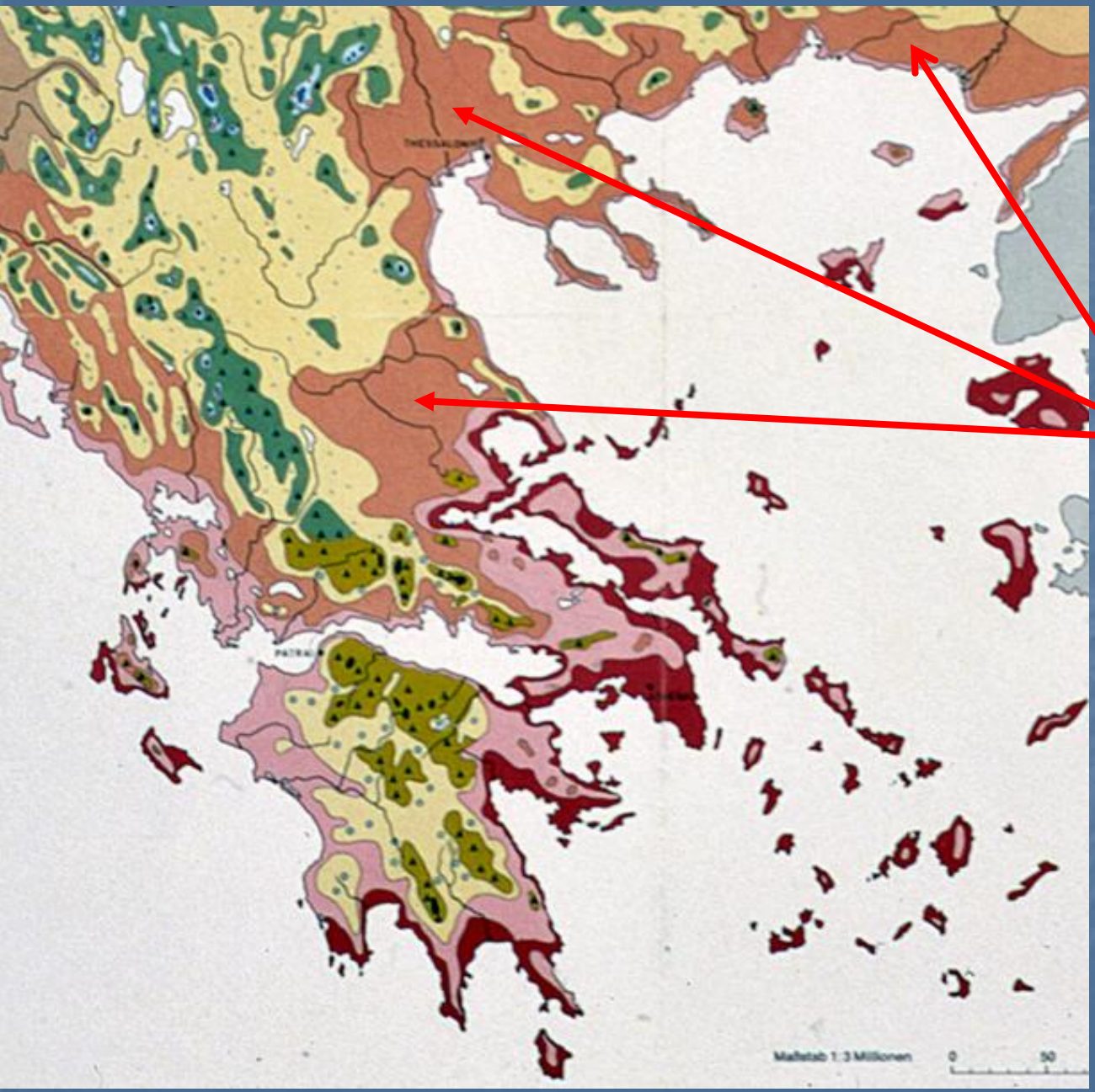
Magnisia peninsula near Argalasti , May 1972

Remnants of zonal *Quercus ilex* forests. Coastal part of Mt Pilion near Milopotamos, June 2015

A treasure in terms of nature conservation.

