

Βιογεωγραφία της Μεσογείου

Κατερίνα Βαρδινογιάννη

Μουσείο Φυσικής Ιστορίας Κρήτης - Πανεπιστήμιο Κρήτης

Ηράκλειο 2020-2021

Ποικιλότητα Ασπονδύλων

- ▶ Γενικά τα ασπόνδυλα είναι βόρειας προέλευσης (παλαιαρκτικά ή ολαρκτικά) και όχι νότιας (αφρικάνικα).
- ▶ Η Βόρεια Μεσόγειος έχει την υψηλότερη ποικιλότητα στην Ευρώπη.
 - 75% των εντόμων της Ευρώπης συναντάται στη Μεσόγειο,
 - Οι πεταλούδες εμφανίζουν το φαινόμενο της χερσονήσου (μειώνονται νότια).

Ενδημισμός Ασπονδύλων

- ▶ Ποικίλει από ομάδα σε ομάδα, πολύ υψηλό ενδημισμό έχουν τα:
 - ▶ Χερσαία γαστερόποδα (59% Ελλάδα υψηλότερος σε όλη την Ευρώπη και Μεσόγειο)
 - ▶ Ισόποδα,
 - ▶ στα Έντομα ο ενδημισμός κυμαίνεται 15% -25%.
 - ▶ Πεταλούδες: 46% στη Μεσόγειο, 7,5% Ισπανία, 9% Ελλάδα, 9% Ιταλία.
 - ▶ Δίπτερα Chironomidae 14% στη Μεσόγειο.
- ▶ στα σπήλαια φτάνει και το 90%.
- ▶ τα βουνά ήταν καταφύγια (υπολείμματα του Πλειστοκαίνου).
 - ▶ π.χ. πεταλούδες, σκαθάρια.



Ποικιλότητα στη θάλασσα

Table 4.1 Species richness of some groups of aquatic plants and animals in the Mediterranean Sea

Group	Number of species	Percentage of the world species richness
Plants		
Red algae	867	16.5
Brown algae	265	17.7
Green algae	214	17.8
Seagrasses	5	10.0
Vertebrates		
Cartilaginous fishes	81	9.5
Bony fishes ¹	532	4.1
Reptiles	5	8.6
Mammals	21	18.4
Invertebrates		
Sponges	600	10.9
Cnidarians	450	4.1
Bryozoans	500	10.0
Annelids	777	9.7
Molluscs	1376	4.3
Arthropods	1935	5.8
Echinoderms	143	2.2
Tunicates	244	18.1
Other invertebrates	≈550	4.1

¹Golani *et al.* (2002) estimated that there are 650 fish species.

Source: Bianchi and Morri (2000).

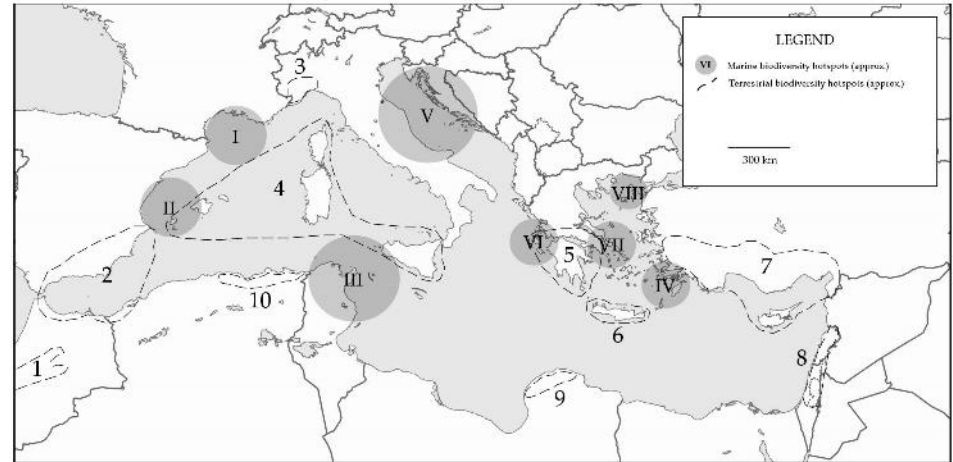
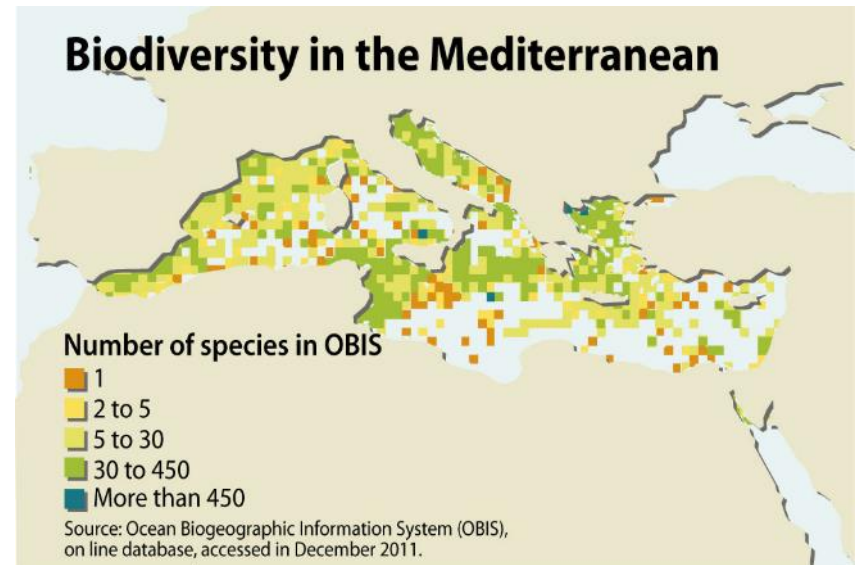


Figure 6.2. Comparison of putative marine fish biodiversity hotspots with reported terrestrial (plant) hotspots. (1) High and Middle Atlas; (2) Baetic-Rifan complex; (3) Maritime and Ligurian Alps; (4) Tyrrhenian Islands; (5) south and central Greece; (6) Crete; (7) south Anatolia and Cyprus; (8) Syria–Lebanon–Israel; (9) Cyrenaica; (10) Kablies–Numidie–Kroumirie (after Médail & Diadema 2009); (I) Golfe du Lion; (II) Balearic Sea; (III) Gulf of Tunis to the Gulf of Hammamet; (IV) southeast Aegean; (V) Adriatic; (VI) south Ionian islands; (VII) western Aegean (off Euboea and Attica); (VIII) northeast Aegean (based on Coll *et al.* 2010; 2012). (Illustration: R. Rabett.)



Number of species in OBIS

- 1
- 2 to 5
- 5 to 30
- 30 to 450
- More than 450

Source: Ocean Biogeographic Information System (OBIS), on line database, accessed in December 2011.

Ποικιλότητα στη θάλασσα

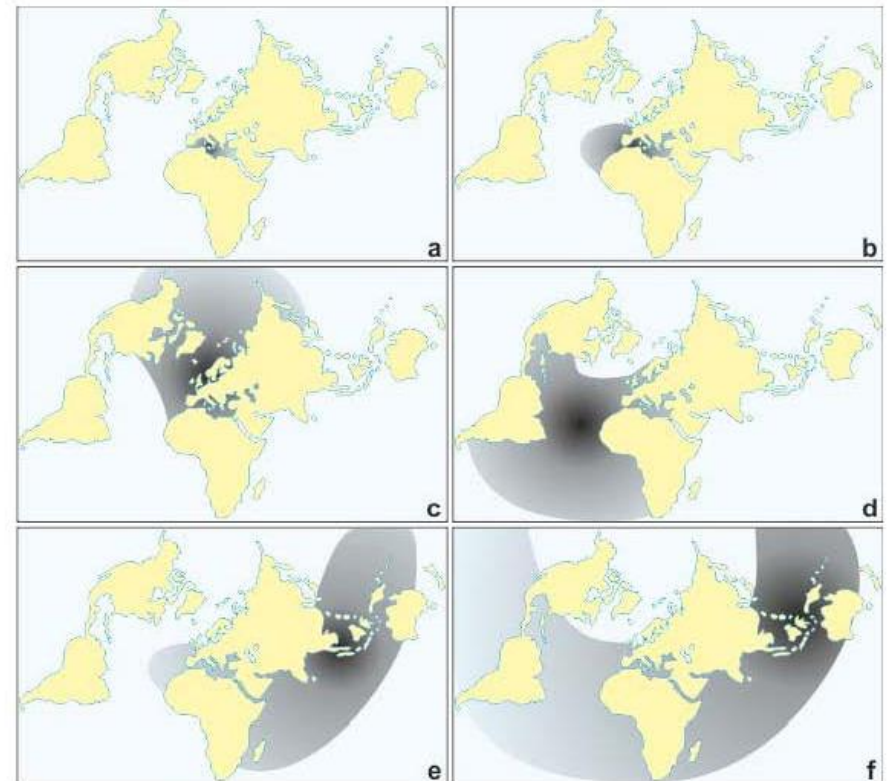
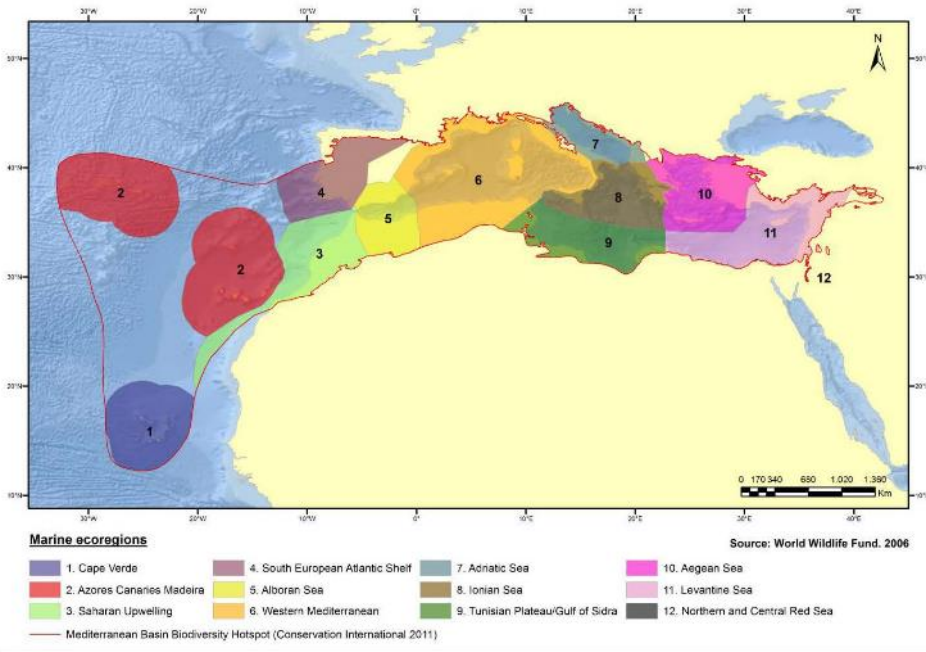
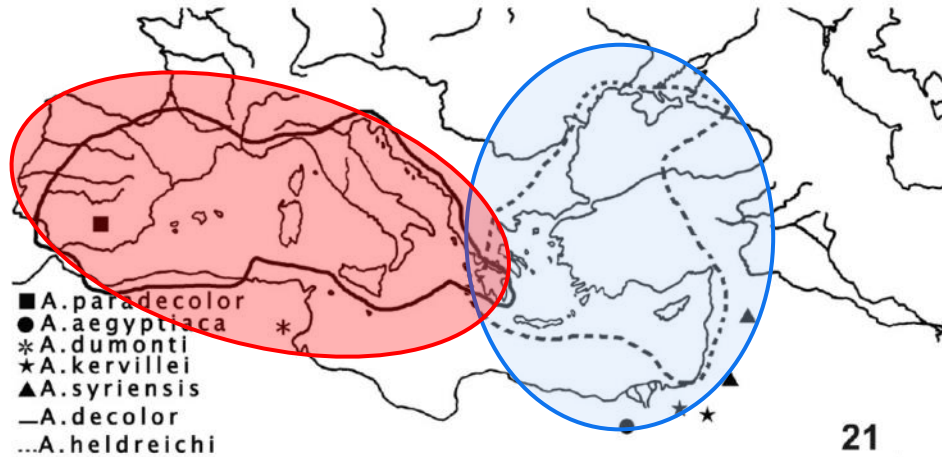
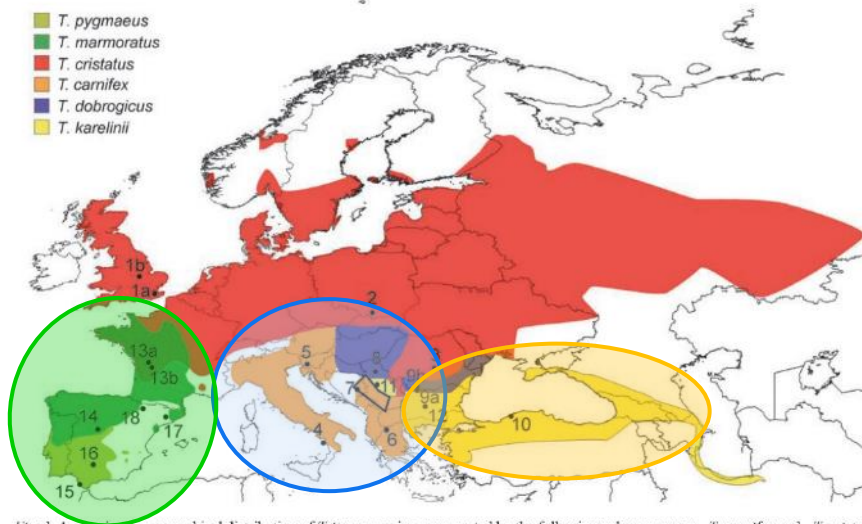


Figure 15. Main basic ranges of the Mediterranean biota: a) Mediterranean endemic; b) Atlantic-Mediterranean; c) Boreo-Atlantic; d) (sub)tropical Atlantic; e) Indo-west Pacific; f) circum-(sub)tropical.

Χαρακτηριστικές κατανομές



Ameles - Mantodea



Triturus



Fig. 1. Approximate geographical distribution of *Triturus* species, represented by the following colours: orange - *T. carnifex*, red - *T. cristatus*, blue - *T. dobrogicus*, yellow - *T. karelinii*, dark green - *T. marmoratus*, light green - *T. pygmaeus*. Numbers indicate the populations sampled in this study as listed in Appendix I. The concave polygon in the Balkans represents the area where karelinii-type mtDNA was observed in *T. carnifex macedonicus* (Amntzen and Wallis, 1999 and present study). Note the zone of sympatry between *T. cristatus* and *T. marmoratus* in western France.

