ISPRA
Istituto Superiore per la Protezione e la Ricerca Ambientale

MINISTERO DELL'AMBIENTE E DELLA TUTELA DEL TERRITORIO E DEL MARE

Società Botanica Italiana onlus
associazione scientifica fondata nel 1888

Approcci metodologici e pratici per un monitoraggio di vasta scala degli habitat di interesse conservazionistico

Alessandro Chiarucci

BIGEA - Alma Mater Studiorum Università di Bologna

verso un piano nazionale di monitoraggio della BIODIVERSITÀ

I MANUALI PER LE SPECIE E GLI HABITAT DI INTERESSE COMUNITARIO

Acquario Romano, 19 e 20 Ottobre 2016

Roma | Piazza Manfredo Fanti, 38

Habitat Italia

home collaboratori documenti archivio link tematici

- 11: Acque marine e ambienti a marea
- 12: Scogliere marittime e spiagge ghiaiose
- 13: Paludi e pascoli inondati atlantici e continentali
- 14: Paludi e pascoli inondati mediterranei e termo-atlantici
- 15: Steppe interne alofile e gipsofile
- 21: Dune marittime delle coste atlantiche, del Mare del Nord e del Baltico
- 22: Dune marittime delle coste mediterranee
- 23: Dune dell'entroterra, antiche e decalcificate
- 31: Acque stagnanti
- 32: Acque correnti - tratti di corsi d'acqua a dinamica naturale o seminaturale (letti minori, medi e maggiori) in cui la qualità dell'acqua non presenta alterazioni significative
- 40: Lande e arbusteti temperati
- 51: Arbusteti submediterranei e

mostra didascalie (in ogni campo)

91: Foreste dell'Europa temperata

9180*: Foreste di versanti, ghiaioni e valloni del Tilio-Acerion

Tilio-Acerion forests of slopes, screes and ravines

Codice CORINE Biotopes

41.4 Mixed ravine and slope forests
41.41 Ravine ash-sycamore forests
41.43 Alpine and peri-Alpine slope forests
41.45 Thermophilous Alpine and peri-Alpine mixed lime forests

Codice EUNIS

G1.A4 Boschi di forra e di versante
  G1.A43 Foreste di versante peri-alpine di *Fraxinus* sp. e *Acer pseudoplatanus*
  G1.A45 Foreste termofile miste della regione alpina e peri-alpina, con *Tilia* sp. dominante
G1.A5 - Boschi con *Tilia* sp. dominante
  G1.A51 - Boschi di *Tilia* sp. dell'Europa centro-occidentale
  G1.A52 - Boschi sub-boreali di *Tilia* sp.
  G1.A53 - Boschi di *Tilia* sp. dell'Europa orientale

Regione biogeografica di appartenenza

Tilia platyphyllos, *Simona Casavecchia*

Habitat Italia

home collaboratori documenti archivio link tematici

mappa del sito

consulta il manuale

SOCIETÀ BOTANICA ITALIANA

Manuale Italiano di interpretazione degli habitat della Direttiva 92/43/CEE

Italian Interpretation Manual of the 92/43/EEC Directive habitats

NATURA 2000

MINISTERO DELL'AMBIENTE E DELLA TUTELA DEL TERRITORIO E DEL MARE

DPN DIREZIONE PER LA PROTEZIONE DELLA NATURA

Praterie e fruticeti alofili mediterranei e termo-atlantici (Sarcocornietea fruticosi)

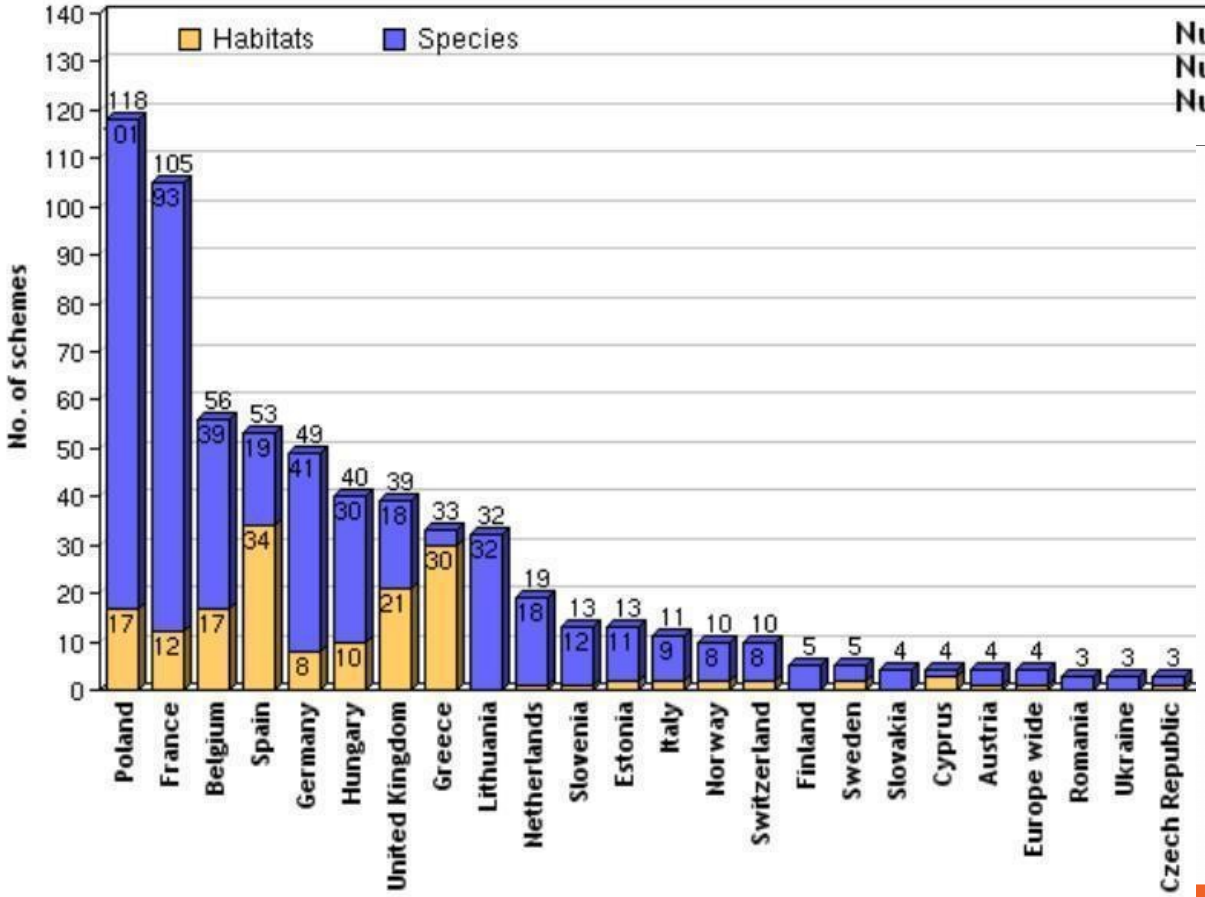
Francescato C.: Suffruticeti succulenti su suoli salati e sullo sfondo il Carso goriziano (Monfalcone, GO)

In caso di problemi contattare il webmaster.

The EuMon Database on European Monitoring Schemes

EuMon Databases

01. Monitoring schemes by country



Number of all schemes : 611
Number of species schemes : 443
Number of habitats schemes: 168

Most countries with EuMon partners comparably well covered

Il Monitoraggio

Perceived and real problems in long-term research and monitoring

Monitoring programs often have a bad reputation [10], and many fail. Norton [18] described how nearly half of all the monitoring programs undertaken in New Zealand went unreported, indicating that the failure rate can be high. Some members of the scientific community have traditionally viewed monitoring as a management activity that is unrelated to scientific research (e.g. Ref. [20]). However, many other authors, including us, have argued that well-conceived and well-executed monitoring is an important component of long-term scientific research programs and, as such, is very useful to natural resource managers and policymakers [8,10,21]. As we argue here, the features of good science and, hence, good research are often the same features that characterize good monitoring and good environmental management.

Lindenmayer & Likens (2011)
Trends in Ecology and Evolution 26: 641–646.

REGIONE TOSCANA
GIUNTA REGIONALE

Dipartimento dell'agricoltura e delle foreste

PROGRAM MON.I.TO.

MONitoraggio Intensivo foreste TOscane

Intensive MONitoring of forests in TOscana

Project "Studies on Forest Damage" 92.60.IT.009.0 co-financed by the Commission of the European Communities EC Regulations 3528/86 and 2157/92

Concepts, Structure and 1995 Results

4.5 Vascular plant diversity

A. Chiarucci, I. Bonini, V. De Dominicis

Dipartimento di Biologia Ambientale, Università di Siena, Via P.A. Mattioli 4, 53100 Siena, Italy.