Sub-mediterranean belt

(*Ostryo-Carpinion orientalis* - zone)



Submediterran "semi-evergreen" zone and belt

Horvat, Glavac & Ellenberg 1974

Quercus coccifera in full flower, Thessaly, in April

Quercus coccifera, Thessaly, in June
Kermes oak can set flowers and fruits even under strong grazing pressure

Overgrazing by goats, *Quercus coccifera-Juniperus oxycedrus* pseudomaquis near Keramidi, Mavrovouni, E Thessaly 1974

Overgrazing by goats, *Quercus coccifera-Juniperus oxycedrus* pseudomaquis near Keramidi, Mavrovouni, E Thessaly 1974

Soil erosion (badlands) after overgrazing by goats, near Keramidi, Mavrovouni, E Thessaly 1974

Soil erosion (badlands) after overgrazing by goats, near Keramidi, Mavrovouni, E Thessaly 1974

Quercus coccifera, mature tree near Spilia, Mt Ossa, 1974

Quercus coccifera, mature trees near Spilia, Mt Ossa, June 2015

A treasure in terms of nature conservation.

Ostrya carpinifolia and *Carpinus orientalis*, Mt Ossa near Stomion, Mai 1980

Ostrya carpinifolia and *Carpinus orientalis*, Mt Ossa near Stomion, Mai 1980

Semi-evergreen pseudomaquis, red-coloured autumn foliage of deciduous *Cotinus coggygria*, mixed with winter-green *Quercus coccifera.* Near Almiros, Thessaly 1974

Cotinus coggygria in June. Xorichtion 2015

Semi-evergreen pseudomaquis, red-coloured autumn foliage of deciduous *Cotinus coggygria*, mixed with winter-green *Quercus coccifera.* Near Almiros, Thessaly 1974

Supra-mediterranean ("Sub-continental") belt

(*Quercion frainetto* - zone)

Sub-continental, deciduous-thermophilous *Quercus* (oak) zone and belt

Quercus frainetto – Hungarian oak, Balcan oak

Quercus cerris – Austrian oak

Huetio-Quercetum frainetto, zonal forest-association described from Mt Mavrovouni, 800 m a.s.l., June 1974

Verbascum phlomoides-clearing,
Mt Mavrovouni, E Thessaly 1974

Lilium chalcedonicum

Digitalis lanata

Asphodeline lutea

Oro-mediterranean ("Central-european") belt

(Fagion sylvaticae - zone)

„Central-european“ *Fagus* (beech) zone and belt

Beech forest in June

Beech forest in January

Cephalanthera rubra, Mt Ossa, E Thessaly

Lesquereuxia syriaca
= *Siphonostegia syriaca*

(Scrophulariaceae)

Agriolefkes, Mt Pilion, *Fagus* belt, 1600 m, July 1974

Special nature conservation responsibility: only three populations in Greece (Pilion, Olympus, Prespa) and three in SE Turkey of this rare semiparasitic plant described from Mt Amanus near the Syrian border.

Lesquereuxia syriaca

Gentiana asclepiadea, Mt Pilion, *Fagus* belt, 1400 m, Euro-siberian element

Lilium martagon, Mt Pilion, above Tsangarada, June 2015. Euro-siberian element.

Landuse in the *Fagus* belt: Anthropo-zoogenic depression of the beech timberline

Landuse in the *Fagus* belt: Skiing centre of Agriolefkes/Pilion with cleared ski runs, 2015.