Χαρακτηριστικές κατανομές Κολεόπτερα

D. García-Vázquez et al.

Deronectes Dytiscidae

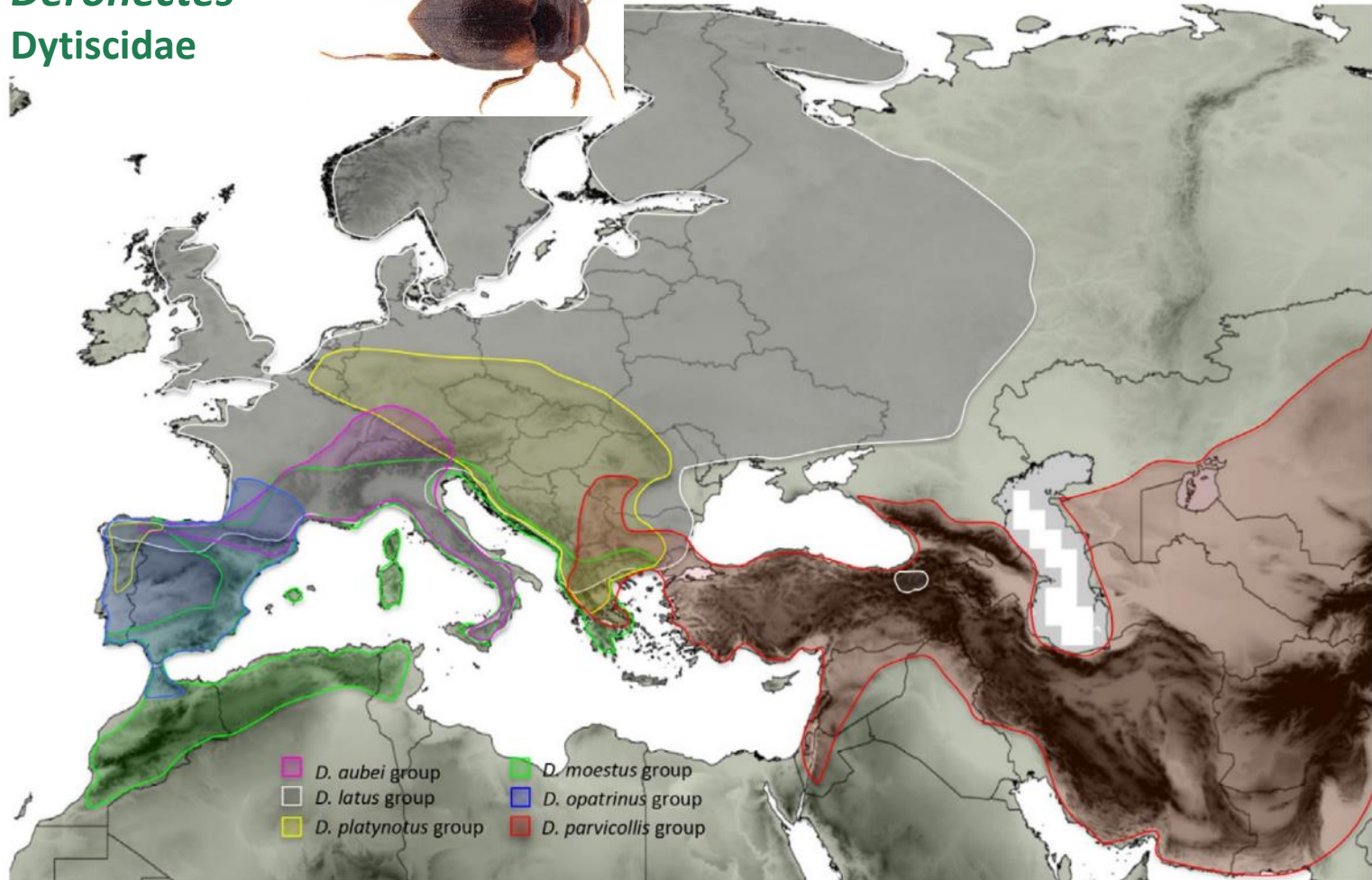


Figure 1 Distribution of the main lineages of *Deronectes* according to our phylogenetic results (see Fig. 2).

Χαρακτηριστικές κατανομές Κολεόπτερα

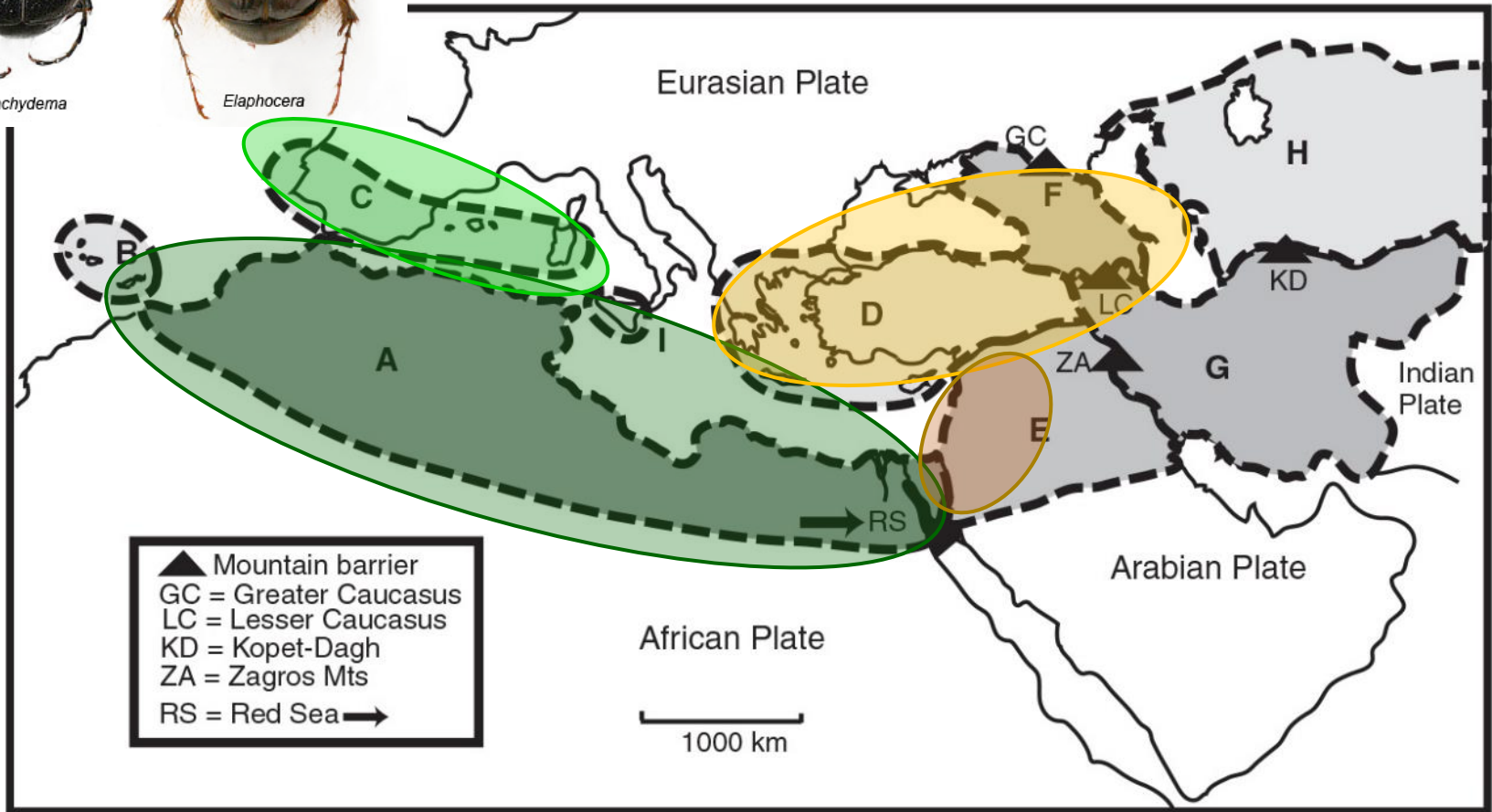


Pachydema



Elaphocera

Palaearctic Pachydeminae in the Mediterranean 1887



Χαρακτηριστικές κατανομές

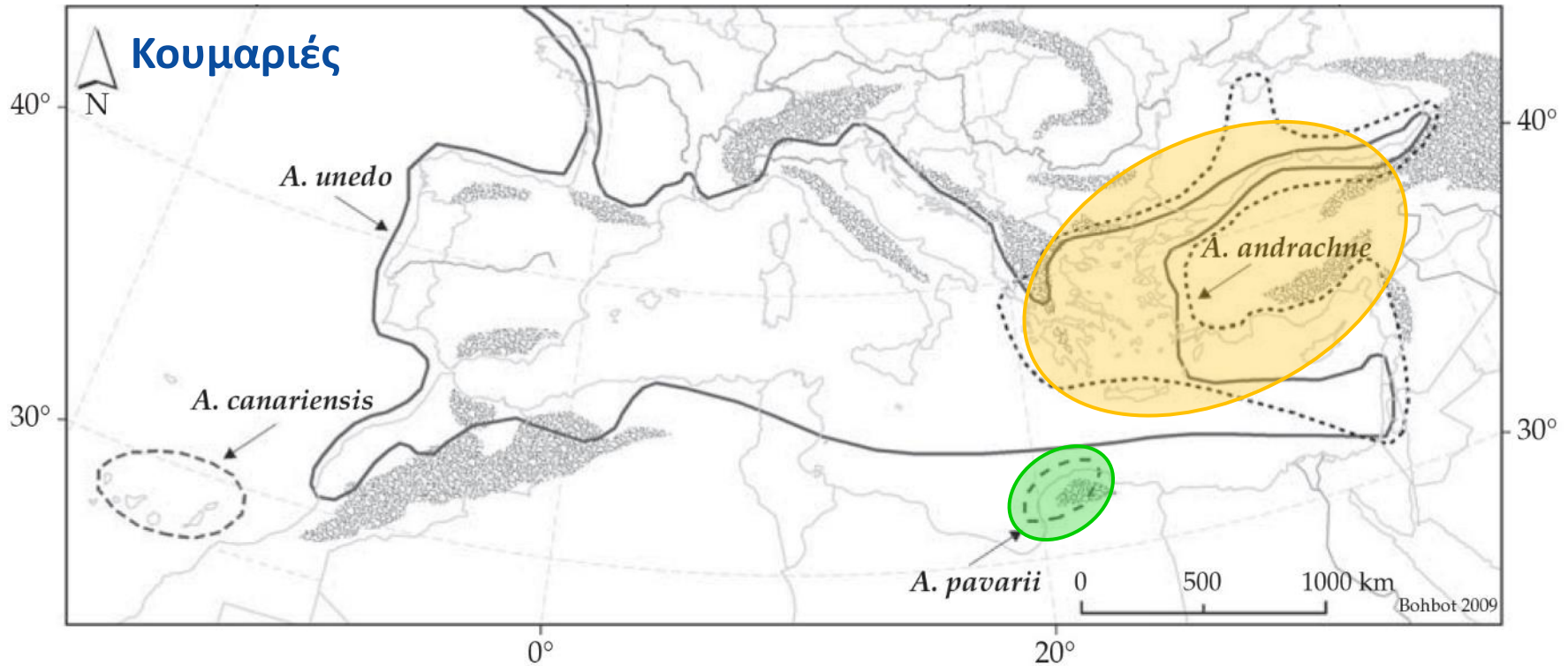
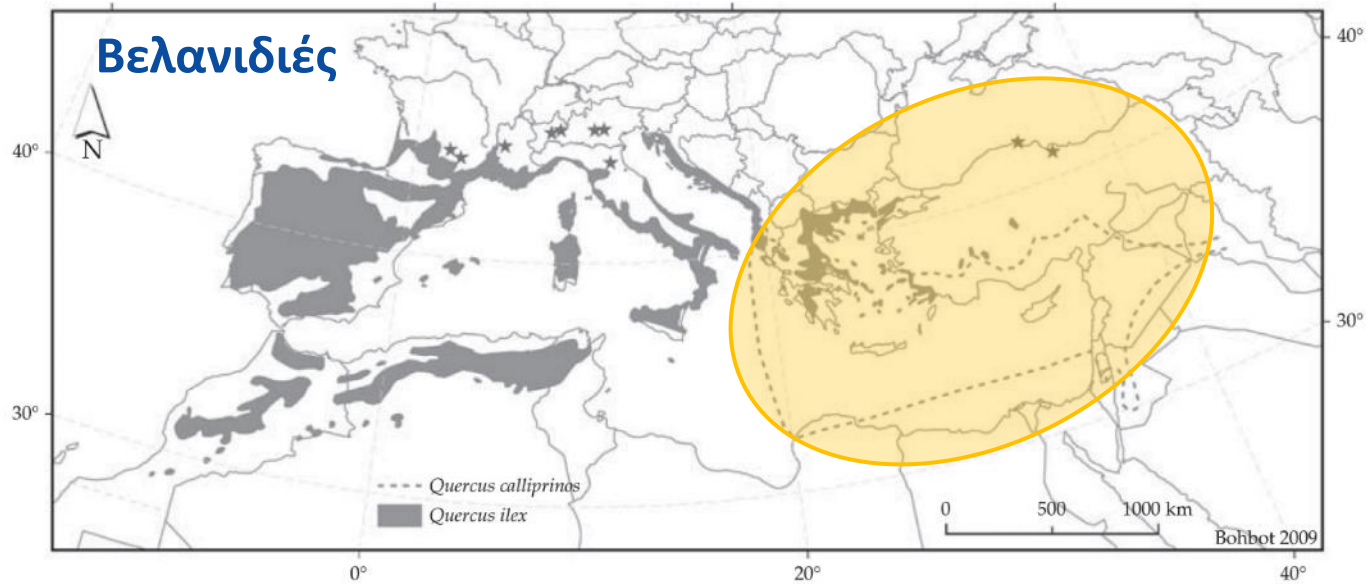
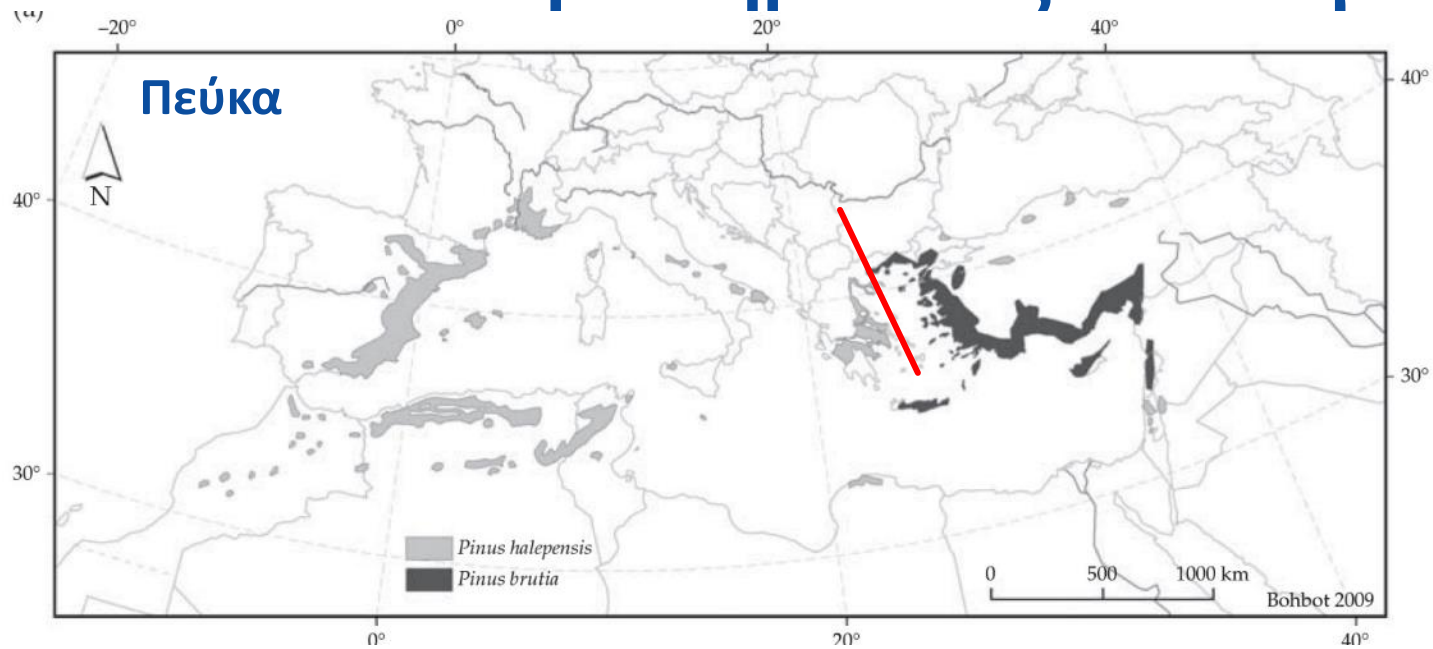


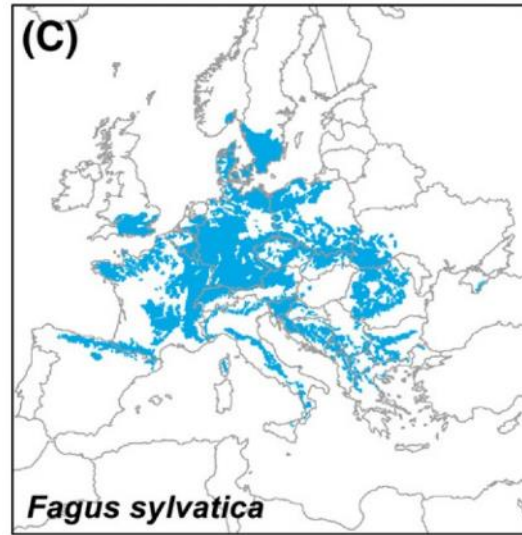
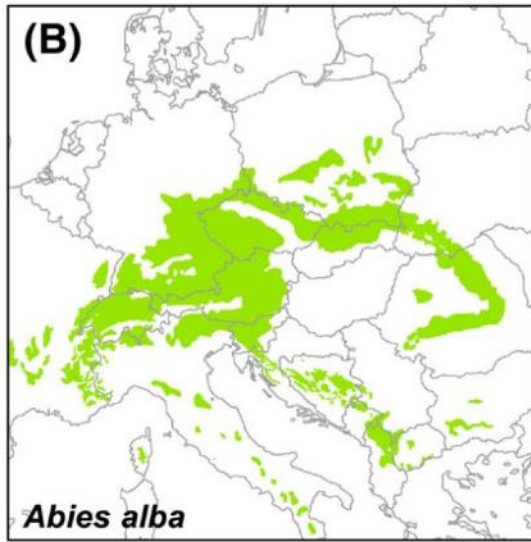
Figure 3.4 Distribution of the four Mediterranean species of strawberry trees (genus *Arbutus*), showing that two species are widespread and two are highly restricted (after Sealy 1949).