Introduction

The study of biological diversity is currently one of the most active fields o theoretical and applied ecology. Although there is no general agreement on methods fo studying species diversity, at the landscape and community levels (Shmida, 1984 Stohlgren, 1994), species diversity is increasingly used in monitoring projects.

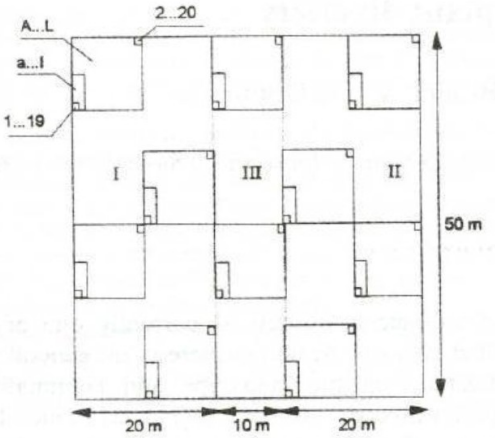


Fig. 1 - Sampling design for the analysis of vascular plant diversity. Total surface is 2500 m²; surface of the sub-plots I and II amounts to 1000 m²; sub-plot III is 500 m²; sub-plots A-L are 10x10 m; sub-plots a-l are 2x5 m; subplots 1-20 are 1x1 m (after Ferretti et al., 1996).

Monitoraggio e Ricerca

ELSEVIER

Forest Ecology and Management 141 (2001) 201–210

Forest Ecology and Management

www.elsevier.com/locate/forec

Structure and floristic diversity in permanent monitoring plots in forest ecosystems of Tuscany☆

A. Chiarucci[a,*], V. De Dominicis[a], J.B. Wilson[b]

ELSEVIER

Biological Conservation 101 (2001) 305–314

BIOLOGICAL CONSERVATION

www.elsevier.com/locate/biocon

Evaluation and monitoring of the flora in a nature reserve by estimation methods

Alessandro Chiarucci*, Simona Maccherini, Vincenzo De Dominicis

ELSEVIER

Available online at www.sciencedirect.com

SCIENCE DIRECT®

The Science of the Total Environment 310 (2003) 171–178

the Science of the Total Environment

An International Journal for Scientific Research into the Environment and its Relationship with Man

www.elsevier.com/locate/scitotenv

Design concepts adopted in long-term forest monitoring programs in Europe—problems for the future?

Marco Ferretti[a,*], Alessandro Chiarucci[b,1]

Mosello, R., B. Petriccione and A. Marchetto (Guest Editors)
Long-term ecological research in Italian forest ecosystems
J. Limnol., 61 (Suppl. 1): 129-136, 2002

Forest ecosystem monitoring in Tuscany (Italy): past activities, present status and future perspectives

Luigi BARTOLOZZI, Ilaria BONINI[1)], Renzo BORETTI, Filippo BUSSOTTI[2)]*, Enrico CENNI[3)], Alessandro CHIARUCCI[1)], Alberto COZZI[3)], Vincenzo DE DOMINICIS[1)], Marco FERRETTI[3)], Paolo GROSSONI[2)], Gianluca LANDI, Claudio LEONZIO[1)] and Giovanni VIGNOZZI

PAPER www.rsc.org/jem | Journal of Environmental Monitoring

Using taxonomic data to assess and monitor biodiversity: are the tribes still fighting?†

Giovanni Bacaro,[ab] Elisa Baragatti[a] and Alessandro Chiarucci*[a]

Opinion

Cell PRESS

Trends in Ecology and Evolution Vol.24 No.9

Adaptive monitoring: a new paradigm for long-term research and monitoring

David B. Lindenmayer[1] and Gene E. Likens[1,2]

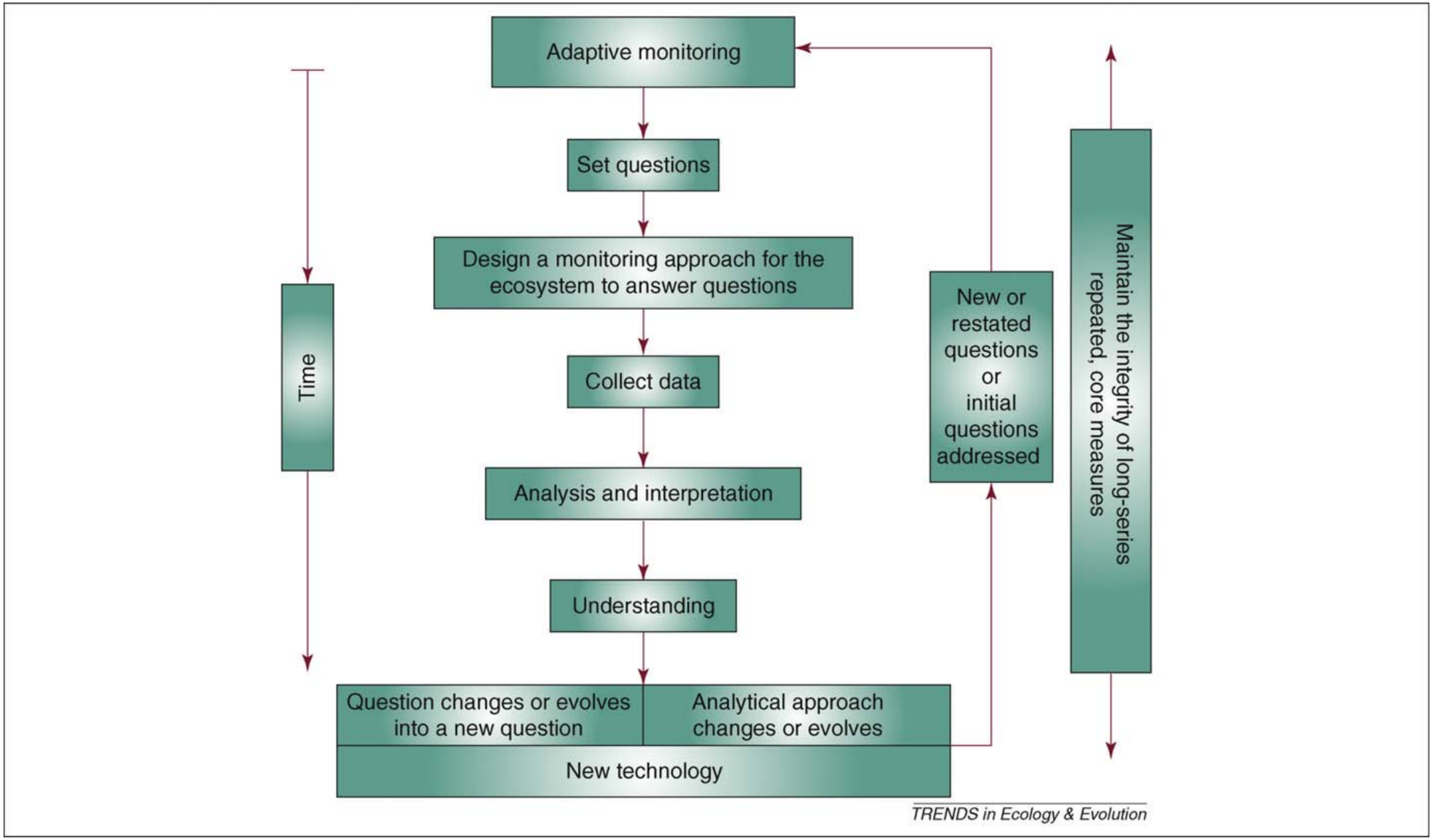


Figure 1. Adaptive monitoring provides a framework for incorporating new questions into a monitoring approach for long-term research while maintaining the integrity of the core measures. Initial key steps are the development of critical questions and a robust statistical design.

Elementi chiave per un programma di monitoraggio efficace

- Porre **domande ben definite** e tracciabili prima di iniziare il monitoraggio;
- Essere basato su un **campionamento rigoroso** dal punto di vista statistico;
- Essere fondato su **modelli concettuali** di funzionamento degli ecosistemi o delle loro componenti;
- Essere guidato da **necessità umane** di comprensione dei fenomeni.

Modificato da:
Lindenmayer et al (2011) *Trends in Ecology and Evolution* 26: 641–646.