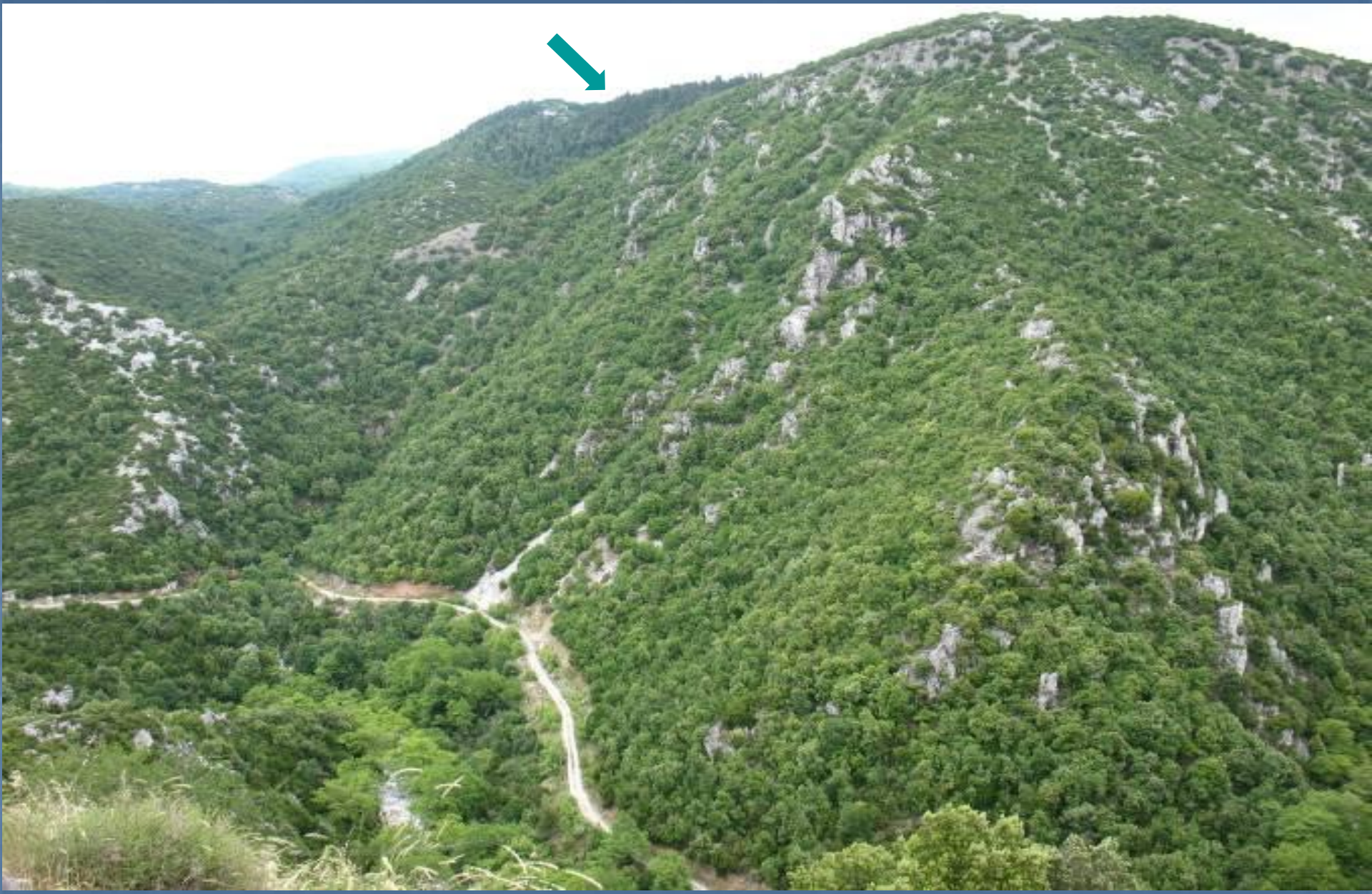
Landuse in the *Fagus* belt: Skiing centre of Agriolefkes/Pilion with cleared ski runs, 2015.

Landuse in the *Fagus* belt: wood pasture, old-growth beech stand for beechnut exploitation, Mt Ossa 1974

Landuse in the *Fagus* belt: Beech coppice for harvesting firewood , Mt Pilion 1974

Landuse in the *Fagus* belt: Secondary *Pteridium aquilinum*-heathland replacing cleared *Fagus*-forest, Mt Ossa 1974 [domestic animals do not feed on *Pteridium*]

Landuse in the *Fagus* belt: Hay meadows rich in orchids, at 1200 m, Mt Ossa, 1974. Sustainable landuse increases plant diversity.



Lee-ward fir forest (*Abies borisii-regis*). Only one single area in Mt Pilion: Elatorema north of Makrinitsa, June 2015. - Worth of nature protection.

Lee-ward fir forest (*Abies borisii-regis*). Only one single area in Mt Pilion: Elatorema north of Makrinitsa, June 2015. - Worth of nature protection.