Χαρακτηριστικές κατανομές



Χαρακτηριστικές κατανομές Νότιο Όριο



Vipera berus

Χαρακτηριστικές κατανομές Βόρειο Όριο

► Αφρικανικά: Μερικά τάξα, κυρίως φυτά, έχουν τη βορειότερο όριο κατανομής τους στην Ελλάδα

- *Androcymbium rechingeri*,
- *Viola scorpuroides*,
- *Acomys cahirinus*.



Πλειστοκαινικά καταφύγια

S. D. Muller et al.

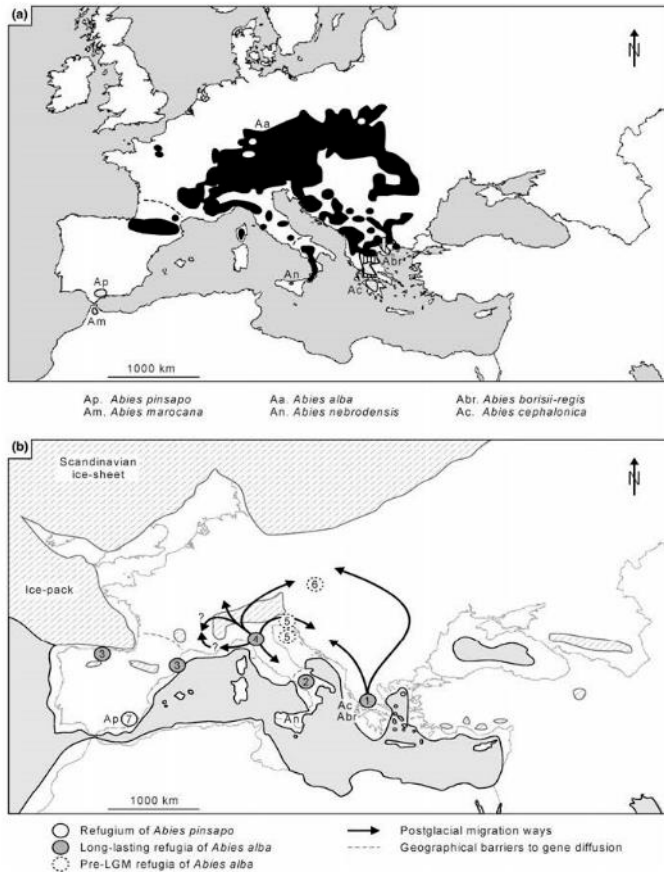


Figure 1 (a) Present range of *Abies* species in Europe (after Tutin et al., 1964–80; Jalas & Suominen, 1973; Quézel & Médail, 2003). (b) Glacial refugia and probable routes of migration of *Abies* species (after Nakagawa, 1998; Treharne-Berson et al., 2004). Circled numbers refer to refugia locations detailed in the text. LGM is used for Last Glacial Maximum.

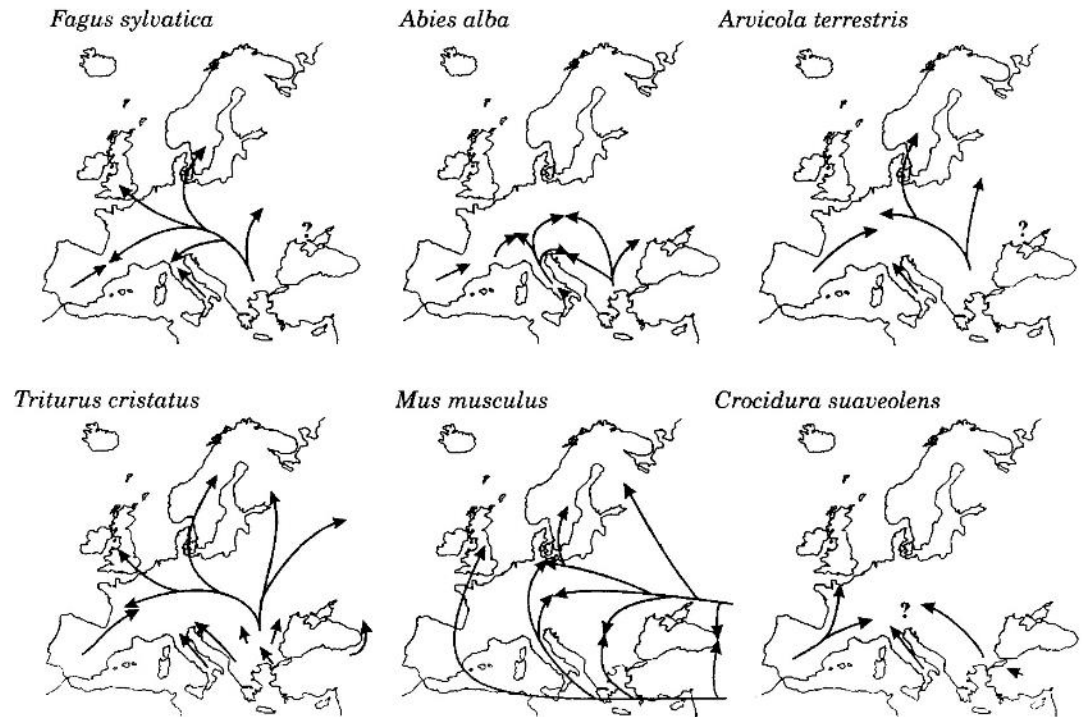


Figure 4. Proposed post-glacial expansion routes deduced from molecular data and fossil evidence. Each case is described in the text. Three broad patterns emerge—the grasshopper, *Chorthippus parallelus*, the hedgehog, *Erinaceus europaeus* & *concolor*, and the bear, *Ursus arctos*. Species with similar patterns are shown below each of these.

Πλειστοκαινικά καταφύγια

Chorthippus parallelus



Erinaceus spp



Ursus arctos



Alnus glutinosa



Quercus spp



Sorex araneus



Figure 4. Proposed post-glacial expansion routes deduced from molecular data and fossil evidence. Each case is described in the text. Three broad patterns emerge—the grasshopper, *Chorthippus parallelus*, the hedgehog, *Erinaceus europaeus* & *concolor*, and the bear, *Ursus arctos*. Species with similar patterns are shown below each of these.

Πλειστοκαινικά καταφύγια

F. Médail and K. Diadema

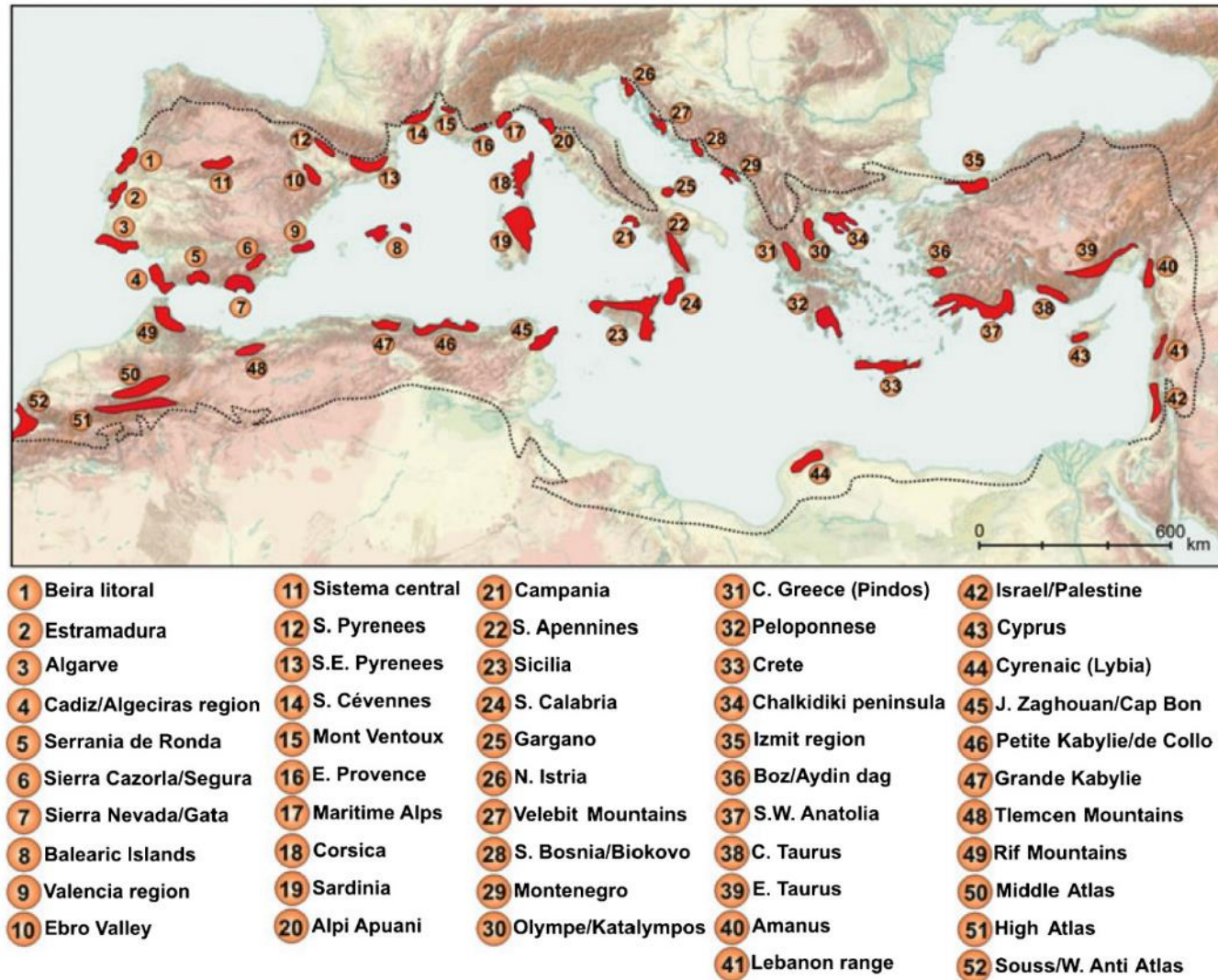


Figure 1 Fine-scale geographical distribution of the 52 putative refugia within the Mediterranean region (limits *sensu* Quézel & Médail, 2003, indicated by a broken line) obtained from the analysis of the phylogeographical patterns of 82 plant species (41 trees and 41 herbs)

Χωρότυποι

- ▶ Η γεωγραφική κατανομή των φυτών και των ζώων μπορεί συνθετικά να εκφραστεί από τους χωρότυπους.

Βιογεωγραφικές Περιοχές Ευρώπης

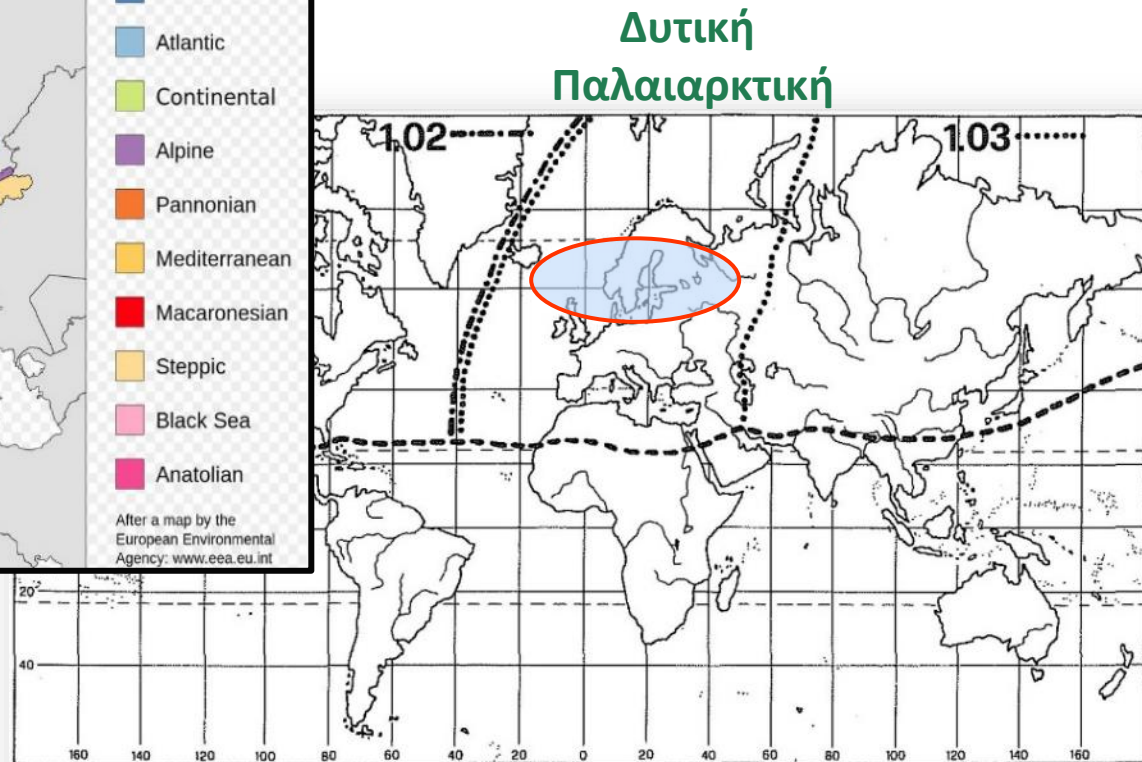
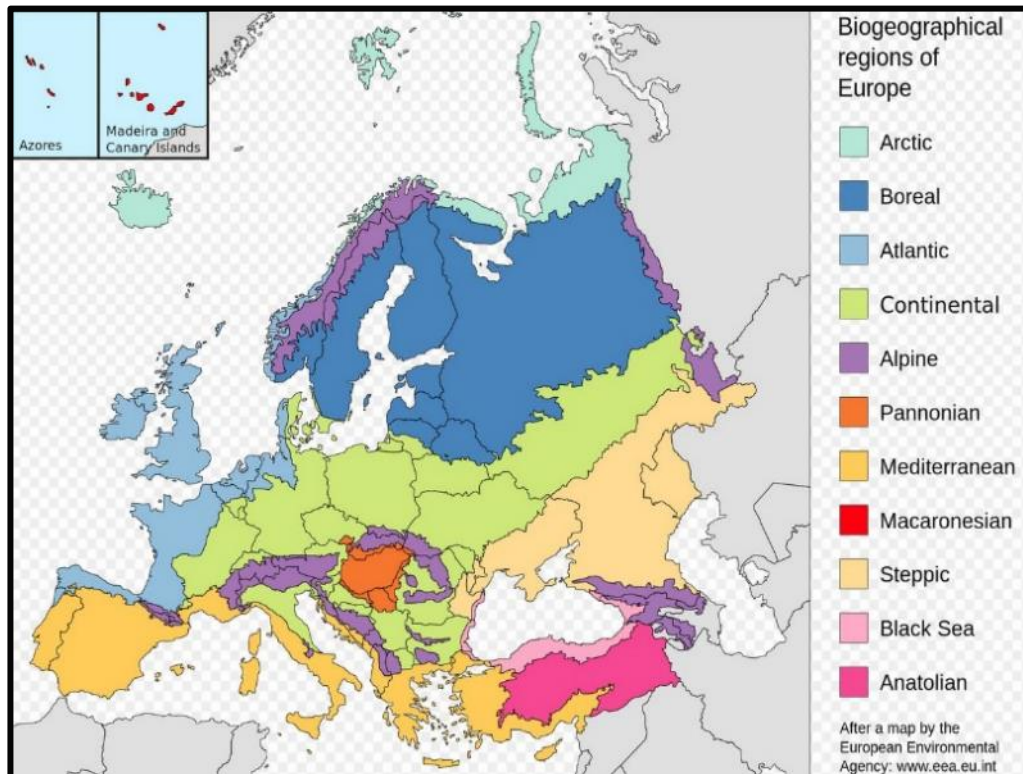


Fig. 1 - Holarctic (1.01 OLA), Palearctic (1.02 PAL) and W-Palearctic (1.03 WPA) chorotypes.