Progettare il campionamento

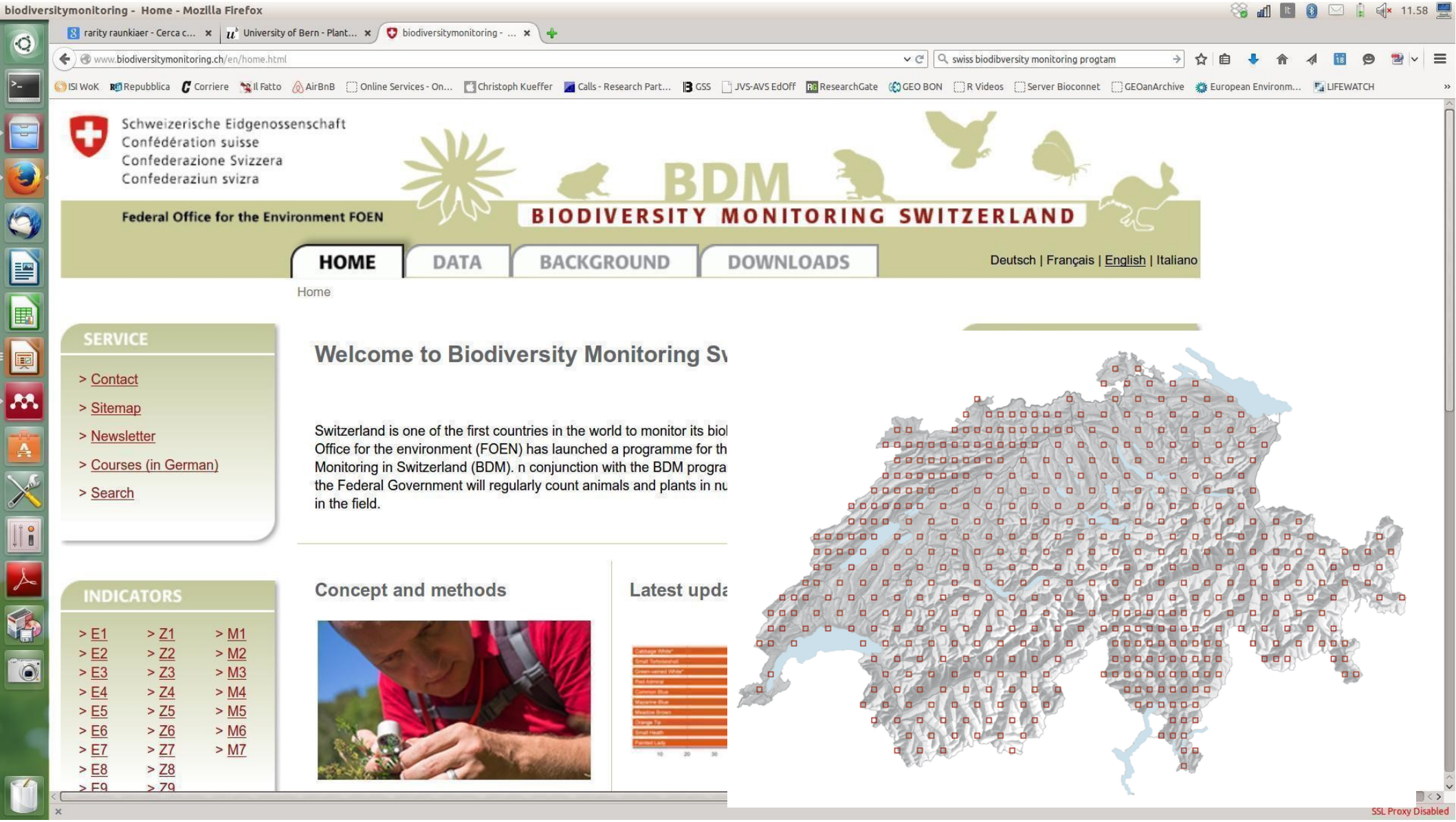
- *Dove?*
- *Come?*
- *Quanto?*
- *Quando?*

Folia Geobotanica 42: 209–216, 2007

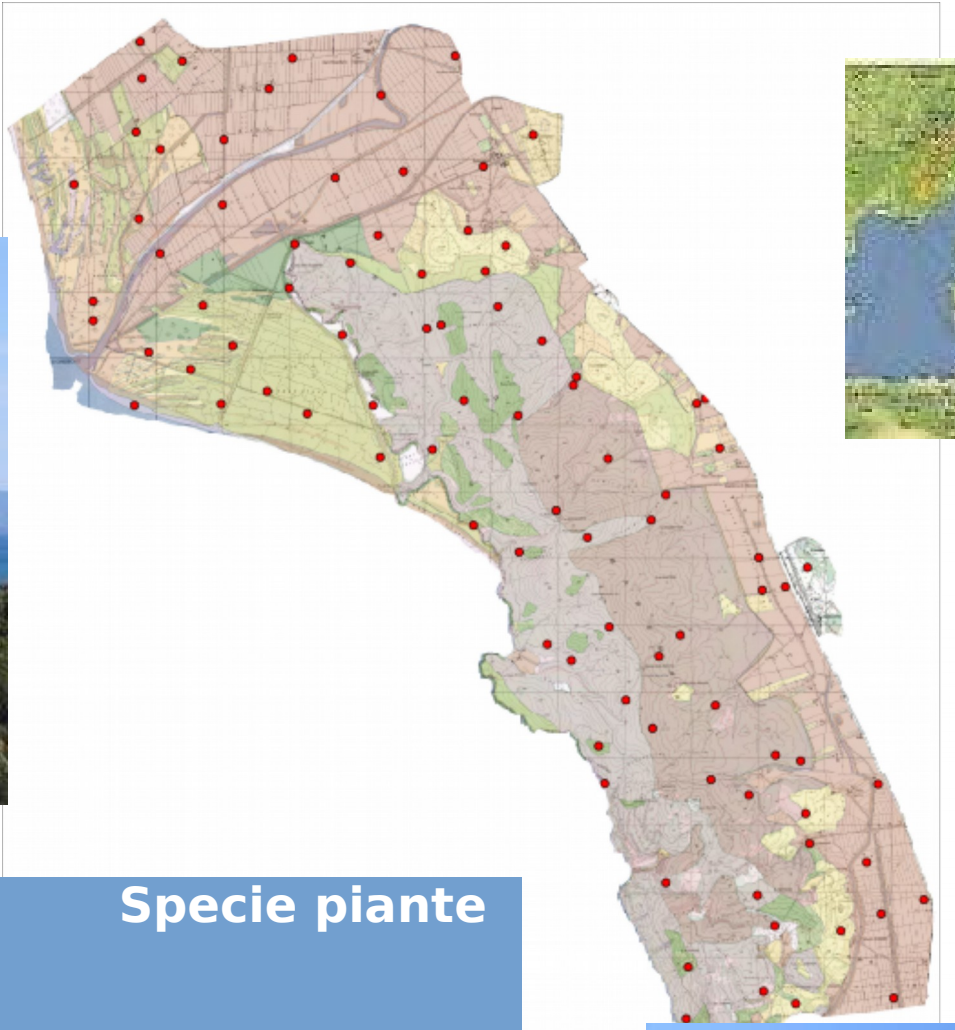
TO SAMPLE OR NOT TO SAMPLE?
THAT IS THE QUESTION ... FOR THE VEGETATION SCIENTIST

Alessandro Chiarucci

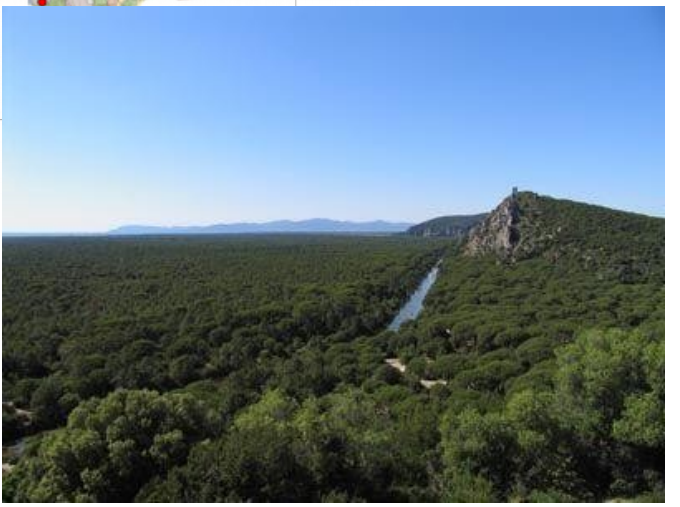
Dove campionare?