Abies borisii-regis, heavily parasited by *Viscum album* subsp. *abietis*

Mt Ossa, south of the summit, June 2015

Morina persica, reaching the southern Balkan Peninsula from the Himalayas

Mt Ossa, south of the summit, June 2015

Azonal vegetation

(driven by hydrology and humidity)

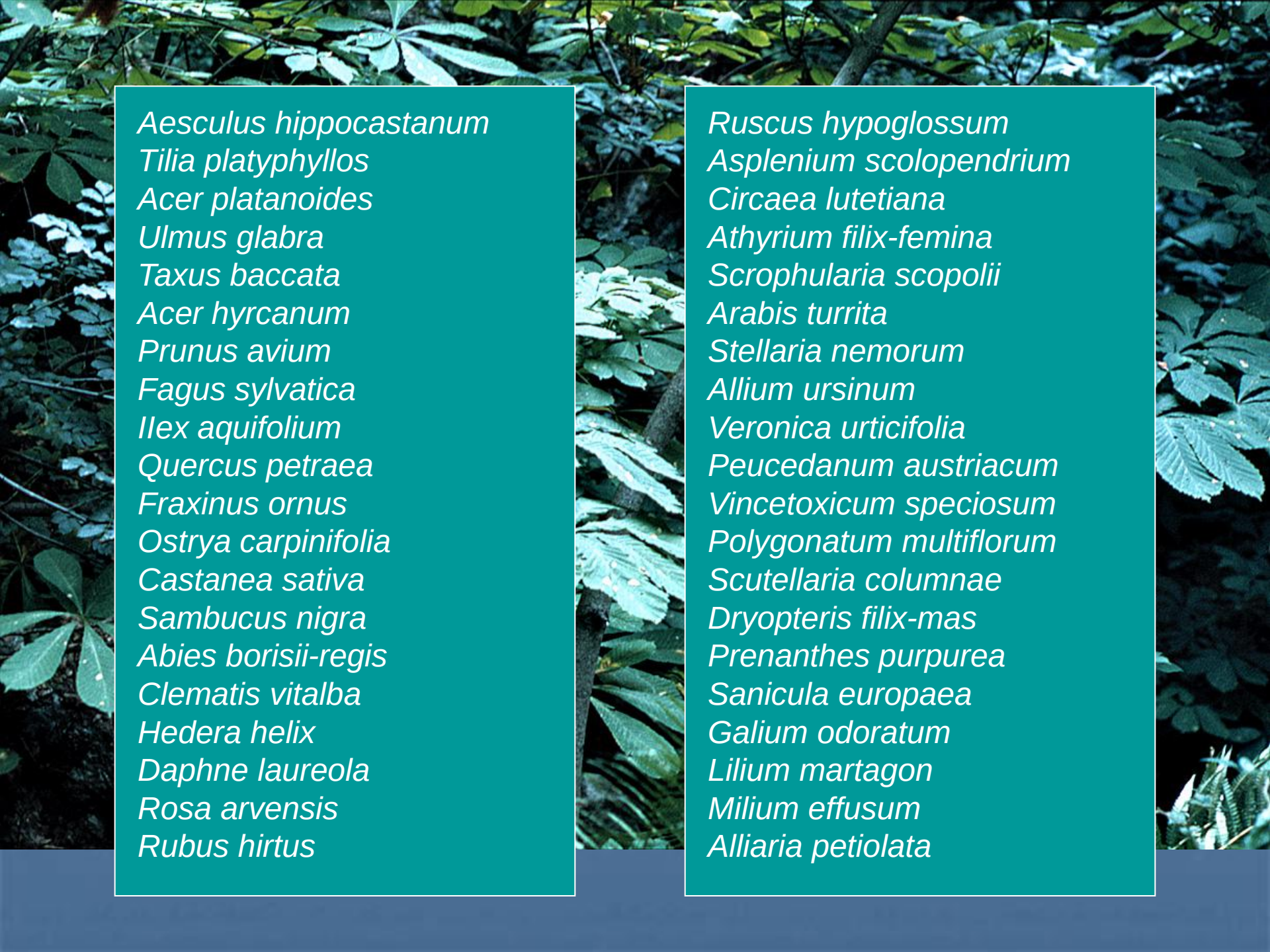
Nature conservation treasure:

Horse-chestnut ravine forest at 800 m near Karitsa, Mt Ossa 1974

Nature conservation treasure:

Horse-chestnut natural regeneration, Mt Ossa 1974

Rusco hypoglossi-Aesculetum hippocastani, natural azonal forest-association described from Mt Ossa, 800 m a.s.l., July 1974