Χωρότυποι

Ευρω-Μεσογειακός

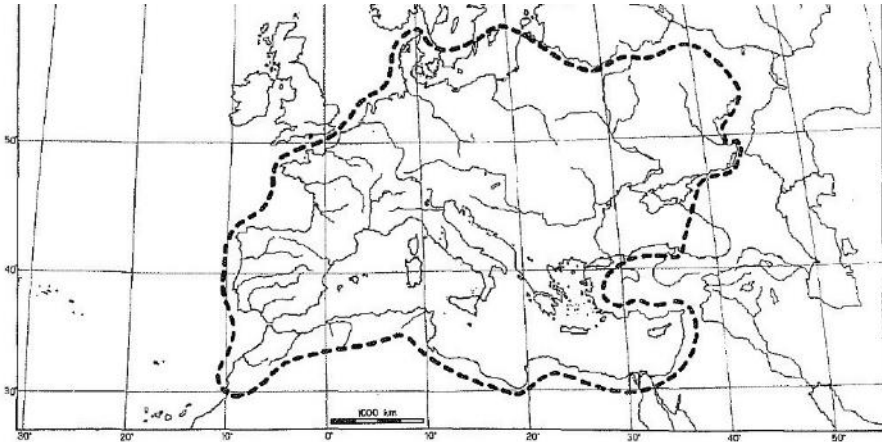


Fig. 10 - Europeo-Mediterranean chorotype (1.12 EUM).

Μεσογειακός Ανατολικός, Δυτικός

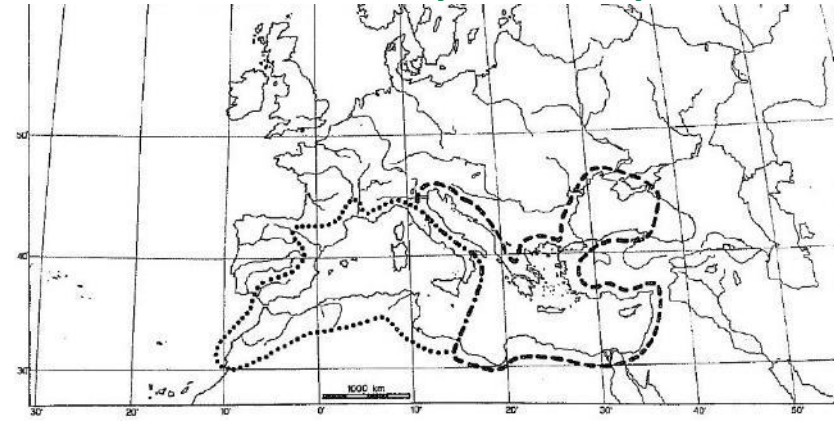


Fig. 18 - W-Mediterranean (3.02 WME) and E-Mediterranean (3.03 EME) chorotypes.

Τουρανο-Ευρω-Μεσογειακός

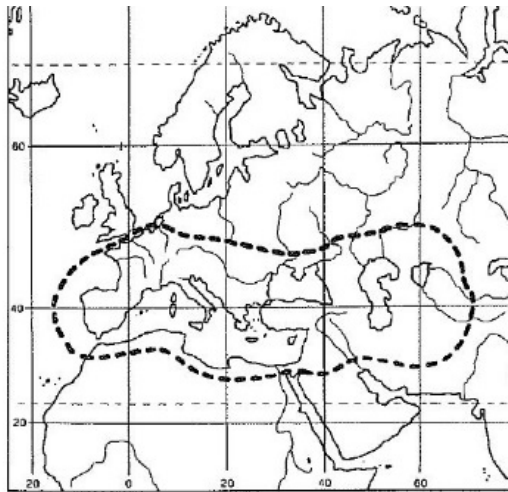


Fig. 7 - Turano-European-Mediterranean chorotype (1.1)

Τουρανο - Μεσογειακός

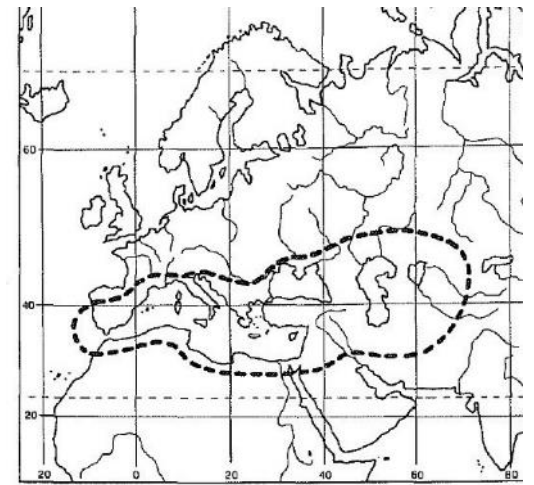


Fig. 9 - Turano-Mediterranean chorotype (1.11 TUM).

Μεσόγειος υποδιαίρέσεις

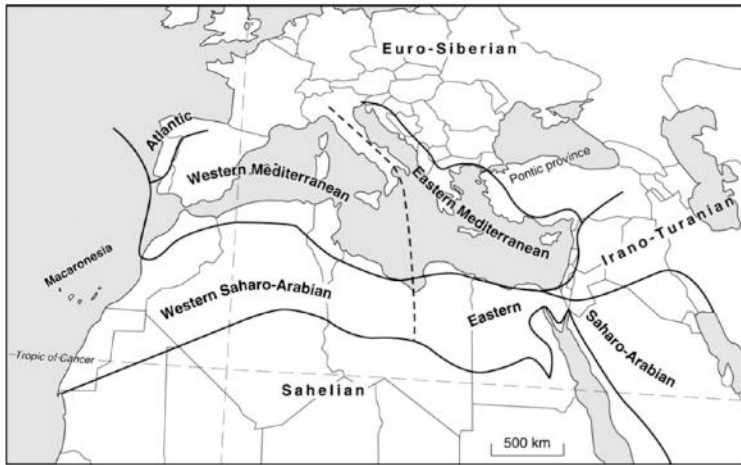


Figure 3 Biogeographical realms in the Mediterranean area
 Source: (adapted from Blondel and Aronson, 1999).

Figure 4.2 Terrestrial ecoregions of the Mediterranean Basin Hotspot (WWF, 2006)

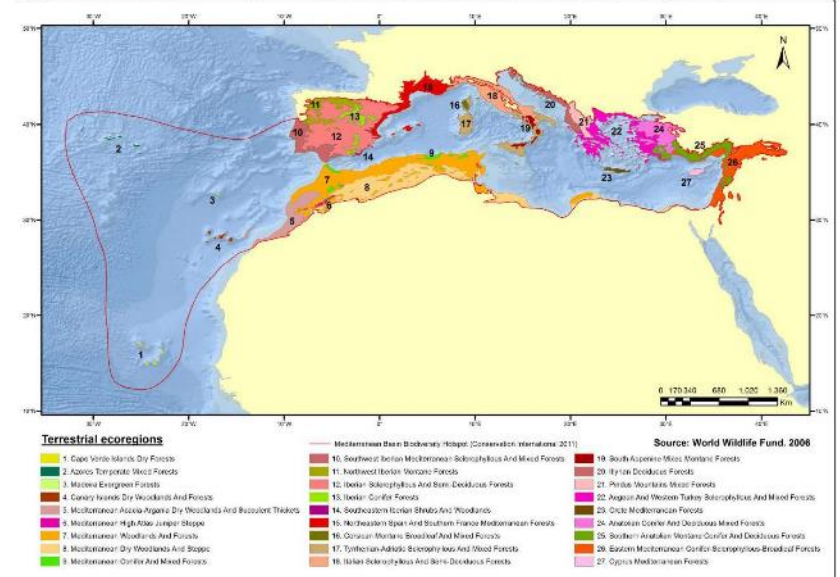
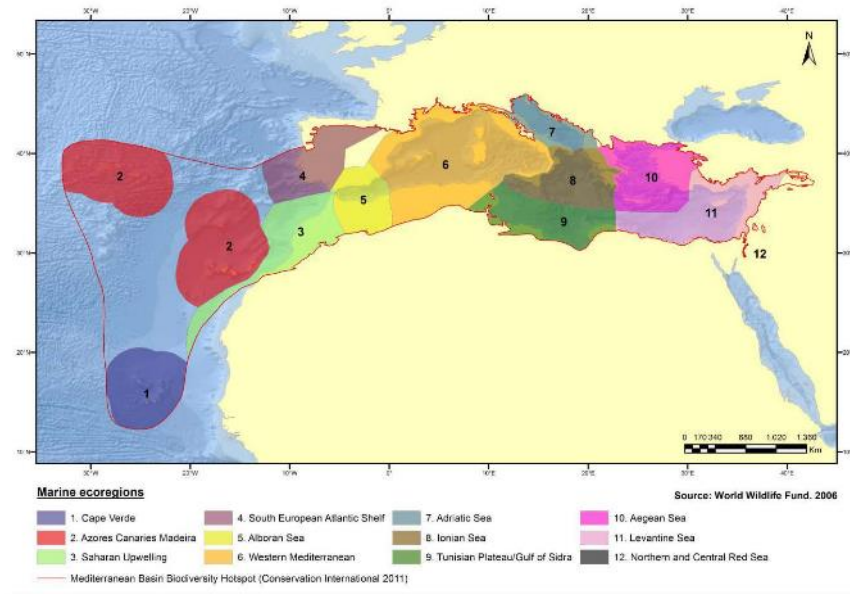
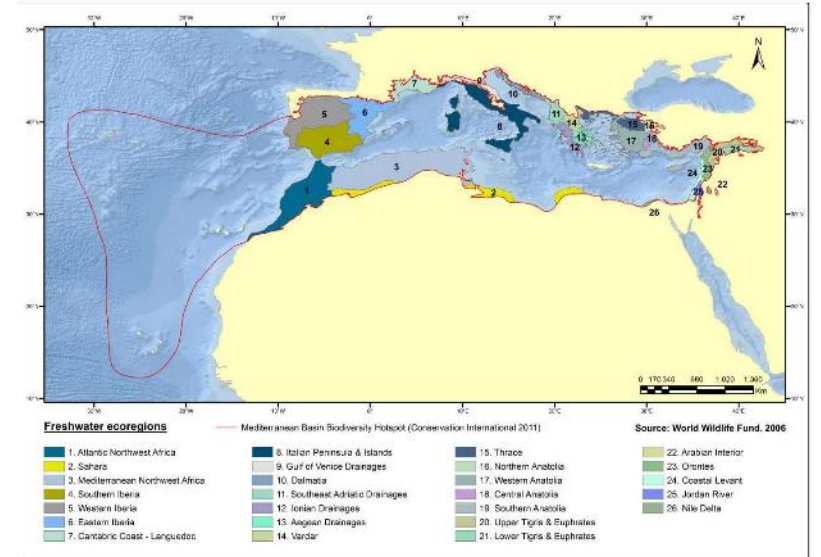
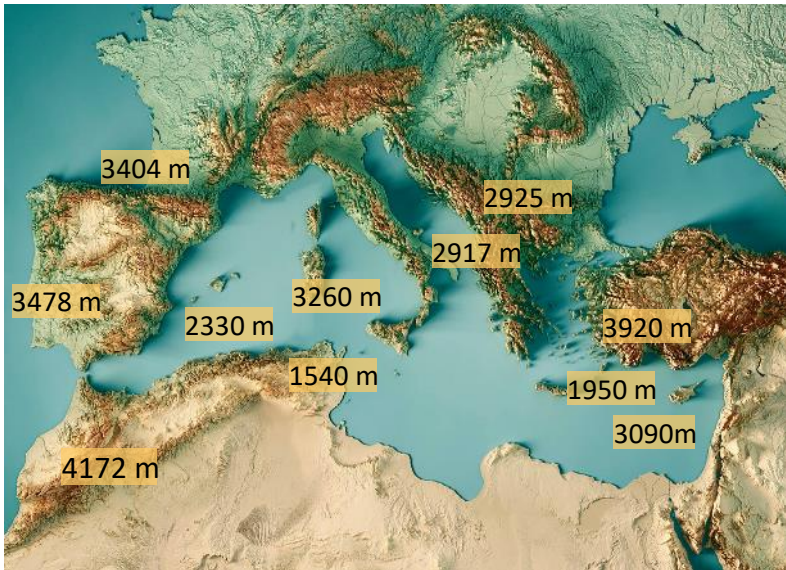


Figure 4.3 Freshwater ecoregions of the Mediterranean Basin Hotspot (WWF, 2006 and TNC, 2011-2013)