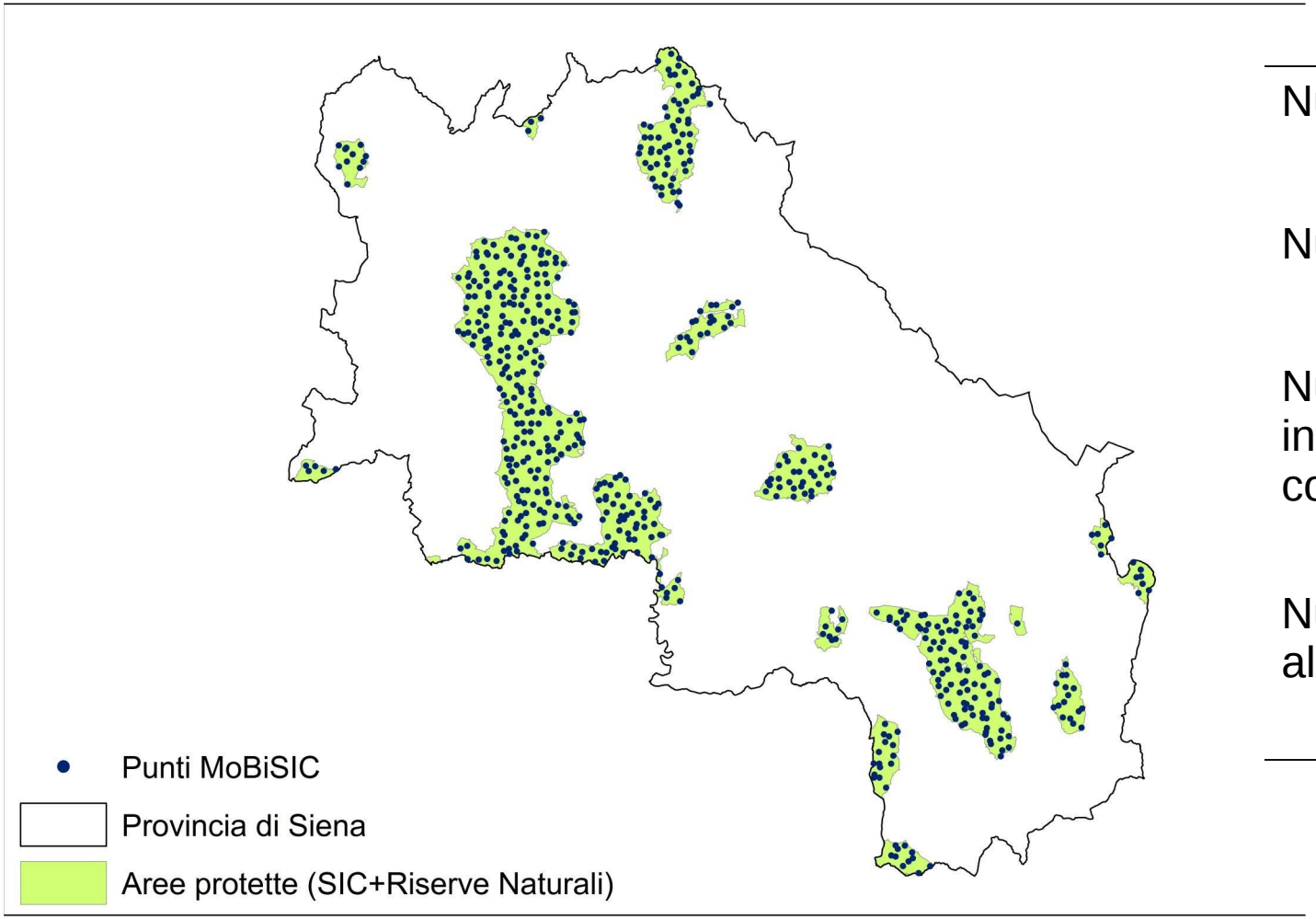
Parco Regionale della Maremma
Toscana (*ca.* 9400 *ha*)



Dati	Specie piante
Flora (Arrigoni, 2004)	874
99 plots (2007-08) (Cortés Selva & Chiarucci)	642
Specie 2007-08 non incluse nella flora del 2004	114

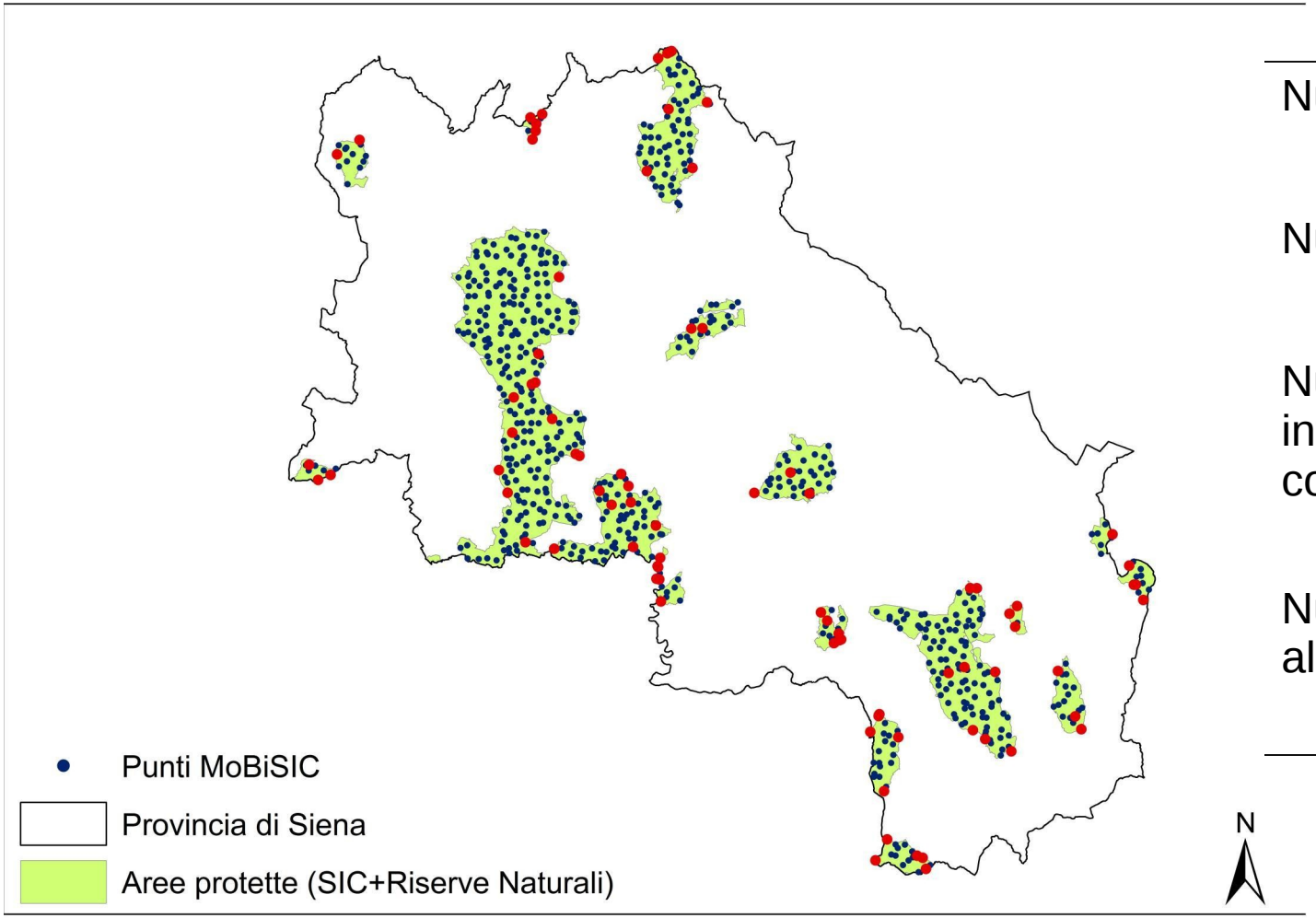


Quanto campionare?



Num. plot	604
Num. Specie totali	1041
Num. Specie interesse conservazionistico	95
Num. Specie aliene	51

Quanto campionare?



Num. plot	685
Num. Specie totali	1102
Num. Specie interesse conservazionistico	103
Num. Specie aliene	52

Dove e quanto campionare?

BIOLOGICAL CONSERVATION 141 (2008) 2608–2618

available at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/biocon

Quantifying plant species diversity in a *Natura 2000* network: Old ideas and new proposals

Alessandro Chiarucci, Giovanni Bacaro, Duccio Rocchini*

COMMUNITY ECOLOGY 9(2): 185-192, 2008
1585-8553/$20.00 © Akadémiai Kiadó, Budapest
DOI: 10.1556/ComEc.9.2008.2.7

Quantifying species richness at multiple spatial scales in a Natura 2000 network

A. Chiarucci[1], G. Bacaro, A. Vannini and D. Rocchini

Systematics and Biodiversity (2010), **8(2)**: 269–280

Taylor & Francis

Research Article

Is floristic quality assessment reliable in human-managed ecosystems?