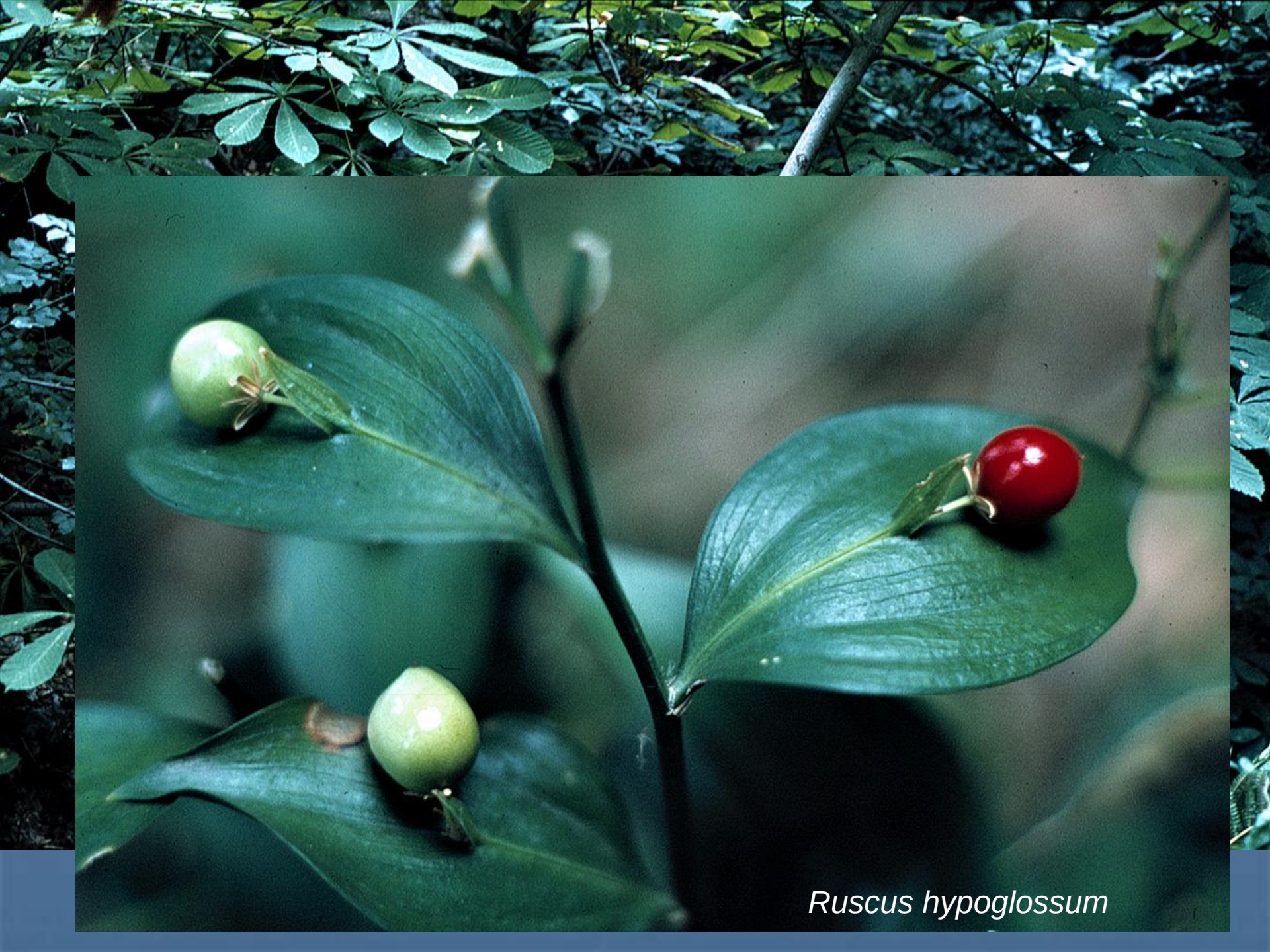


Aesculus hippocastanum
Tilia platyphyllos
Acer platanoides
Ulmus glabra
Taxus baccata
Acer hyrcanum
Prunus avium
Fagus sylvatica
Ilex aquifolium
Quercus petraea
Fraxinus ornus
Ostrya carpinifolia
Castanea sativa
Sambucus nigra
Abies borisii-regis
Clematis vitalba
Hedera helix
Daphne laureola
Rosa arvensis
Rubus hirtus

Ruscus hypoglossum
Asplenium scolopendrium
Circaea lutetiana
Athyrium filix-femina
Scrophularia scopolii
Arabis turrita
Stellaria nemorum
Allium ursinum
Veronica urticifolia
Peucedanum austriacum
Vincetoxicum speciosum
Polygonatum multiflorum
Scutellaria columnae
Dryopteris filix-mas
Prenanthes purpurea
Sanicula europaea
Galium odoratum
Lilium martagon
Milium effusum
Alliaria petiolata

Carpinus betulus, very rare forest tree in moist ravines of Mt Ossa where it occurs at its southern distribution limit.