Μεσόγειος

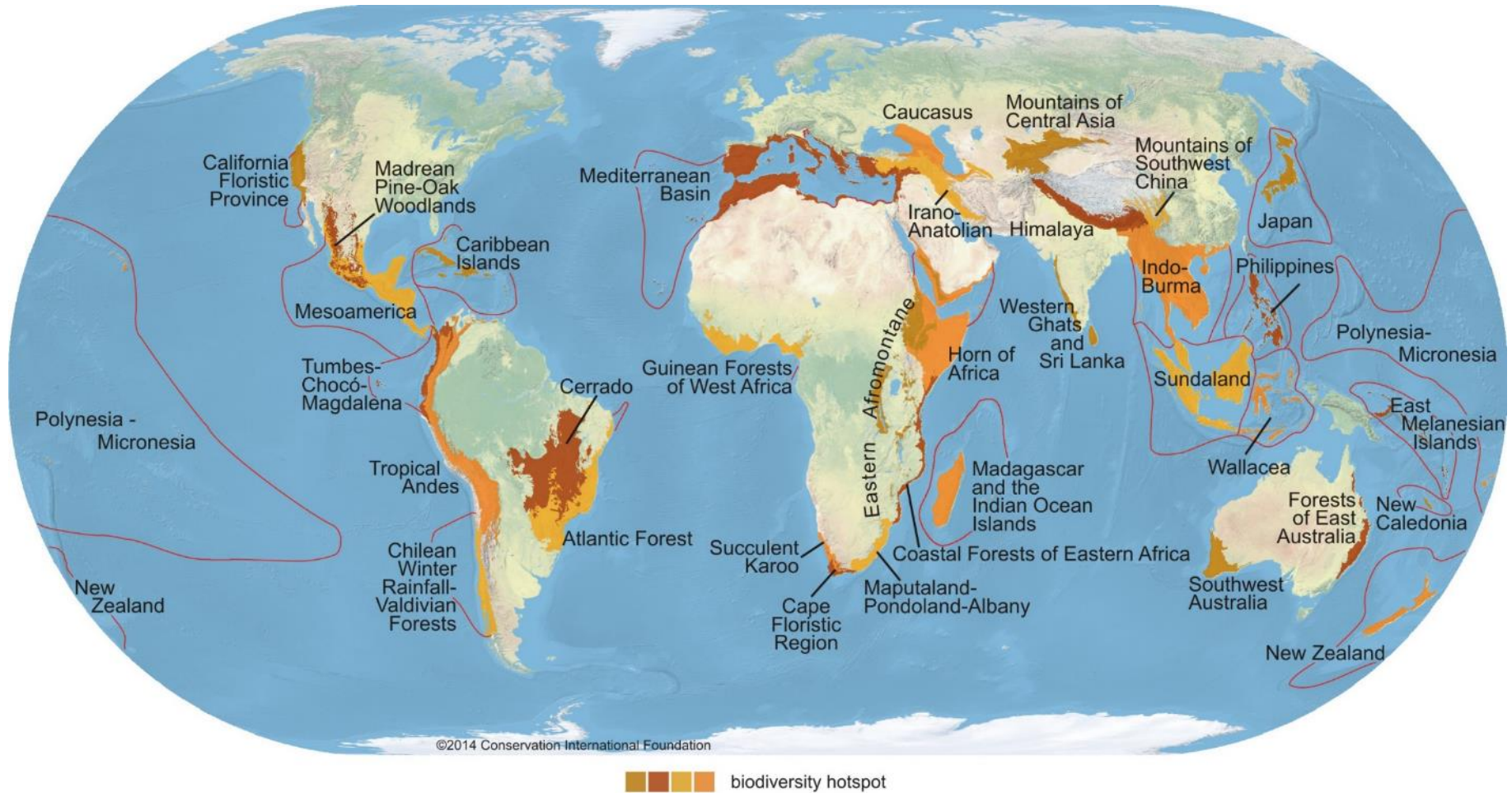
- ▶ Είναι η Μεσόγειος μία ενιαία ξηρά;
- ▶ Είναι η Μεσόγειος μία θάλασσα;



Αρχιπέλαγος

- βιοτοπικά νησιά
- γεωγραφικά νησιά

Hotspot Βιοποικιλότητας



Conservation International (conservation.org) defines 35 biodiversity hotspots — extraordinary places that harbor vast numbers of plant and animal species found nowhere else. All are heavily threatened by habitat loss and degradation, making their conservation crucial to protecting nature for the benefit of all life on Earth.

Άνθρωπος

► Τροποποιεί το περιβάλλον



Άνθρωπος

- ▶ Τροποποιεί το περιβάλλον
- ▶ Διακοπή χερσαίας επικοινωνίας - «ανθρωπογενής βικαριανισμός»
- ▶ Θαλάσσια επικοινωνία – «ανθρωπογενής διάχυση»



Άνθρωπος

► Τροποποιεί το περιβάλλον



Η Λευκάδα αποκόπηκε από την Αιτωλοακαρνανία τον 7^ο αιώνα π.Χ. από τους αρχαίους Κορίνθιους. Σήμερα ενώνεται με γέφυρα.

Χαλκιδική - Άθως
Ξέρξης 480 π.Χ.



Άνθρωπος

- ▶ Τροποποιεί το περιβάλλον
- ▶ Πολλές εισαγωγές φυτών και ζώων



Ξενικά Εισβλητικά είδη

- ▶ Charles Elton (1900-1991)
- ▶ Ιδρυτής της σύγχρονης Οικολογίας, της Πληθυσμιακής Οικολογίας,
 - του Οικολογικού Θώκου και της
 - Οικολογίας των Εισβολών - ζώα και φυτά.



The Ecology of Invasions

by Animals and Plants

1958

CHARLES S.
ELTON

Science Paperbacks

It has been cited more than 1500 times in the international literature listed on the Web of Science to date, **more than any other publication on invasions** (Pyšek *et al.*, 2006).

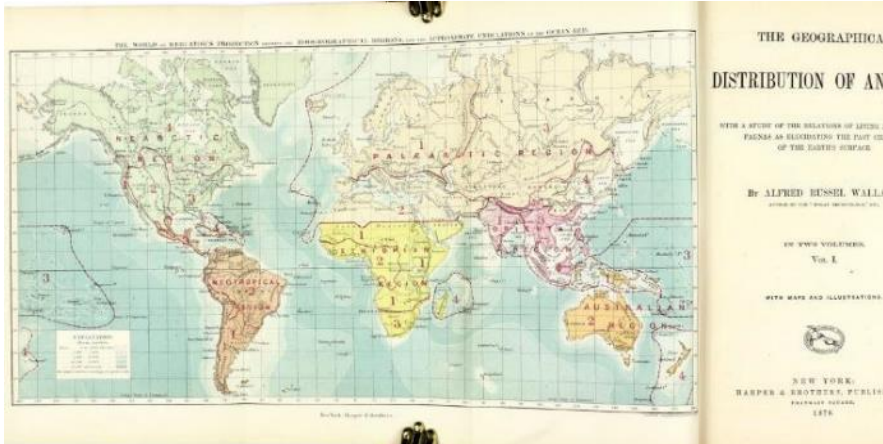
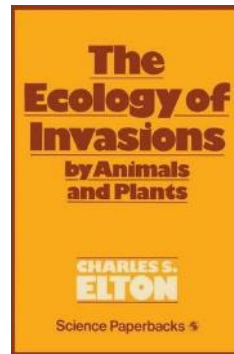
► Charles Elton (1900-1991)

- Οικολογία των Εισβολών - ζώα και φυτά (1958).



ρ. 30: Alfred Wallace: 6 regions (realms): *“They were isolated for long periods that many different animals were isolated or evolved.”*

ρ.51: *Instead of 6 continental realms of life, separated by barriers to dispersal, there will be one world with the remaining wild species dispersed up to the limits set by genetic characteristics, not to the narrower limits set by mechanical barriers as well.*



Ορισμοί

- ▶ Ιθαγενές (Native)
- ▶ Ξενικό (Alien) ή Εισαγμένο (Introduced)
- ▶ Εισβλητικό (Invasive Alien)

- ▶ **Ιθαγενές (Native):** Είδος που υπάρχει ή φτάνει σε μία περιοχή χωρίς την επέμβαση (άμεση ή έμμεση) του ανθρώπου.

Native plants

Synonym: indigenous plants.

Definition: Taxa that have originated in a given area without human involvement or that have arrived there without intentional or unintentional intervention of humans from an area in which they are native.

Interpretation: This definition excludes products of hybridization involving alien taxa since “human involvement” in this case includes the introduction of an alien parent.

TAXON 53 (1) • February 2004: 131–143

Pyšek et al. • Alien plants in checklists and floras

Hui et al. 2017

Native species (synonym: indigenous species, sometimes referring to native species occurring over a broad range, and endemic species, sometimes used to refer to native species found nowhere else, over a much smaller range)—Species that have evolved in a given area or that arrived there by natural means (via range expansion), without the intentional or accidental intervention of humans from an area where they are native.

► **Ξενικό (Alien) ή Εισαγμένο (Introduced):** Είδος που υπάρχει σε μία περιοχή λόγω εκούσιας ή ακούσιας δράσης του ανθρώπου και το οποίο έχει υπερβεί βιογεωγραφικά φράγματα.

- π.χ. Αροκάρια

TAXON 53 (1) • February 2004: 131–143

Pyšek et al. • Alien plants in checklists and floras

Alien plants

Synonyms: exotic plants; introduced plants; non-native plants; non-indigenous plants.

Definition: Plant taxa in a given area (see below) whose presence there is due to intentional or unintentional human involvement, or which have arrived there without the help of people from an area in which they are alien (Fig. 2).

Interpretation: Taxa can be alien to any definable area, e.g., continents, islands, bio- or ecoregions, or any political entity (e.g., countries, states, provinces). Human involvement here does not include habitat changes, global warming, atmospheric nitrogen fertilization, acid rain, etc. Native species that change their geographical range due to these processes should not be considered aliens unless there is clear evidence of significant leaps in distribution attributable to human-aided dispersal of propagules. For the purpose of particular studies, a geographic modifier should be included of how far a taxon has to be moved by human activities from the border of its native distribution to be considered alien. It would normally be arbitrary where political boundaries are involved, and natural where biogeographic boundaries exist, e.g., between islands and mainlands, on the borders of phyto-geographical regions or wherever there are natural barriers. The term alien also includes all non-native taxa under cultivation. Many alien taxa that currently are not casual aliens, naturalized plants or invasive plants, may become such in the future.

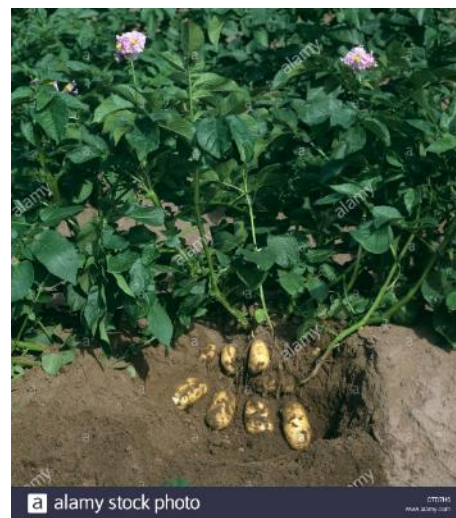


Μελιτζάνα Παλαιαρκτικό ξενικό στην Αμερική.

Alien species: a species moved by human activities beyond the limits of its native geographic range into an area in which it does not naturally occur. The movement allows the species to overcome fundamental biogeographic barriers to its natural dispersal. Common synonyms are exotic, introduced, non-indigenous, or non-native [50]. Blackburn et al. 2014

Alien species (synonyms: adventive, exotic, foreign, introduced, non-indigenous, non-native)—Species whose presence in a region is attributable to human actions that enabled them to overcome fundamental biogeographical barriers (i.e. human-mediated extra-range dispersal). Some alien species (a small proportion) form self-replacing populations in the new region. Of these, a subset has the capacity to spread over substantial distances from introduction sites. Depending on their status within the naturalization–invasion continuum, alien species may be objectively classified as casual, naturalized, or invasive.

Hui et al. 2017



Πατάτα Αμερικάνικο ξενικό Ευρώπη.

► Εισβλητικό (Invasive Alien): Είδος ξενικό το οποίο

- διατηρεί πληθυσμούς,
- παράγει γόνιμους απογόνους για πολλές γενιές,
- εξαπλώνεται σε σχετικά μεγάλες αποστάσεις από τον πατρικό πληθυσμό ή τον τόπο εισαγωγής.

εισβλητικό ≠ επεκτατικό

διαφορετική ίδια

βιογεωγραφική περιοχή

An **alien** (exotic, non-native, nonindigenous, introduced) species is considered **invasive** when it sustains self-replacing populations over several life cycles, spreads considerable distance from its site of introduction and often reaches very large numbers (Richardson et al. 2000, 2011).

Invasive plants

Definition: Invasive plants are a subset of naturalized plants (Fig. 2) that produce reproductive offspring, often in very large numbers, at considerable distances from the parent plants, and thus have the potential to spread over a large area.

Interpretation: Approximate scales: > 100 m in < 50 years for taxa spreading by seeds and other propagules (for dioecious taxa that rely exclusively on seeds for reproduction, this applies only after the introduction of both sexes); > 6 m in 3 yrs for taxa spreading by roots, rhizomes, stolons, or creeping stems. Taxa that spread previously, but do not spread currently because the total range of suitable habitats and landscapes has been occupied, should still be termed invasive because local eradication will undoubtedly lead to re-invasion. Many alien taxa that are not classified as “invasive” by the criteria above may become invasive in the future, given time to reach optimum habitats, to make adaptive genetic changes, or when key mutualist partners arrive in their new range; some taxa may also become invasive because of the introduction of new genotypes.

Hui et al. 2017

Invasive species—Alien species that sustain self-replacing populations over several life cycles produce reproductive offspring, often in very large numbers at considerable distances from the parent and/or site of introduction, and have the potential to spread over long distances. Invasive species are a subset of naturalized species; not all naturalized species become invasive. This definition explicitly excludes any connotation of impact, and is based exclusively on ecological and biogeographical criteria. It should be noted that the definition supported by the World Conservation Union (IUCN), the Convention on Biological Diversity (CBD), and the World Trade Organization (WTO) that explicitly assumes invasive species cause impacts on the economy, environment, or health. This important difference has implications for risk analyses of invasive species. Consequently, it is crucial for risk assessment protocols to assign dimensions of risk separately for elements of invasion and impact. Note: designation of a species as invasive should include a statement about the region under discussion; depending on the scale of observation.

► Χρόνος εισαγωγής (ακούσια) ξενικών ειδών (φυτών):

- Αρχαιοφύτο πριν τον Κολόμβο (πριν 1500μ.Χ.)
- Νεόφυτο μετά τον Κολόμβο (μετά 1500 μ.Χ.)

► Τι ισχύει στη Μεσόγειο;

Table 1. Comparison of the terminology for alien plants that has been traditionally used in Central-European classification schemes (based on Holub & Jirásek, 1967) with the one suggested in the present paper (based on Richardson & al., 2000). Criteria used by Holub & Jirásek (1967) for the classification of particular categories are indicated: T = time of immigration, M = means of introduction, H = type of encountered habitat. Note that in our scheme, neophytes and archaeophytes are subdivisions of both hemerophytes and xenophytes (see Pyšek & al., 2002b).

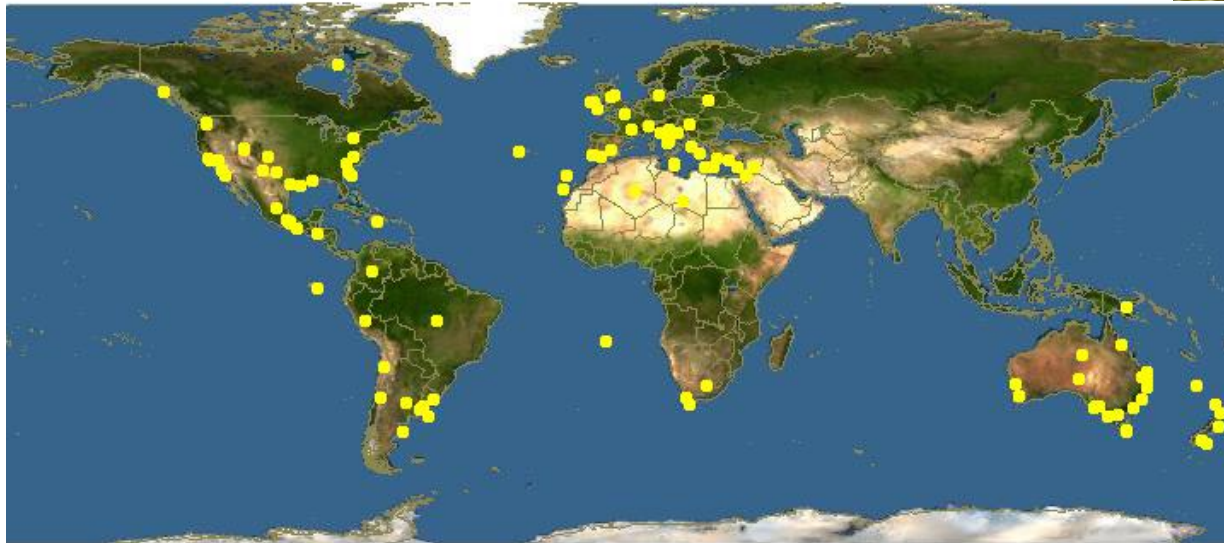
Term in Holub & Jirásek (1967)	Criteria	Explanation	As expressed using the terminology here
Anthropophytes		introduced by people regardless of time and means	alien
I. Hemerophytes	M	introduced intentionally	any intentionally introduced alien
1. Ergasiophytes	MH	found only in cultivation	cultivated alien
2. Ergasiophygo-phytes	MH	found in cultivation and occasionally escaping	intentionally introduced casual alien
3. Ergasiolipophytes	MH	formerly planted, currently occurring in the territory without need of human intervention	intentionally introduced alien, naturalized or invasive
II. Xenophytes	M	unintentionally introduced	any unintentionally introduced alien
1. Archaeophytes	MT	unintentionally introduced before ca. 1500 ¹	alien introduced before ca. 1500, both deliberately or accidentally, regardless of invasion status
2. Neophytes	MT	unintentionally introduced after ca. 1500	alien introduced after ca. 1500, both deliberately or accidentally, regardless of invasion status
(a) Ephemerophytes	MTH	occurring temporarily in human-made habitats	casual alien introduced after ca. 1500
(b) Epekeophytes	MTH	established in human-made habitats	alien introduced after ca. 1500, naturalized or invasive in human-made habitats
(c) Neoindigeno-phytes ²	MTH	established in the region, occurring in human-made habitats and penetrating to natural habitats, too	alien introduced after ca. 1500, naturalized or invasive in seminatural and/or natural habitats

¹ Approximate date corresponding to the discovery of America (1492).