SARA LANDI & ALESSANDRO CHIARUCCI

Biodivers Conserv (2012) 21:503–516
DOI 10.1007/s10531-011-0196-8

ORIGINAL PAPER

Scale dependence of plant species richness in a network of protected areas

A. Chiarucci · G. Bacaro · G. Filibeck · S. Landi · S. Maccherini · A. Scoppola

Rend. Fis. Acc. Lincei (2014) 25:369–380
DOI 10.1007/s12210-014-0313-1

Commonness and rarity of plants in a reserve network: just two faces of the same coin

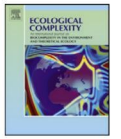
Sara Landi · Alessandro Chiarucci

Ecological Complexity 9 (2012) 55–62

Contents lists available at SciVerse ScienceDirect

Ecological Complexity

journal homepage: www.elsevier.com/locate/ecocom



Original research article

Effects of an afforestation process on plant species richness: A retrogressive analysis

Valerio Amici[a,*], Duccio Rocchini[b], Francesco Geri[a], Giovanni Bacaro[a], Matteo Marcantonio[a], Alessandro Chiarucci[a]

Journal of Biogeography (J. Biogeogr.) (2013) **40**, 2335–2347

ORIGINAL ARTICLE

Influence of secondary forest succession on plant diversity patterns in a Mediterranean landscape

Valerio Amici[1]*, Elisa Santi[2], Goffredo Filibeck[3], Martin Diekmann[4], Francesco Geri[1], Sara Landi[1], Anna Scoppola[3] and Alessandro Chiarucci[1]

Dove e quanto campionare?

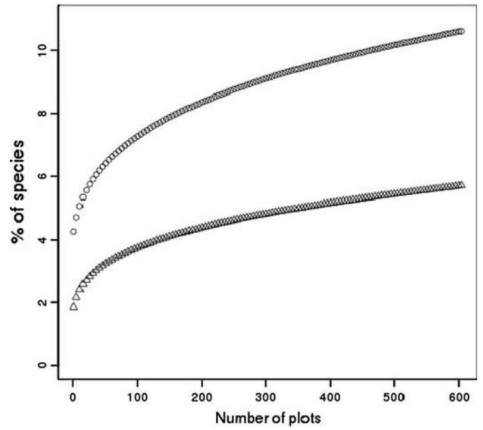
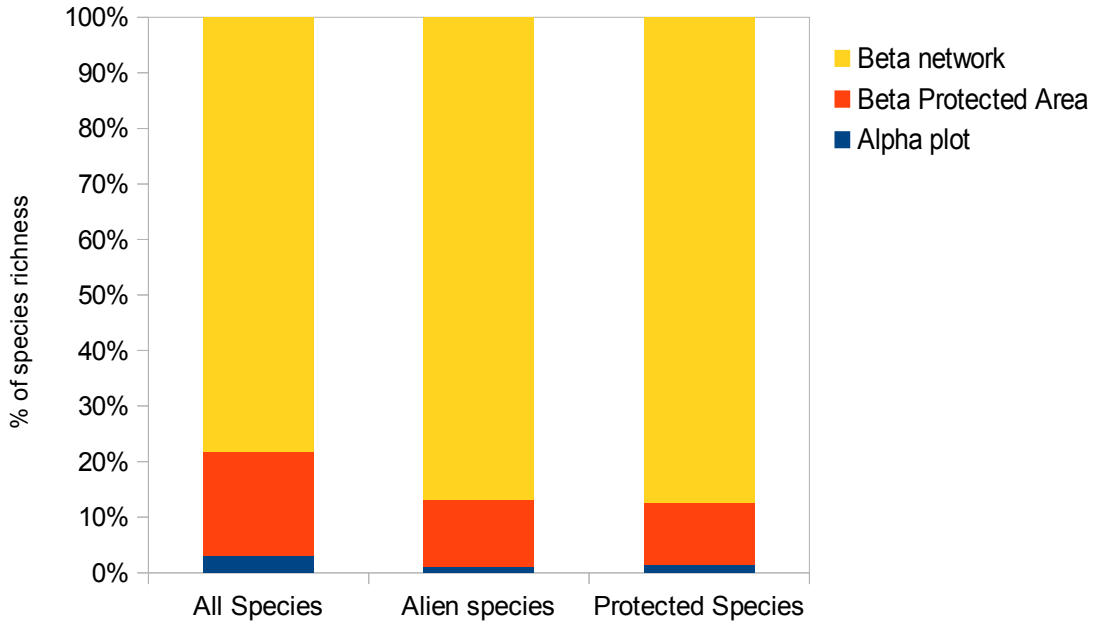


Fig. 2 Curves showing the percentage of alien species (*triangles*, *lower curve*) and protected species (*circles*, *upper curve*) with respect to the total number of species sampled (all species) and as a function of the number of sampled plots



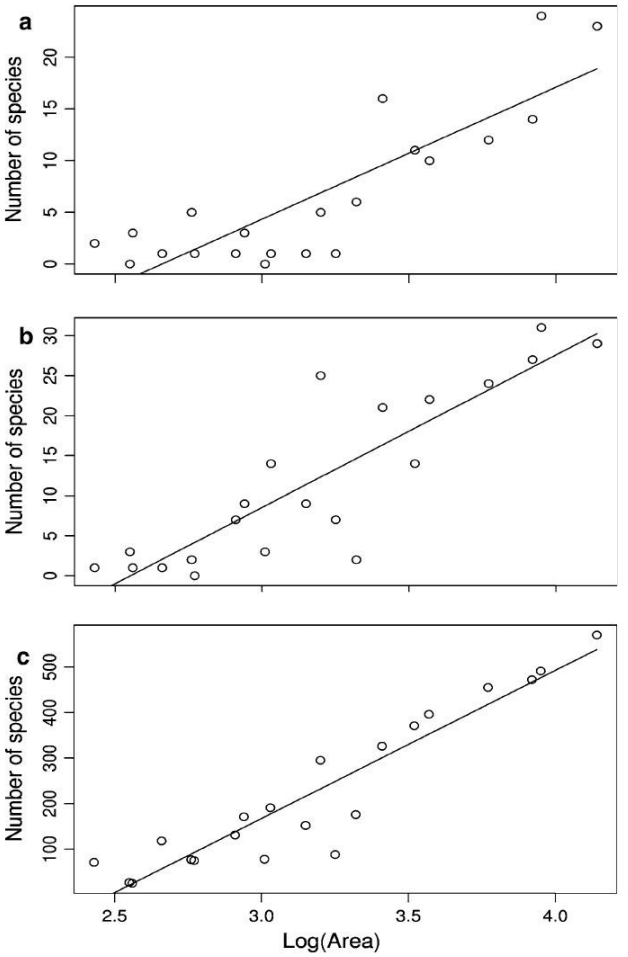
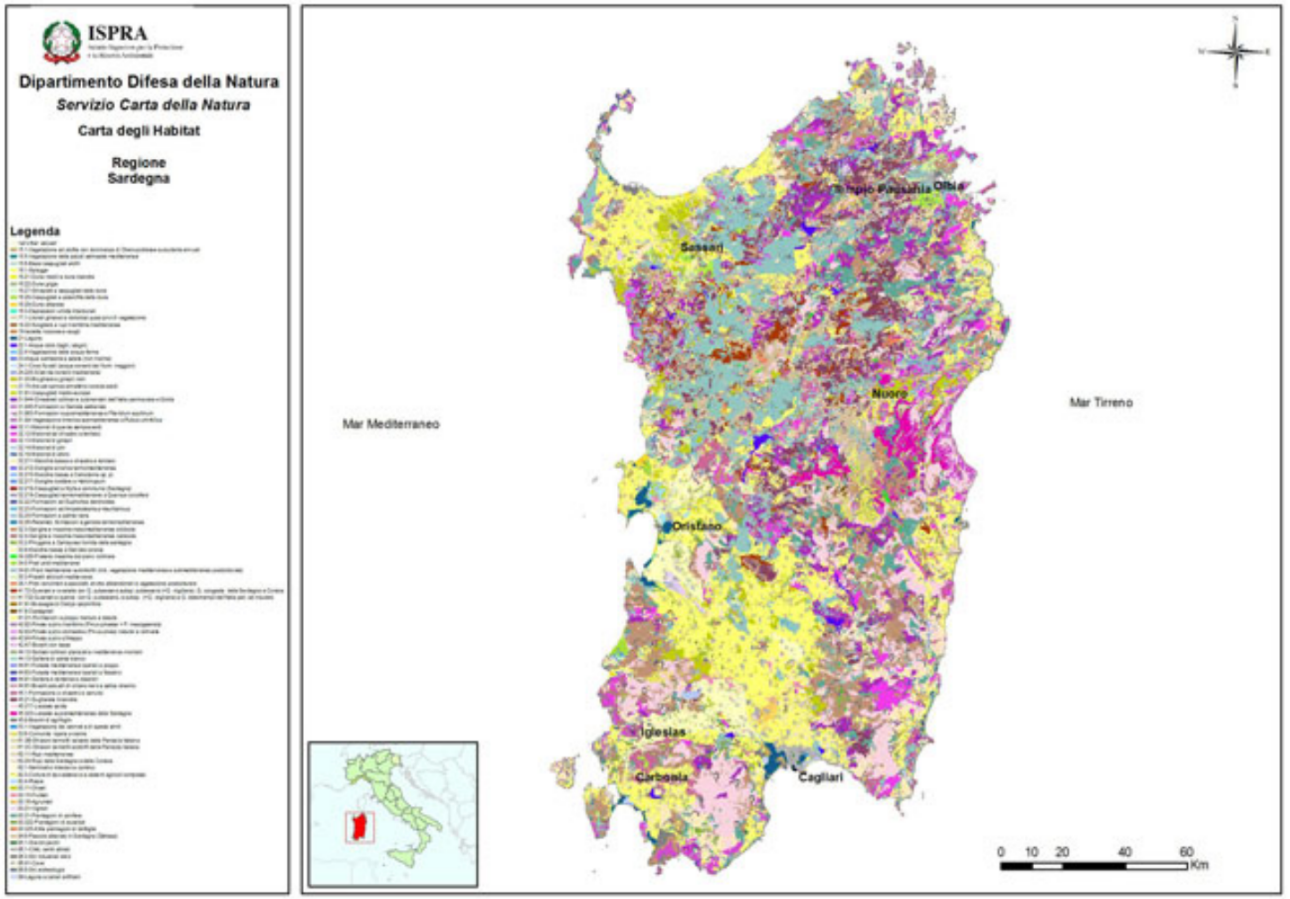