Near Stomion, June 2015



Ruscus hypoglossum

Frontiers in Ecology and the Environment

Tracking origins of invasive herbivores through herbaria and archival DNA: the case of the horse-chestnut leaf miner

David C Lees, H Walter Lack, Rodolphe Rougerie, Antonio Hernandez-Lopez, Thomas Raus, Nikolaos D Avtzis, Sylvie Augustin, and Carlos Lopez-Vaamonde

Front Ecol Environ 2011; doi:10.1890/100098

esa

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- Determining the native geographic range or origin of alien invasive species is crucial to developing invasive species management strategies. However, the necessary historical dimension is often lacking. The origin of the highly invasive horse-chestnut leaf-mining moth *Cameraria ohridella* has been controversial since the insectwas first described in 1986 in Europe. Here, we reveal that herbarium collections across Europe indicate a Balkan origin for *C ohridella*. We successfully amplified nuclear DNA and mitochondrial DNA barcode fragments from larvae pressed within leaves of herbarium samples collected as early as 1879. These archival sequences confirm an identity of *C ohridella* and set back its history in Europe by more than a century. The herbarium samples uncovered previously unknown mitochondrial haplotypes and locally undocumented alleles, showing local outbreaks of *C ohridella* back to at least 1961 and dynamic frequency changes that may be associated with road development. This case history demonstrates that herbaria are greatly underutilized in studies of insect–plant interactions, herbivore biodiversity, and invasive species' origins.