² Some authors use the term "agriophytes" (Schroeder, 1969; Lohmeyer & Sukopp, 1992) for this category, which is sometimes further divided into "hologriophytes" (in natural vegetation) and "hemagriophytes" (in seminatural vegetation; see, e.g., Kornas, 1990).

Cornu aspersum

- ▶ **Ιθαγενές (Native):** ΒΔ Αφρική, Άτλαντας.
- ▶ **Ξενικό (Alien):** υπόλοιπες Μεσογειακές χώρες (μινιώτες, φοίνικες).
- ▶ **Εισβλητικό (Invasive Alien):** Αμερική (Β & Ν), Νότια Αφρική, Αυστραλία.



Εισαγωγή

- ▶ Η μελέτη της εισβολής των ειδών έχει αυξηθεί σημαντικά τα τελευταία χρόνια.
- ▶ Ποια είναι τα βιολογικά χαρακτηριστικά που καθορίζουν αν ένα είδος θα γίνει ή όχι εισβλητικό;
 - Αναπαραγωγικός ρυθμός,
 - Υψηλή ικανότητα διασποράς,
 - Απουσία θηρευτών...
- ▶ Ποια είναι τα χαρακτηριστικά ενός οικοσυστήματος που καθορίζουν αν είναι επιρρεπές σε εισβολές ή όχι;
 - Διαταραχή
 - Παρόμοιες κλιματικές συνθήκες

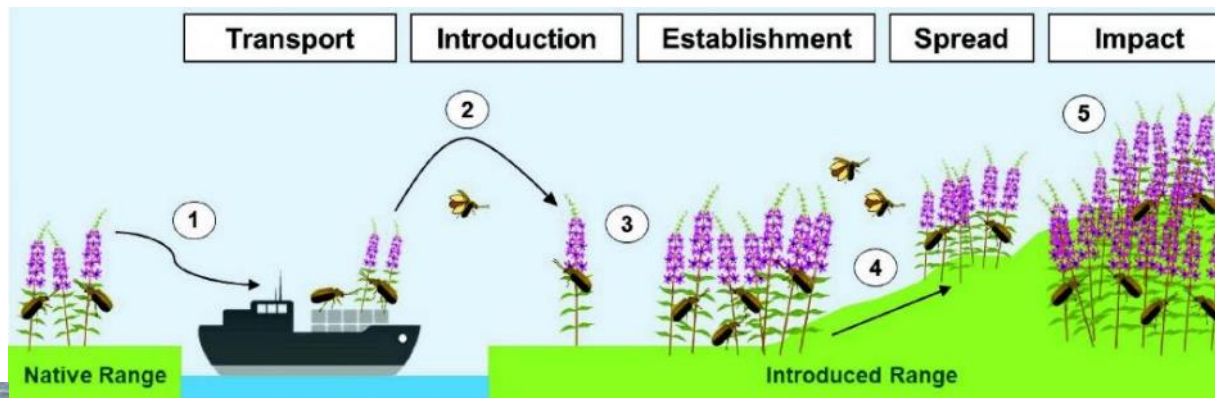
Williamson (1993): μόνο το 0,1% των εγκλιματισμένων ειδών καταλήγουν εισβλητικά.

Ούτε κάποιο συγκεκριμένο χαρακτηριστικό ούτε ένα απλό αίτιο (Elton, 1958)

***«αδυνατούμε να προβλέψουμε αν μια εισαγωγή θα πετύχει»
Crawley (1987)***

Τρόποι εισαγωγής ξενικών ειδών

- ▶ Έμμεσοι
- ▶ Άμεσοι



Τρόποι εισαγωγής ξενικών ειδών

▶ Άμεσοι



Τρόποι εισαγωγής εντόμων

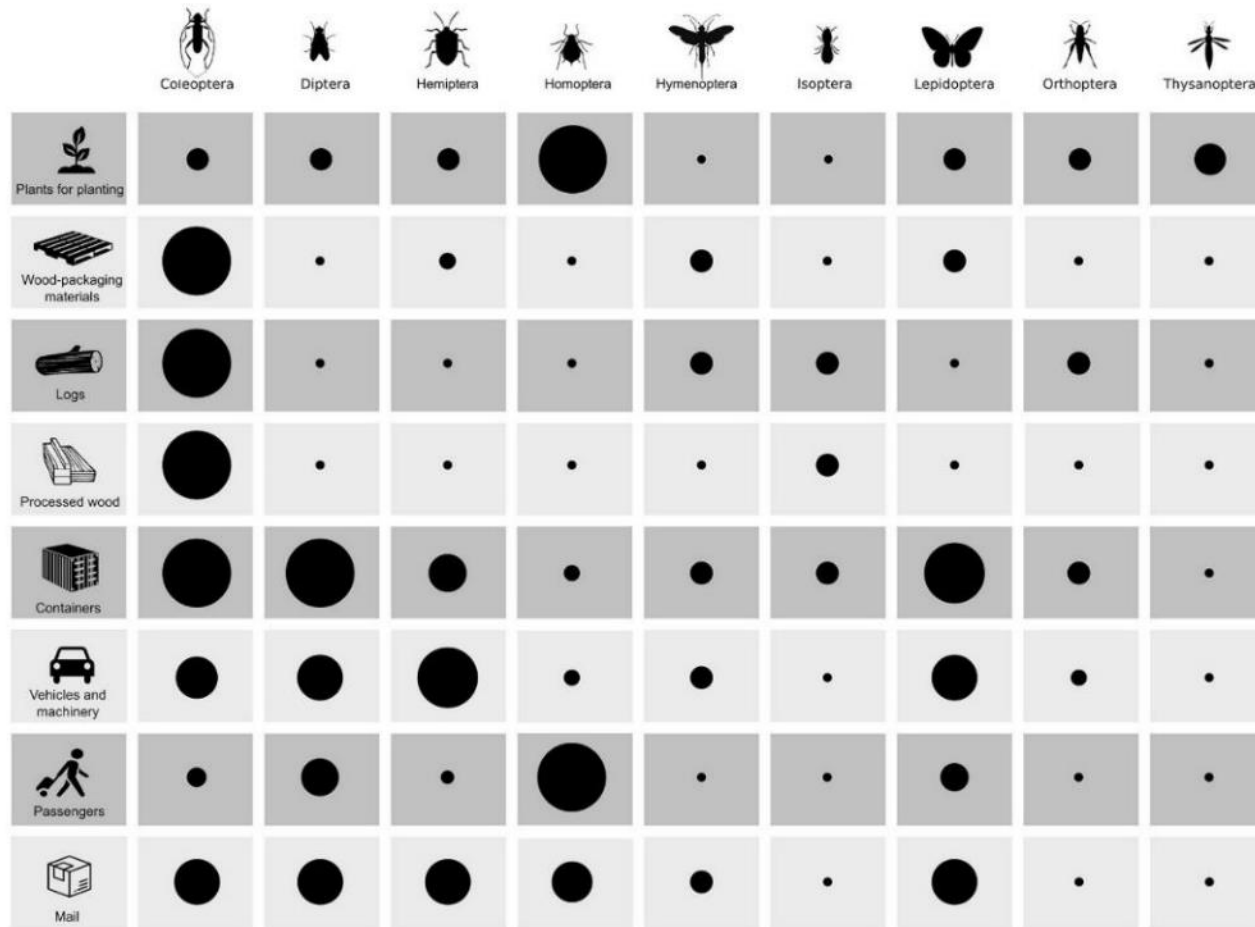


Fig. 1 Relative frequency of insect orders unintentionally transported on common pathways. The size of the circle denotes the relative importance of each insect order within each pathway, based on interceptions at ports-of-entry (MAF 2003; Caton et al. 2006; Liebhold et al. 2006; Table 1) and informed estimates. Heteroptera refers to the “true bugs” formerly classified as the order Hemiptera. Homoptera refers to the three current suborders Auchenorrhyncha, Sternorrhyncha, and Coleorrhyncha. The order Orthoptera includes Phasmida and Blattodea (but not termites). Live plants=live plants, cuttings, and

seeds; Logs=wood traded as logs and which can be used for various purposes such as lumber, pulp, or fuel; Wood packaging=dunnage, crating, pallets, skids, and drums; Processed wood=sawn timber and other processed bulk wooden material, wooden cargo such as wooden sport items, furniture, and handicrafts, furniture, and flooring; Containers=containers, cargo, sea and air vessels, and land modes of transport; Vehicles=trade vehicles, and machinery; Passengers=passengers themselves, their luggage, and personal effects

Τρόποι εισαγωγής ξενικών ειδών στην Ευρώπη

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P. Pyšek et al.

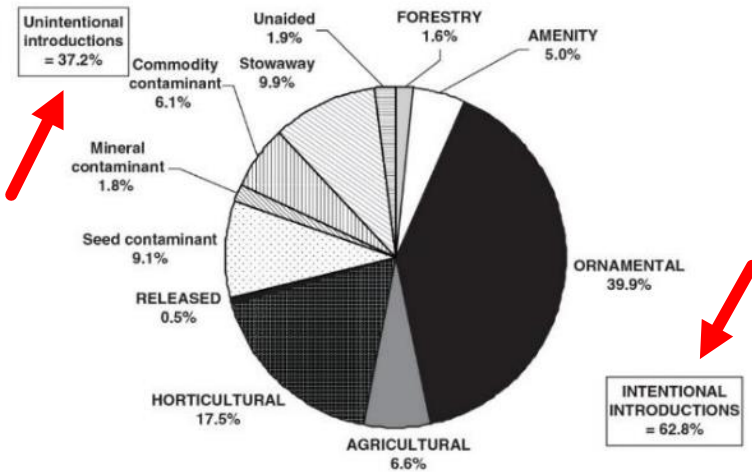
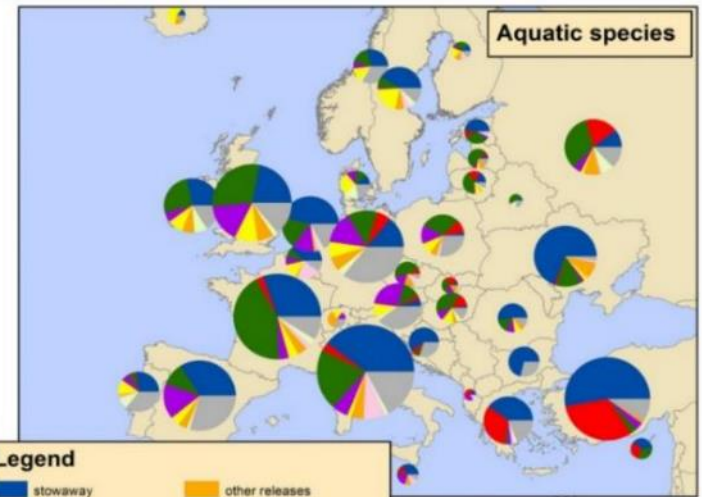
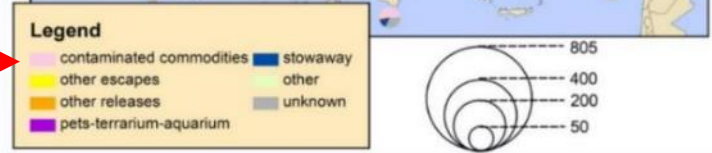
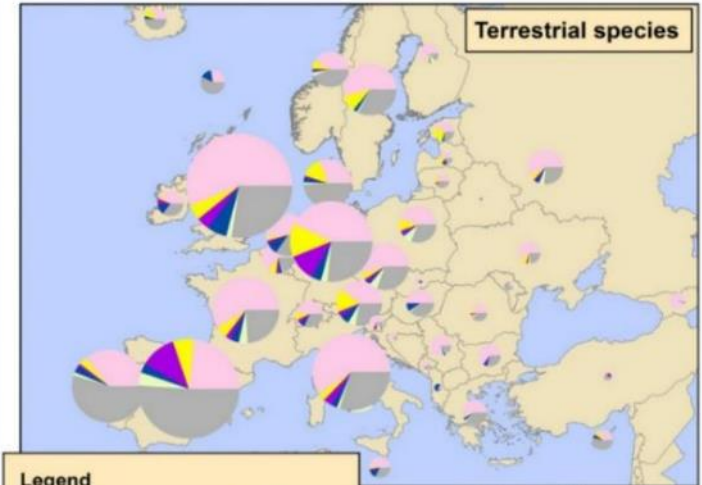


Fig. 4.4 Relative contribution of pathways of introduction sh i.e. species with the area of origin outside Europe. Pathway upper case letters, unintentional in lower case (Based on Lambdon et al. 2008)

Figure 4. Geographic variation of the importance of main pathways of introductions in Europe, of aquatic and terrestrial alien species. The size of the pie charts indicates the approximate numbers of alien species per recipient country of first introduction. Species of European origin have been counted in the country of first introduction in their alien range. Outermost regions were excluded. A few species that were linked to more than one pathway were given a value of $1/k$ for each of the k associated pathways so that the overall contribution of each species to the pie charts was always 1. Pathway categories as in Figure 3.

Katsanevakis et al 2015



Τρόποι εισαγωγής ξενικών ειδών στη Μεσόγειο

42

Philip E. Hulme et al.