Fig. 3 Species–area relationships showing the number of species recorded in the 21 protected areas of the Province of Siena, Italy, according to Gleason exponential model. Different graphs are shown for alien species (**a**), protected species (**b**), and all species (**c**)

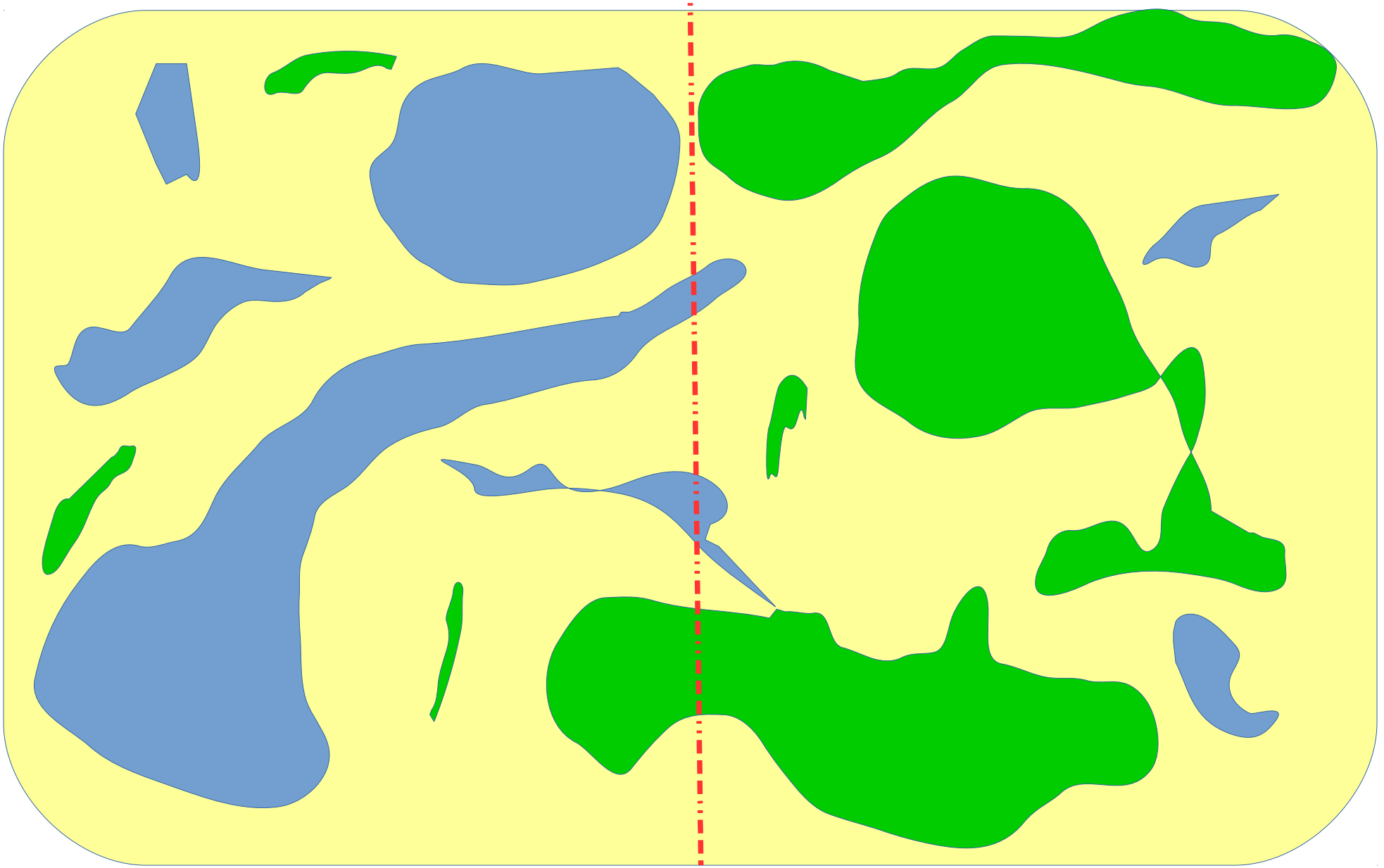
Campionare gli habitat

Gli habitat della Sardegna

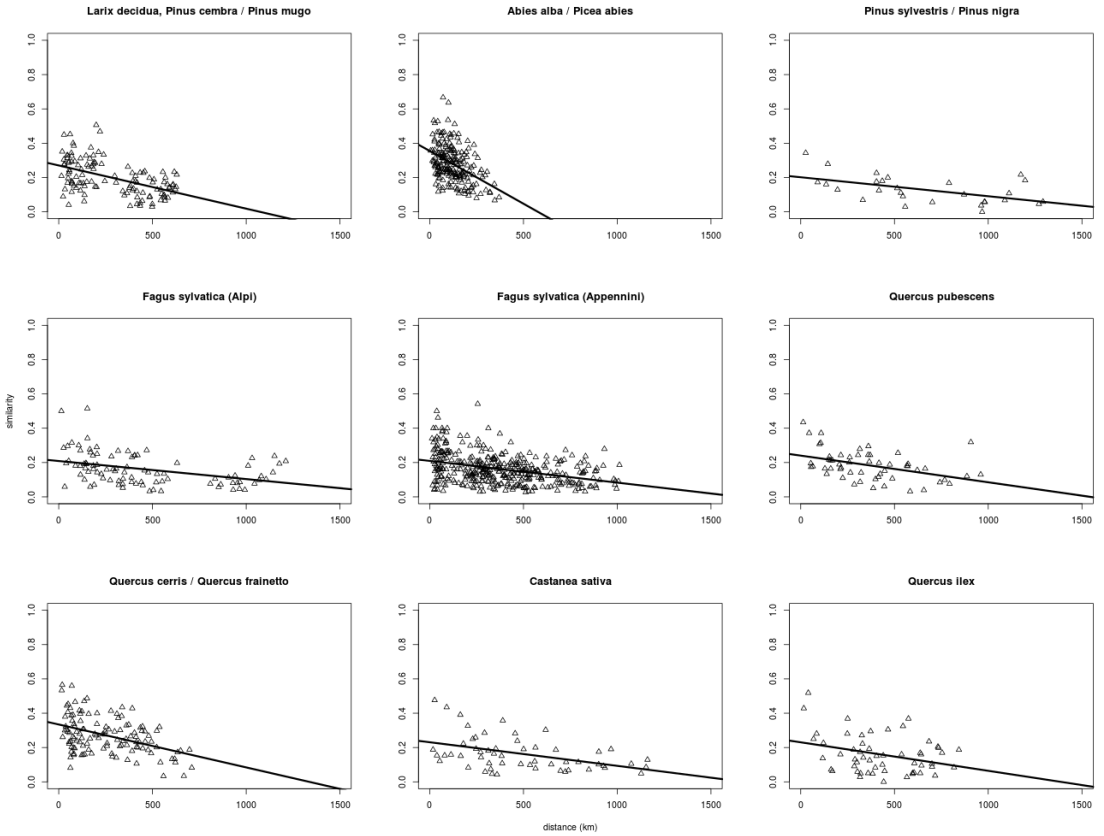
Utilizzando la metodologia cartografica illustrata nel Manuale “ISPRA 2009, **Il Progetto Carta della Natura alla scala 1:50.000 - Linee guida per la cartografia e la valutazione degli habitat.** ISPRA ed., Serie Manuali e Linee Guida n.48/2009, Roma”, nel territorio della regione Sardegna sono stati rilevati **93 differenti tipi di habitat**, cartografati secondo la nomenclatura CORINE Biotopes (con adattamenti ed integrazioni), riportata nel Manuale “ISPRA 2009, **Gli habitat in Carta della Natura, Schede descrittive degli habitat per la cartografia alla scala 1:50.000**. ISPRA ed., Serie Manuali e Linee Guida n.49/2009, Roma”.