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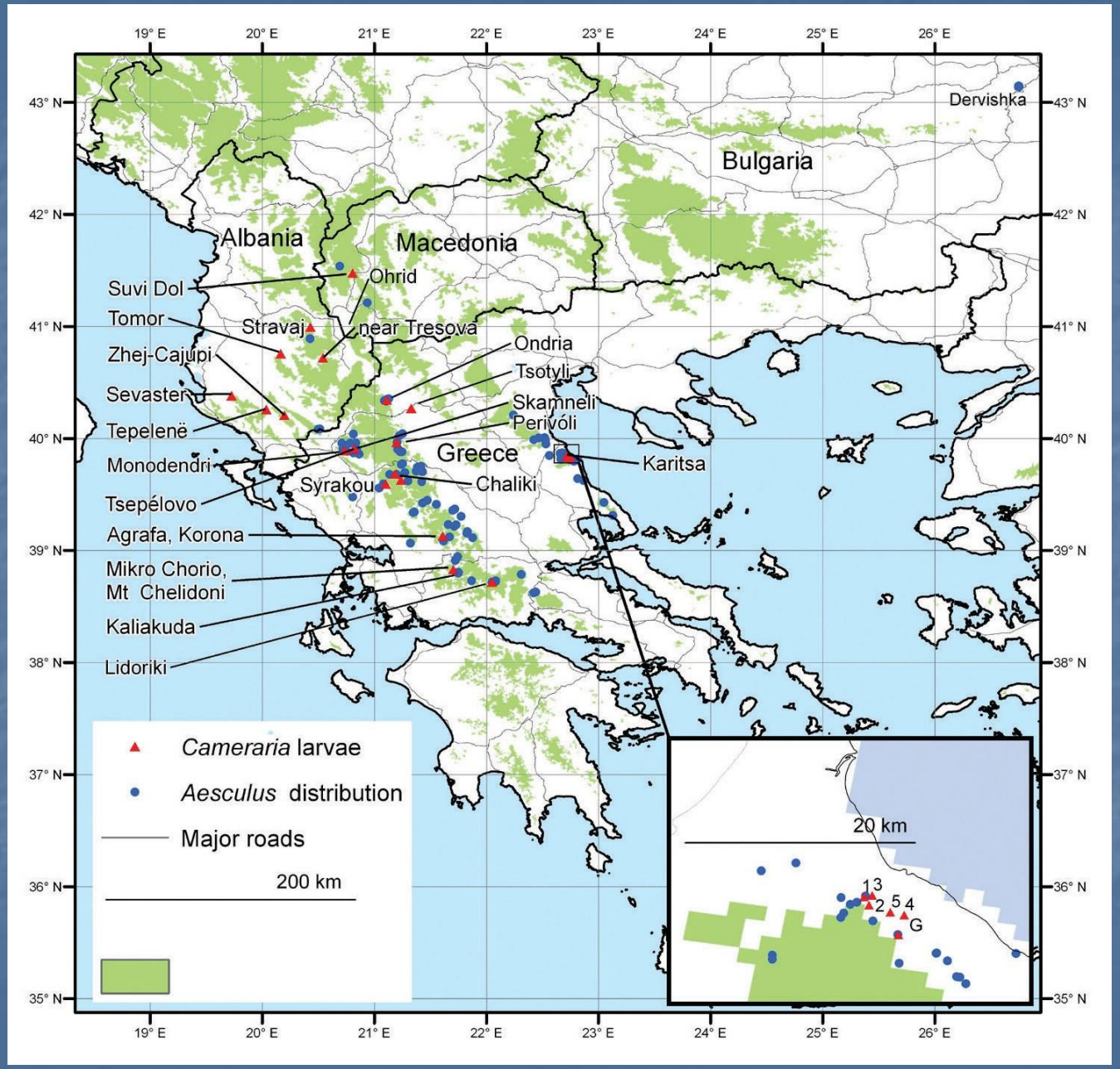
During our modern sampling, we had suspected that the horse-chestnut itself was introduced to Karitsa. Instead, unique *Cameraria ohridella* haplotypes (if not also genotypes) suggest a natural host-plant site, as already evident from the occurrence of horse-chestnut within plant communities rich in typically relict species (Raus 1980).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20° E
21° E
22° E
23° E
24° E
25° E
26° E
43° N
42° N
41° N
40° N
39° N
38° N
37° N
36° N
35° N
Albania
Macedonia
Bulgaria
Greece
Dervishka
Ohrid
Suvi Dol
Tomor
Stravaj
near Tresova
Zhej-Cajupi
Sevaster
Tepelenë
Monodendri
Tsepélovo
Agrafa, Korona
Mikro Chorio,
Mt Chelidoni
Kaliakuda
Lidoriki
Ondria
Tsotyli
Skamneli
Perivóli
Karitsa
Syrakou
Chaliki
Cameraria larvae
Aesculus distribution
Major roads
200 km
20 km
13
2
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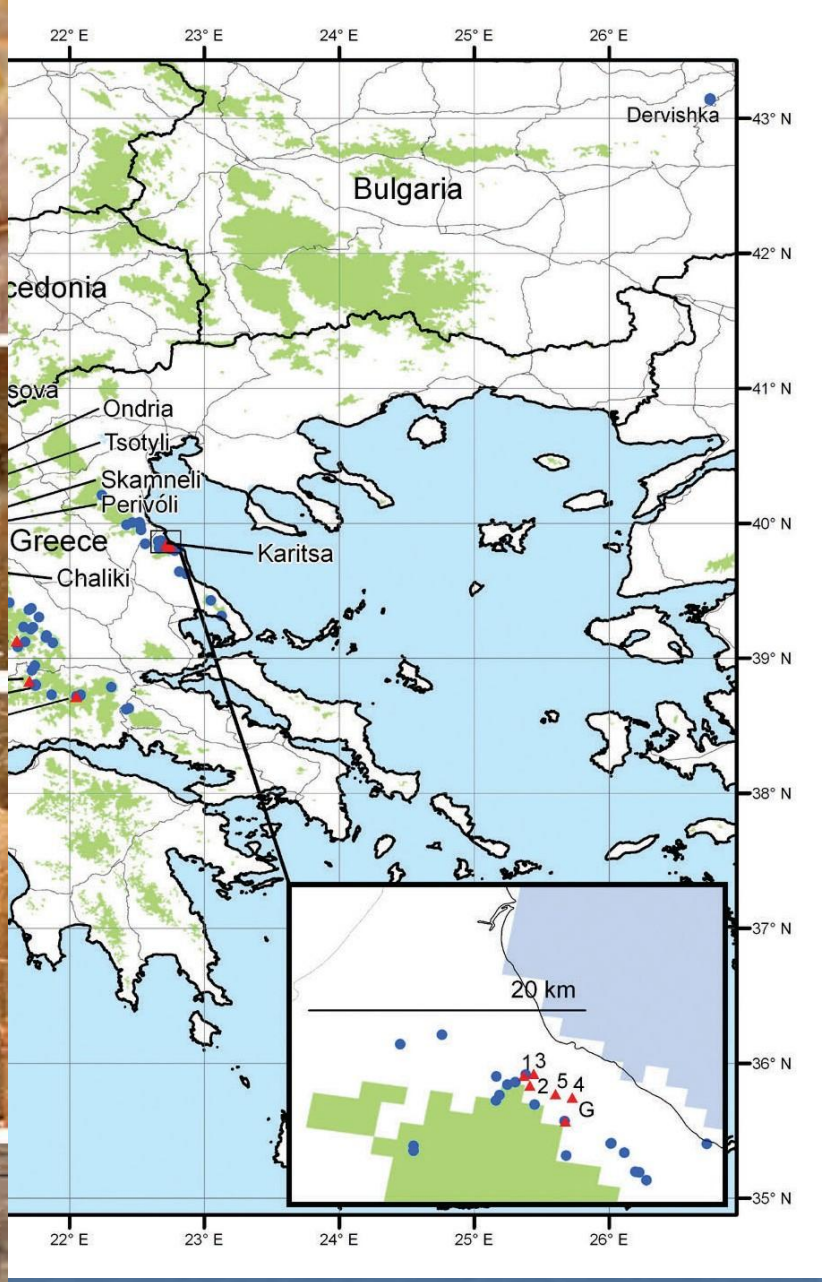
22° E
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43° N
42° N
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38° N
37° N
36° N
35° N
Dervishka
Bulgaria
cedonia
sova
Ondria
Tsotyli
Skamneli
Perivóli
Greece
Karitsa
Chaliki
20 km
1 3
2 5 4
G