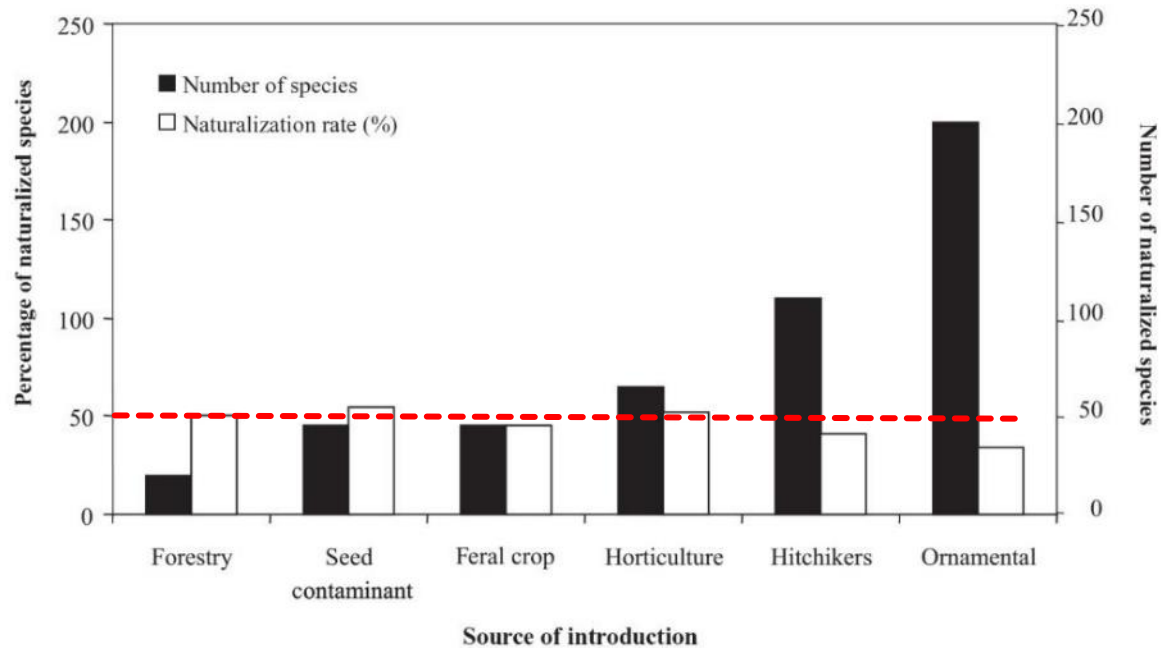


Fig. 1. Major pathways of introduction for alien plants occurring on Mediterranean islands. Both the number of species introduced and the percentage of species successfully naturalizing are presented for each of six invasion pathways.

Hulme et al. 2008: Mediterranean Islands.

Οικοσυστήματα «δέκτες» στα νησιά της Μεσογείου.

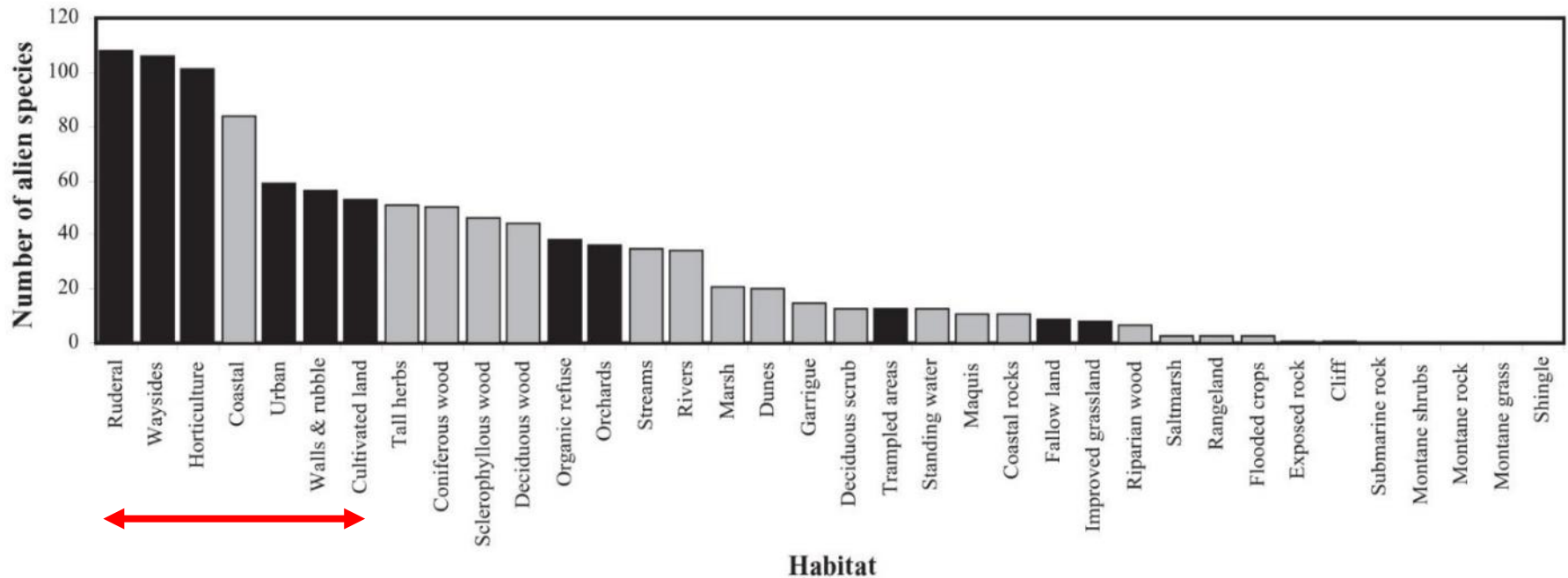
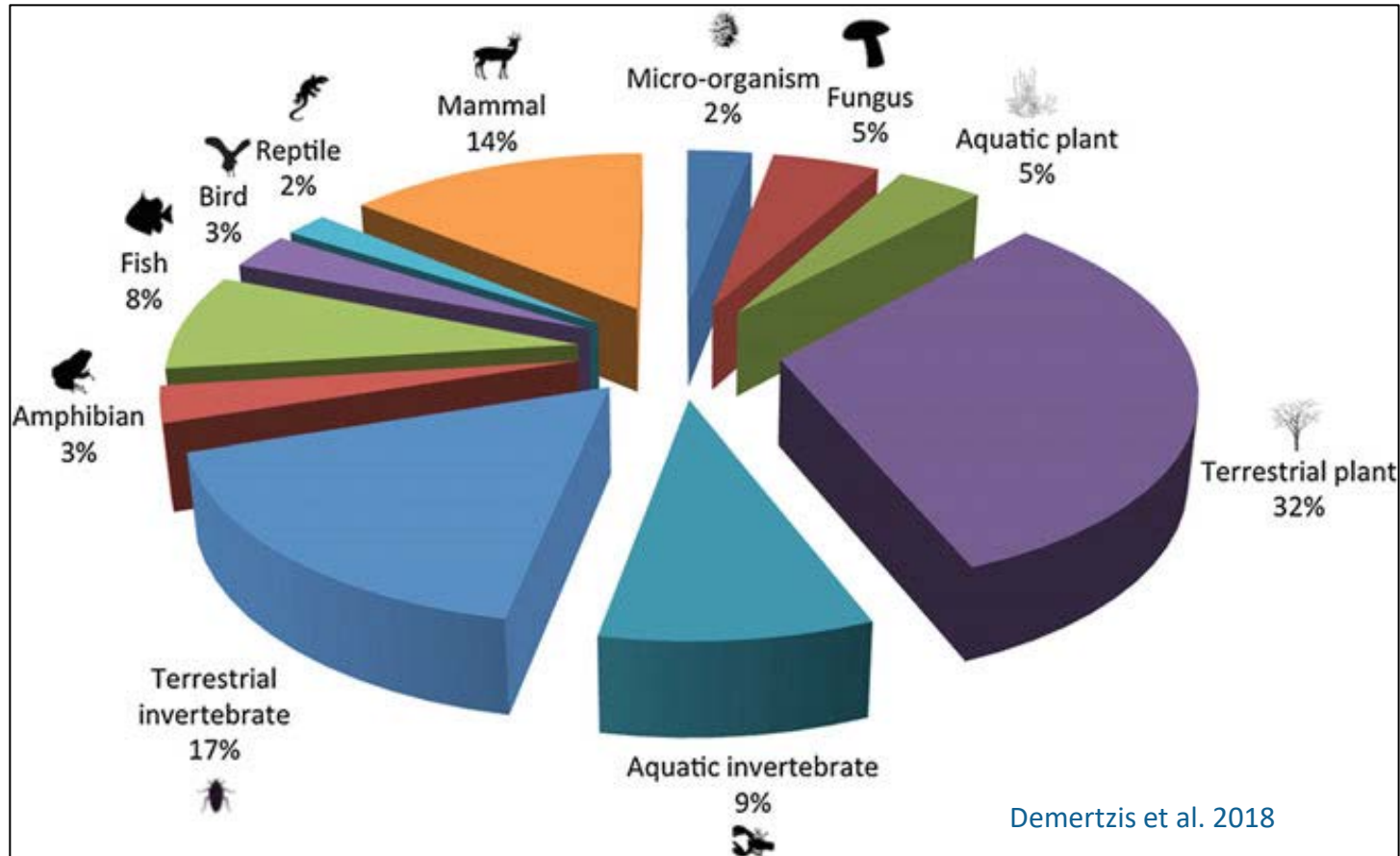


Fig. 4. Number of alien species occurring in different Mediterranean island habitats. Human-dominated habitats are highlighted by dark shading.

Hulme et al. 2008: Mediterranean Islands

Ξενικά είδη στην Ελλάδα



Ξενικά Φυτά

- ▶ Τα περισσότερα ξενικά είδη συναντώνται σε παράκτια οικοσυστήματα και στα εσωτερικά ύδατα.
- ▶ *Opuntia ficus-barbarica*, *Ailanthus altissima*, *Oxalis pes-caprae*, είναι εισβλητικά.



Erigeron bonariensis



Oxalis pes-caprae



Opuntia ficus-barbarica

Ailanthus altissima

▶ Ασιατικό είδος

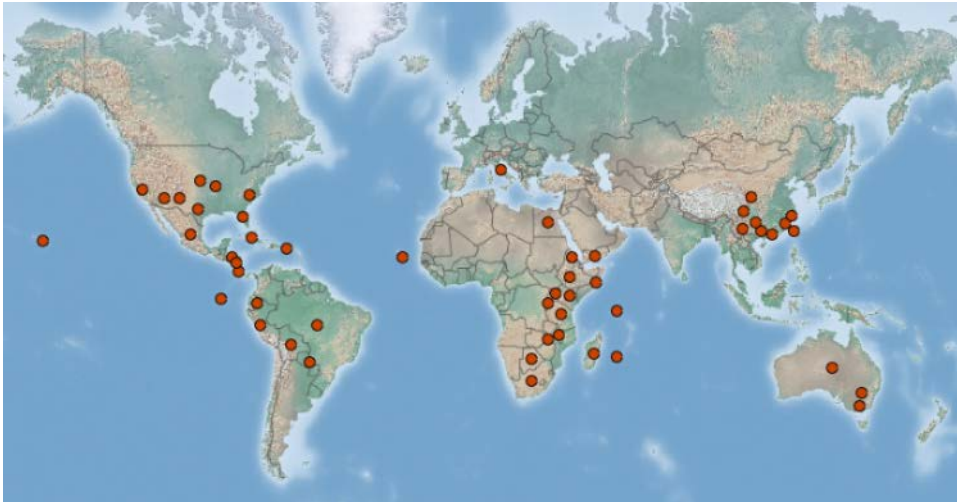
▶ Εισβλητικό

- Παράδρομο, Σκουπιδότοποι,
- Έντονα επηρεασμένες περιοχές,
- Αλλά συναντάται και σε όλους τους βιοτόπους.



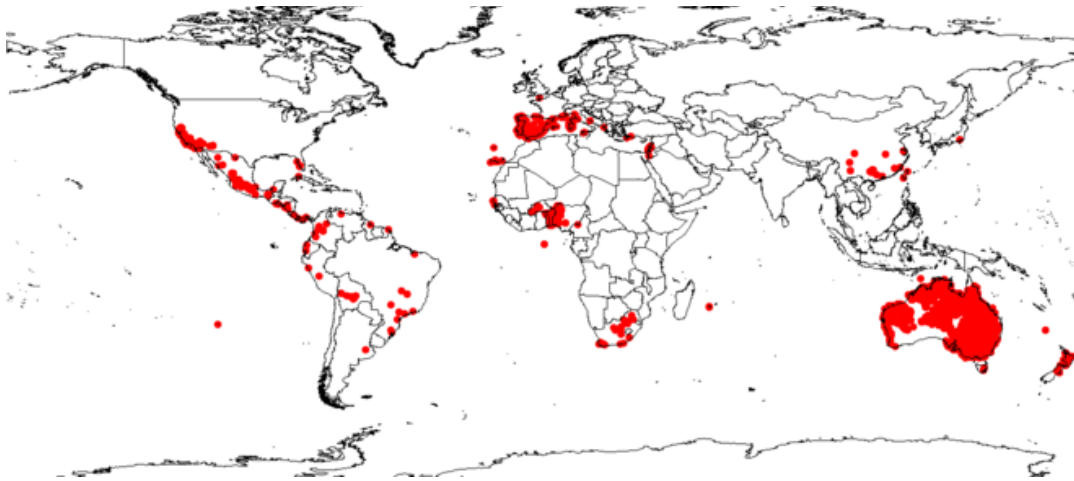
Nicotiana glauca

- ▶ ΒΔ Αργεντινή, Βολιβία
 - Κυρίως σε έντονα επηρεασμένες περιοχές
- ▶ Εισβλητικό



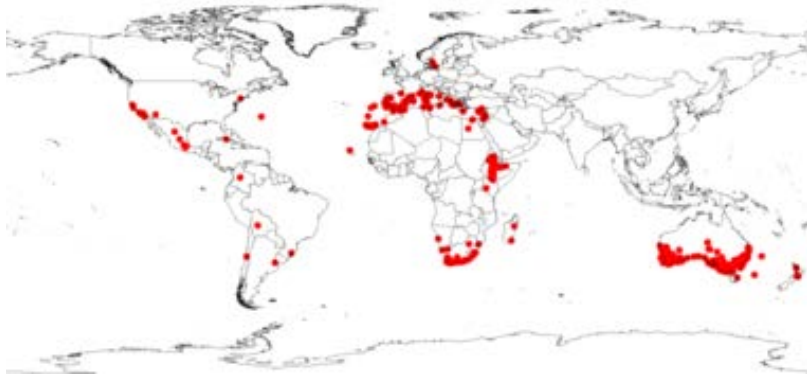
Ευκάλυπτος

- ▶ Αυστραλία
- ▶ Ξενικό, σπάνια εισβλητικό (εισβάλλει σπάνια σε παρόχθιες διαπλάσεις)
 - Χρησιμοποιείται σε αναδασώσεις για ξυλεία, παραγωγή χαρτιού, αιθέρια έλαια κ.λπ.
 - Είναι πολύ εύφλεκτο.



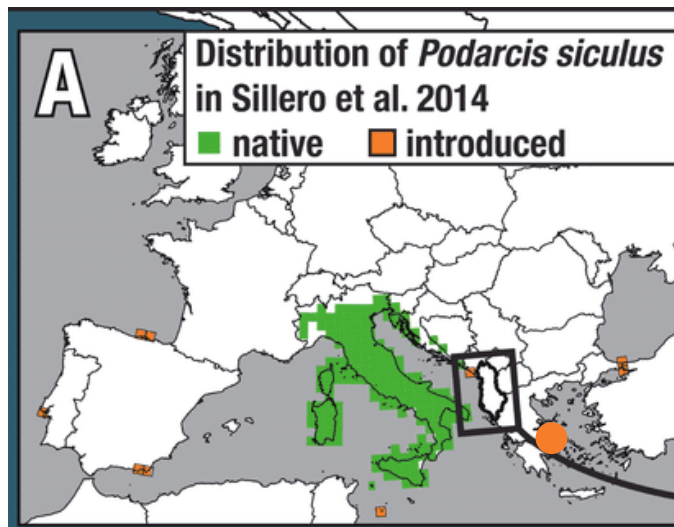
Acacia saligna

- ▶ Δυτική Αυστραλία
- ▶ Εισβλητικό
 - Παράδρομο, καλλιέργειες



Podarcis siculus

- ▶ Ιταλική χερσόνησος και βόρεια παράλια Αδριατικής
- ▶ Ξενικό είδος
 - 1 πληθυσμός Αθήνα (Παλιό Φάληρο)
 - Πορτογαλία, Β & ΝΑ Ισπανία,
 - Μάλτα, Κωνσταντινούπολη.



Neovison vison

- ▶ Βόρεια Αμερική
- ▶ Ξενικό
 - Εισήχθη για εκτροφή για τη γούνα.