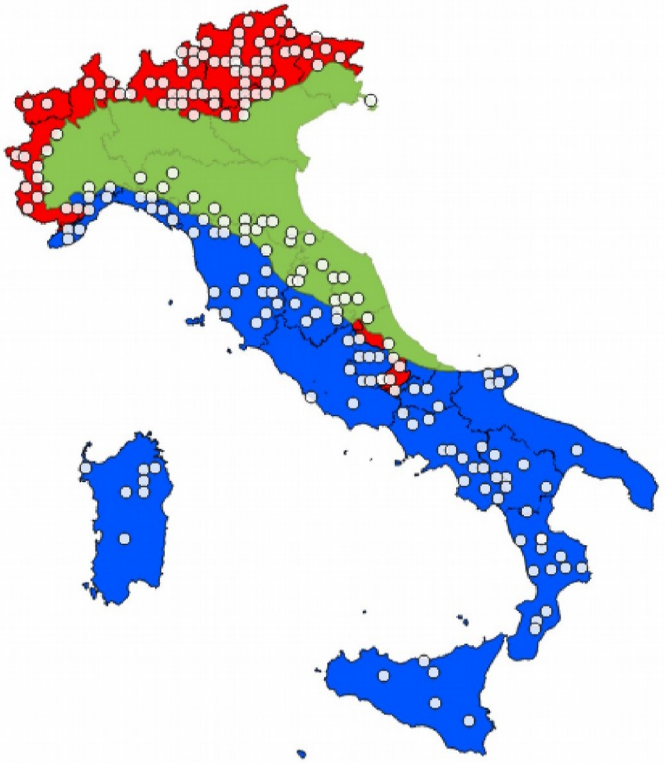


Campionare gli habitat



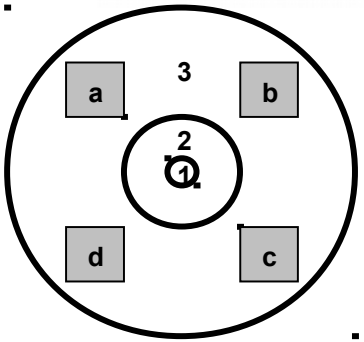
Campionare gli habitat





BIOSOIL project (European Commission, 2010)

- Plot sampled within the BioSoil project
- 201 plots
- 804 subplots (10m x 10m each)
- Quality Assurance Procedures



Survey unit

Come campionare?

Come campionare? 1. Dimensione

Journal of Vegetation Science 9: 57-62, 1996
© IAVS; Opulus Press Uppsala. Printed in Sweden

Species diversity in plant communities on ultramafic soils in relation to pine afforestation

Chiarucci, A.

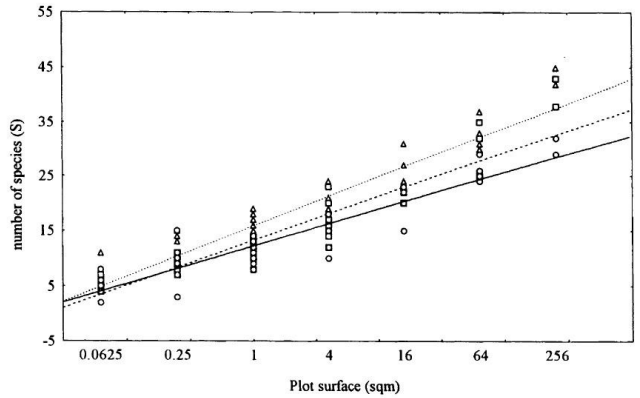


Fig. 1. Regression lines for the semi-logarithmic model ($S = a + b \log A$) at the three sites. Circles and line = no pine canopy; quadrats and broken line = scattered pine canopy; triangles and dotted line = dense pine canopy.

Table 2. Slope and intercept parameters for the semi-logarithmic model at the three sites. Different letters denote statistically significant differences according to the Tukey test at $p < 0.05$. A = no pine canopy; B = scattered pine canopy; C = dense pine canopy.

Site	Slope	Intercept
A	2.93 [a]	12.2
B	3.50 [b]	13.2 [a]
C	3.93 [b]	15.8 [b]

OIKOS 115: 475–483, 2006

Effects of productivity on species–area curves in herbaceous vegetation: evidence from experimental and observational data

Alessandro Chiarucci, Daniele Viciani, Christina Winter and Martin Diekmann

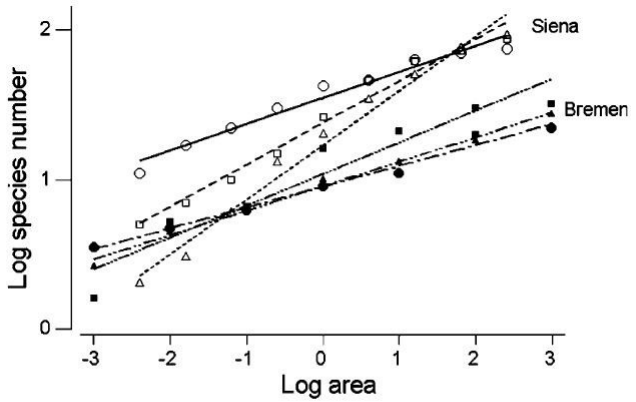


Fig. 1. Species–area curves (both variables log-transformed) for three plots from Siena and three plots from Bremen. For both regions, examples of plots with low, medium and high biomass are shown. Filled symbols: Siena, open symbols: Bremen.

Come campionare? 1. Dimensione

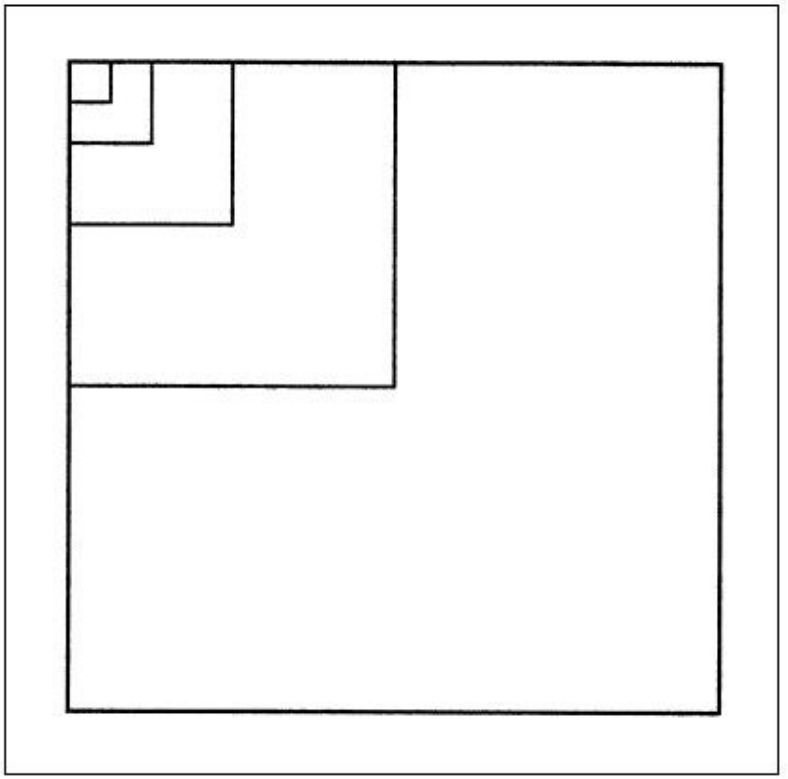


Figura 1 - Disposizione classica di una serie di aree campione annidiate. *(Classic design of a series on nested sample plots.)*