Cryo-oromediterranean ("subalpine") belt

(*Daphno-Festucetalia* - zone)

Subalpine grassland at the summit of Mt Ossa, 1978 m a.s.l.

Summit of Mt Ossa, 1978 m a.s.l. – Timberline depressed by traditional grazing

Summit of Mt Ossa, 1978 m a.s.l. – View down to the secondary beech timberline. Artificial depression for several hundreds of meters of altitude evident.

Centaurea ossaea, Mt Ossa, endemic to the summit, June 2015

Galium degenii (syn. *G. ossaeum*), from S Albania to E Thessaly. Mt Ossa, summit, June 2015

Mt Ossa, summit area, June 2015

Astragalus mayeri

Astragalus angustifolius

Astragalus thracicus subsp. *parnassi*

Lake Karla,
re-established and restored,
June 2015

Lake Karla: restoration and environmental education

Maria Chamoglou

Management Body of Ecodevelopment Area of Karla - Mavrovouni – Kefalovriso – Velestino, Greece

Lake Karla is a lake ecosystem which was completely drained in 1962 and has experienced a number of anthropogenic impacts including wetland loss, significant drawdown of the aquifer's water table leading to soil salinization, loss of ecological and aesthetic value. Restoration efforts started in the 80's, addressing to the re-establishment of a new functional reservoir and wetland.

The necessity for protection and sustainable management of Karla's wetland has been recognized as an element of natural and cultural heritage, but also a foundation for economic and social development.

Moving towards the goal of sustainability requires fundamental changes in human attitudes and behavior. Progress in this direction is thus critically dependent on environmental education and public awareness. The planning such kind of of public awareness campaigns is one of the main projects of the Management Body of the Ecodevelopment area of Karla-Mavrovouni-Kefalovriso-Velestino.

http://medina.org/Portals/0/Uploads/Tunis%20workshop%20presentations/Chamoglou%20Lake%20Karla%20.pdf

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Congratulations for these important efforts !

Plant biodiversity of Eastern Thessaly

Historical, ecological and phytogeographical aspects

Thomas Raus, Berlin

Botanischer Garten und Botanisches Museum Berlin-Dahlem

Φορέας Διαχείρισης Περιοχής Οικοανάπτυξης Κάρλας – Μαυροβουνίου –Κεφαλόβρυσου – Βελεστίνου (Π.Ο.Κα.Μα.Κε.Βε) Management Body of Ecodevelopment Area of Karla - Mavrovouni – Kefalovriso – Velestino (E.A.Ka.Ma.Ke.Ve)

The end.

Thank you very much for your attention!