Το 2010 ελευθερώθηκαν 52.000 άτομα από δύο εκτροφεία σε Κοζάνη και Καστοριά. Έχουν εξαπλωθεί στη γύρω περιοχή και παρατηρήθηκαν στις Πρέσπες.

Myocastor coypus

- ▶ Νότια Αμερική
- ▶ Εισβλητικό είδος



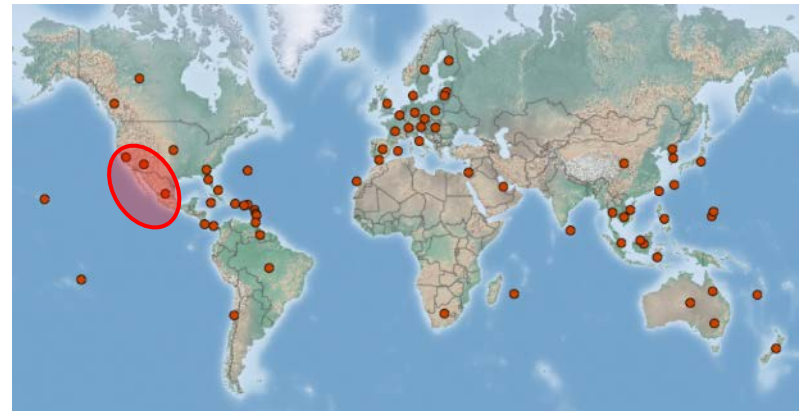
Lithobates catesbeianus

- ▶ Αμερική
- ▶ Εισβλητικό



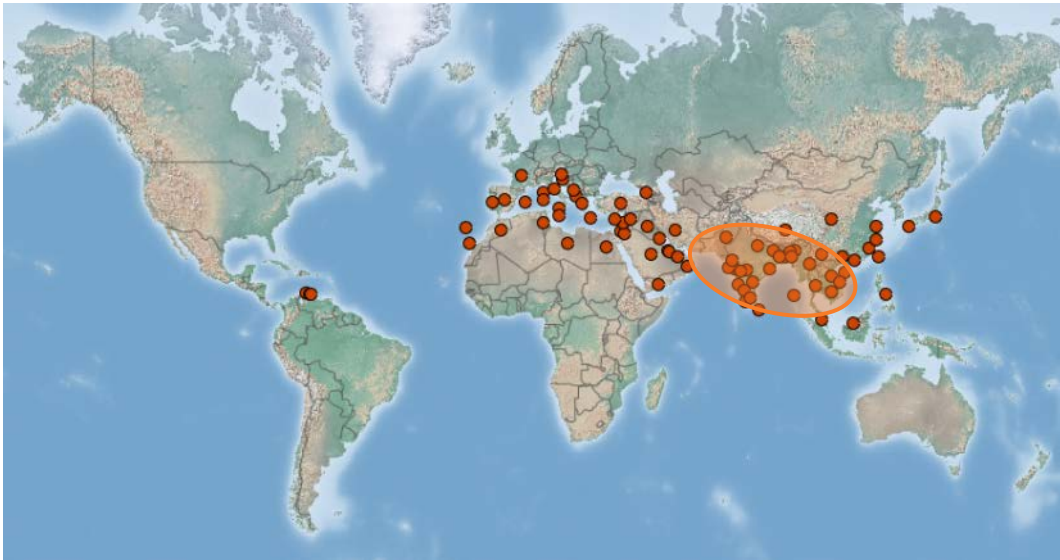
Trachemys scripta

- ▶ Ανατολική ΗΠΑ & ΒΑ Μεξικό
- ▶ Εισβλητικό
- ▶ Απειλούνται τα ιθαγενή είδη



Rhynchophorus ferrugineus

- ▶ Πακιστάν-Ταϊβάν
- ▶ Εισβλητικό
 - Καταστρέφει φοίνικες



Leptinotarsa decemlineata

- ▶ Αμερική
- ▶ Εισβλητικό
 - Δορυφόρος της Πατάτας
 - Καταστροφές σε καλλιέργειες



Γαστερόποδα χερσαία









► Ιβηρική, Βόρεια Αμερική, Βόρεια Ευρώπη

- Στην Ελλάδα 6 ξενικά είδη, αλλά προέρχονται από διαφορετικές βιογεωγραφικές περιοχές.

► Ξενικά

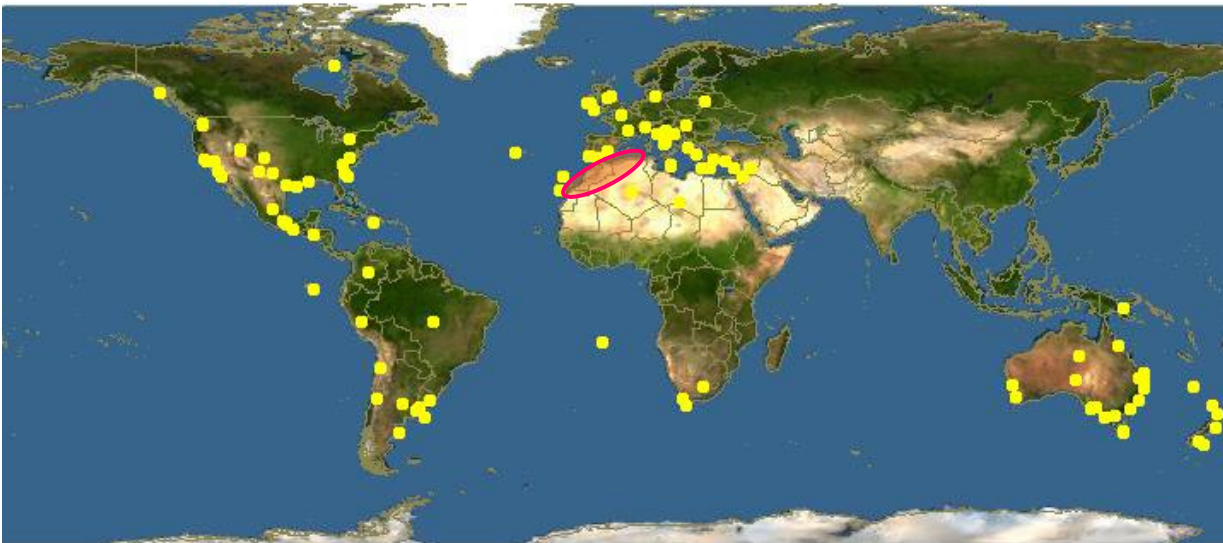
- Εισαγωγές μέσω διεθνούς εμπορίου φυτών, κυρίως κηπουρικών (horticulture) ή/και καλλωπιστικών (ornamental).
- Συναντώνται κυρίως σε περιοχές έντονα επηρεασμένες από τον άνθρωπο (αστικές, περιαστικές, καλλιέργειες).



Alien species	Year of first record	
	Greece	Cyprus
 <i>Lehmannia valentiana</i> (A. Ferrussac, 1822)	2004 ^a	2016
 <i>Boettgerilla pallens</i> (Simroth, 1822)	2011 ^b	-
 <i>Deroceras invadens</i> Reise, Hutchinson, Schunack & Schlitt, 2011	2014 ^c	-
 <i>Succinea putris</i> (Linnaeus, 1758)	-	2009 ^e
 <i>Oxyloma</i> sp.	2010	-
 <i>Hawaii minuscula</i> (Binney, 1841)	2009 ^d	-
 <i>Zonitoides nitidus</i> * (Müller, 1774)	2015	-
 <i>Polygyra cereolus</i> (Mühlfeld, 1816)	-	2009 ^e

Cornu aspersum

- ▶ **Ιθαγενές (Native):** ΒΔ Αφρική, Άτλαντας.
- ▶ **Ξενικό (Alien):** υπόλοιπες Μεσογειακές χώρες.
- ▶ **Εισβλητικό (Invasive Alien):** Αμερική (Β & Ν), Νότια Αφρική, Αυστραλία.

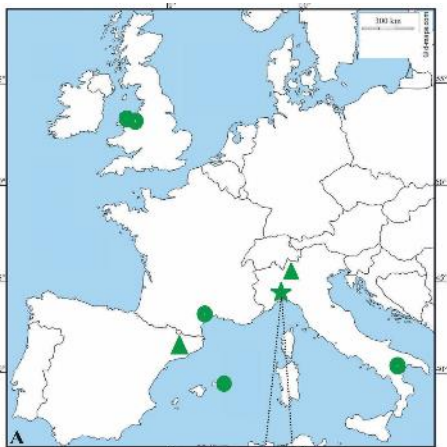


Platyhelminthes

► Εισβλητικά

- Εισαγωγές μέσω φυτών, κυρίως λόγω διεθνούς εμπορίου κηπουρικών (horticulture) ή/και καλλωπιστικών (ornamental).

Girardia tigrina: Νεαρκτικό είδος που εισήχθη στην Ευρώπη τη δεκαετία του 1920.



















Caenoplana bicolor: Αυστραλιανό είδος

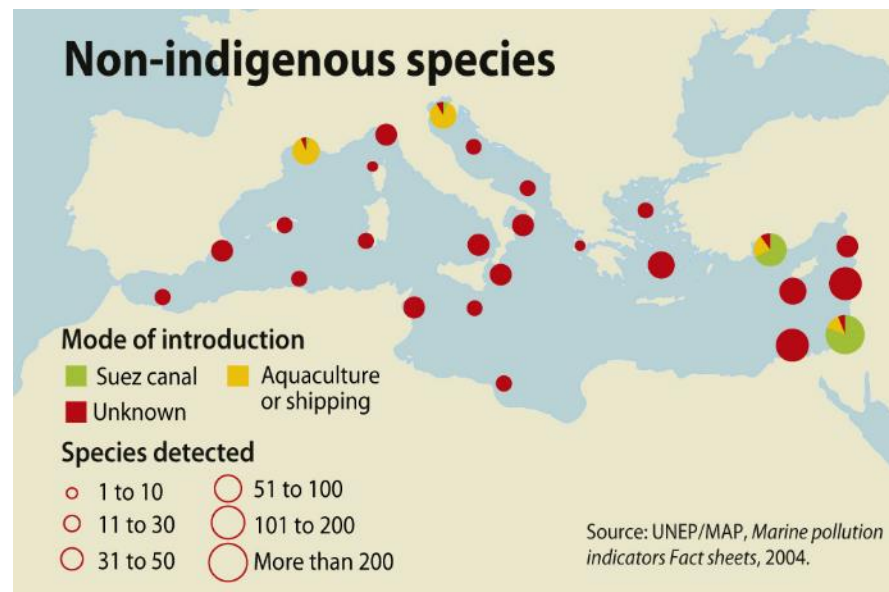
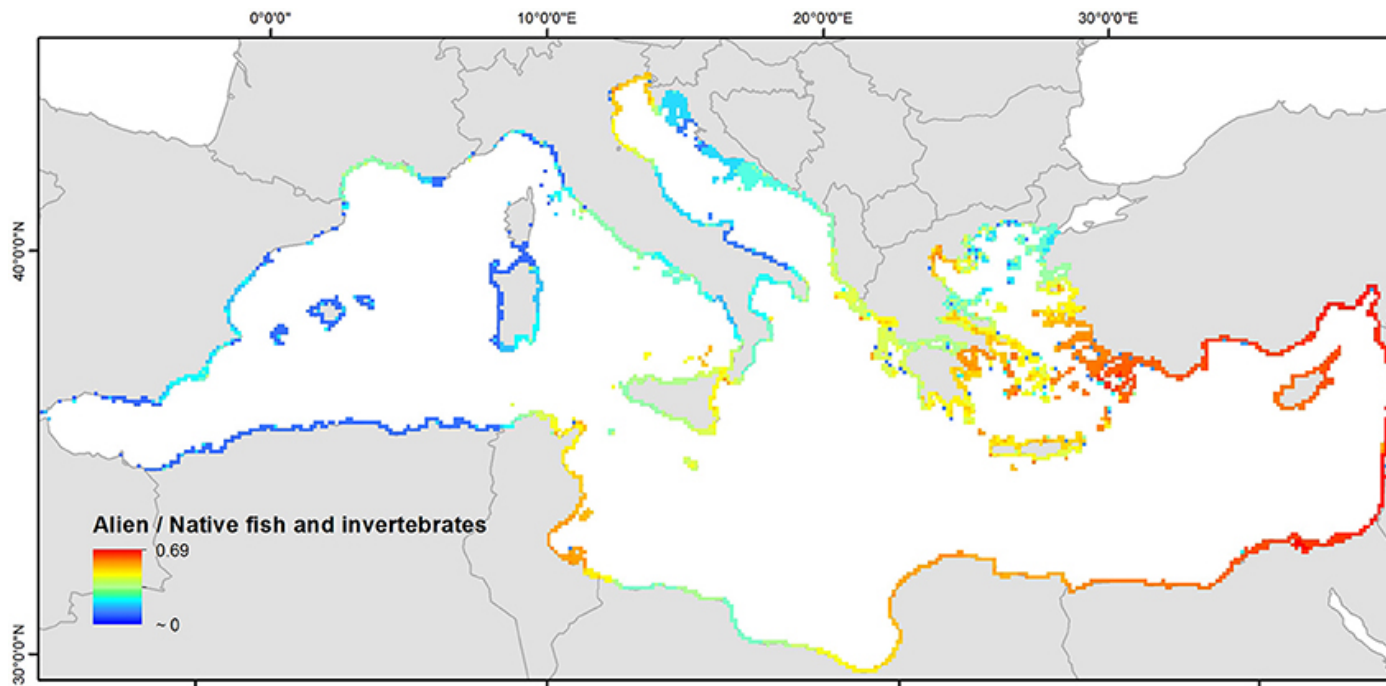


Figure 3. *Caenoplana bicolor* from western Crete. A: largest specimen; B: part of the underside of the body; C: both specimens.

Selected Invasive Flatworms

species	common name (if applicable)	native range	nonnative range
 <i>Arthurdendylus triangulatus</i>	New Zealand flatworm	New Zealand	Faroe Islands, Ireland, United Kingdom
 <i>Artiposthia exulans</i>		New Zealand	United Kingdom
 <i>Australoplana sanguinea</i>	Australian flatworm	Australia	United Kingdom
 <i>Bipalium adventitium</i>		unknown	United States
 <i>Bipalium kewense</i>		Indochina	All over world, including the United Kingdom and United States
 <i>Bipalium multilineatum</i>		Japan	France, Italy, and maybe South Korea
 <i>Bipalium pennsylvanicum</i>		unknown	United States
 <i>Bipalium vagum</i>		unknown	Bermuda, United States
 <i>Caenoplana bicolor</i>		Australia	Italy, Spain, the Netherlands, United Kingdom
 <i>Caenoplana coerulea</i>	Australian blue garden flatworm	Australia	Argentina, France, New Zealand, Norfolk Islands, Spain, United Kingdom, United States
 <i>Dolichoplana striata</i>		Indomalaysia	Spain, United Kingdom, United States
 <i>Kontikia andersoni</i>		New Zealand	United Kingdom
 <i>Marionifylea</i> sp.		New Zealand	France, the Netherlands, United Kingdom
 <i>Obama nungara</i>		Brazil	France, Guernsey, Italy, Spain, United Kingdom
 <i>Parakontikia ventrolineata</i>		Australia	France, Ireland, Mexico, New Zealand, South Africa, United Kingdom, United States
 <i>Platydemus manokwari</i>	New Guinea flatworm	New Guinea	France, Japan, New Caledonia, Puerto Rico, Singapore, the Philippines, Tahiti, the Maldives, the Solomon Islands, United States, various other islands in the southeastern Pacific

This selection of species of introduced land flatworms, including some of the most pernicious invaders, shows their widespread distribution.



Μεσόγειος

- ▶ Είναι η Μεσόγειος μία ενιαία ξηρά;
- ▶ Είναι η Μεσόγειος μία θάλασσα;



Αρχιπέλαγος

- βιοτοπικά νησιά
- γεωγραφικά νησιά