Come campionare? 2. Forma

Ecological Complexity 24 (2015) 37–45

Contents lists available at ScienceDirect

Ecological Complexity

journal homepage: www.elsevier.com/locate/ecocom

Original research article

Shape matters in sampling plant diversity: Evidence from the field

Giovanni Bacaro [a,*], Duccio Rocchini [c], Martin Diekmann [d], Patrizia Gasparini [e], Margherita Gioria [f], Simona Maccherini [b], Matteo Marcantonio [c], Enrico Tordoni [a], Valerio Amici [b], Sara Landi [g], Dino Torri [h], Miris Castello [a], Alfredo Altobelli [a], Alessandro Chiarucci [g]

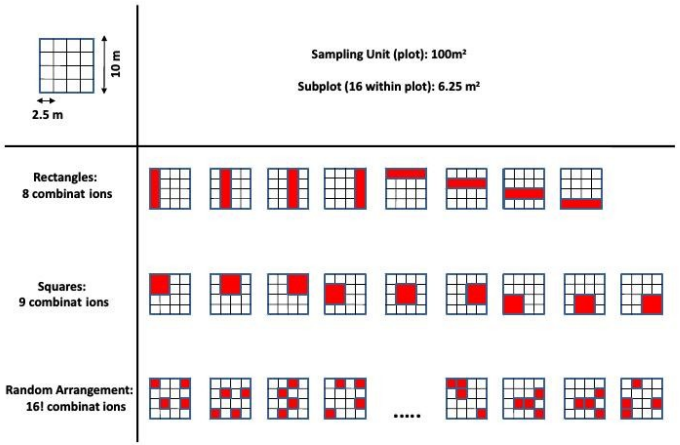


Fig. 2. Description of three possible spatial arrangements of subplots (here constraining the total plot area to 25 m² to visualise one of the possible combinations of subplots within each plot) used to test the effect of subplot shape on total species richness. Total species richness for each design (rectangular, squared and random subplots) was evaluated as the mean of 1000 random selections multiplied by each possible combination of rectangles (8), squares (9) and (16!) random subplots for the 604 plots.

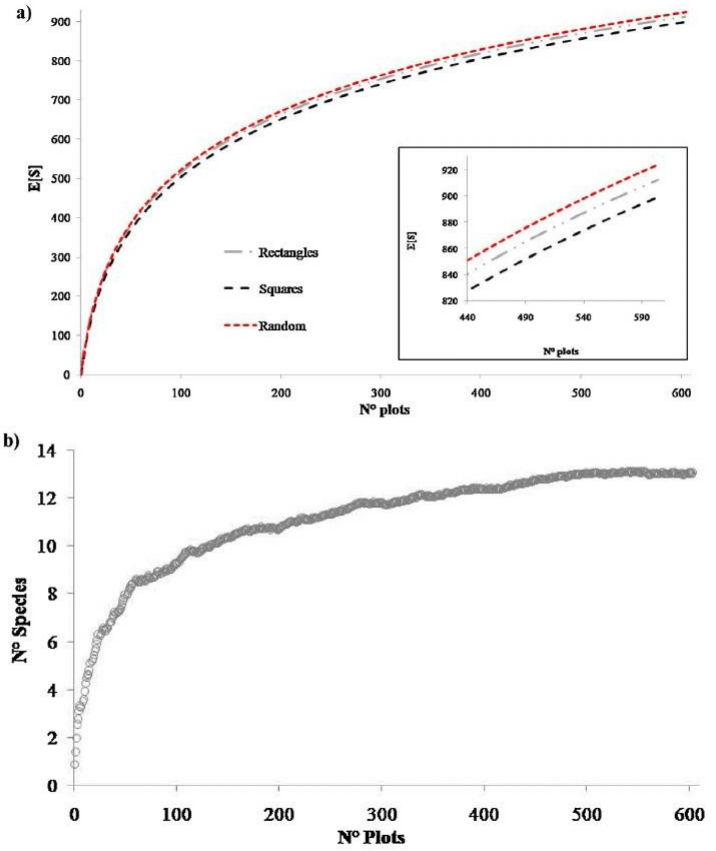


Fig. 3. Effect of the shape of the sampling unit on the number of species using rarefaction curves (a). Each curve was calculated as the mean of 1000 accumulation curves obtained by combinations of subplots for each shape. (b) Mean species differences between squares and rectangles expressed as a function of the sampling effort (number of accumulated plots).

Come campionare? 3. Specie

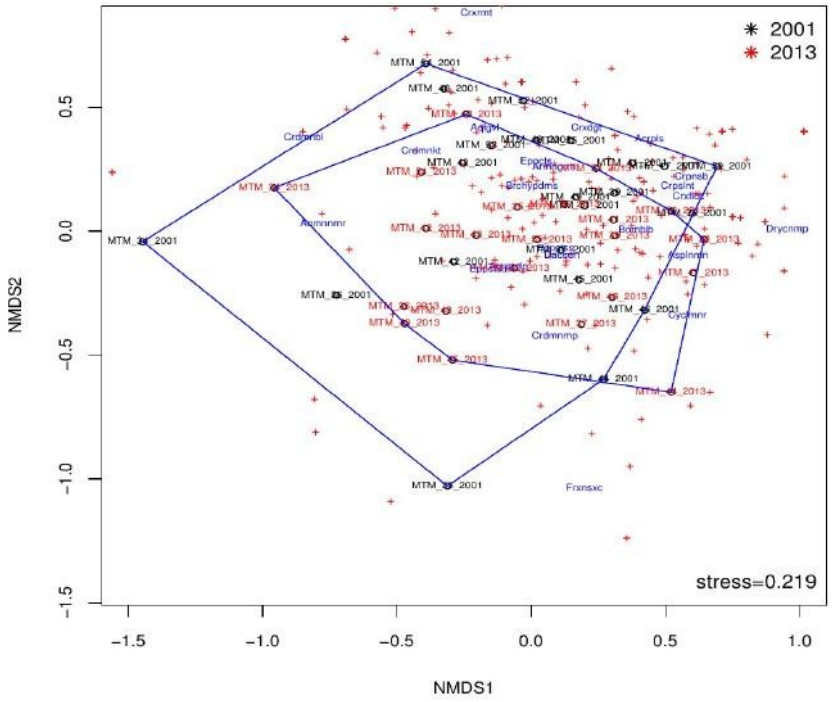


Figura 2.4 *Confronto temporale. Ordinamento NMDS tra le AdS identificate dalle medesime coordinate MTM 2013 e MTM 2001, con il valore di stress. Acrpls = Acer opalus, Acrpsdp = Acer pseudoplatanus, Anmnnmr = Anemone nemorosa, Aqlgvl = Aquilegia vulgaris, Armngrm = Aremonia agrimonoides, Asplnmn = Asplenium adiantum nigrum, Bnmblb = Bunium bulbocastanum, Brchypdms = Brachypodium sylvaticum, Crdmnbl = Cardamine bulbifera, Crdmnc = Cardamine chelidonia, Crdmnkt = Cardamine kitaibelii, Crdmnmp = Cardamine impatiens, Crpnsb= Carpinus betulus, Crpslnt = Crepis leontodontoides, Crxdgt = Carex digitata, Crxflcc = Carex flacca, Crxrmt = Carex remota, Cyclmnr = Cyclamen repandum, Dacscrt = Dactylis glomerata, Drycnmp = Dorycnium pentaphyllum, Dryptrs = Dryopteris dilatata, Eppctsm = Epipactis microphylla, Eppcts 0= Epipactis helleborine, Frxnsxc = Fraxinus excelsior.*

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Using taxonomic data to assess and monitor biodiversity: are the tribes still fighting?†

Giovanni Bacaro,[ab] Elisa Baragatti[a] and Alessandro Chiarucci*[a]

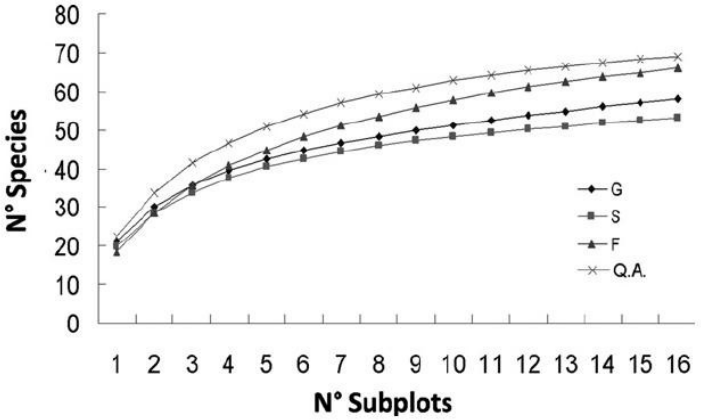
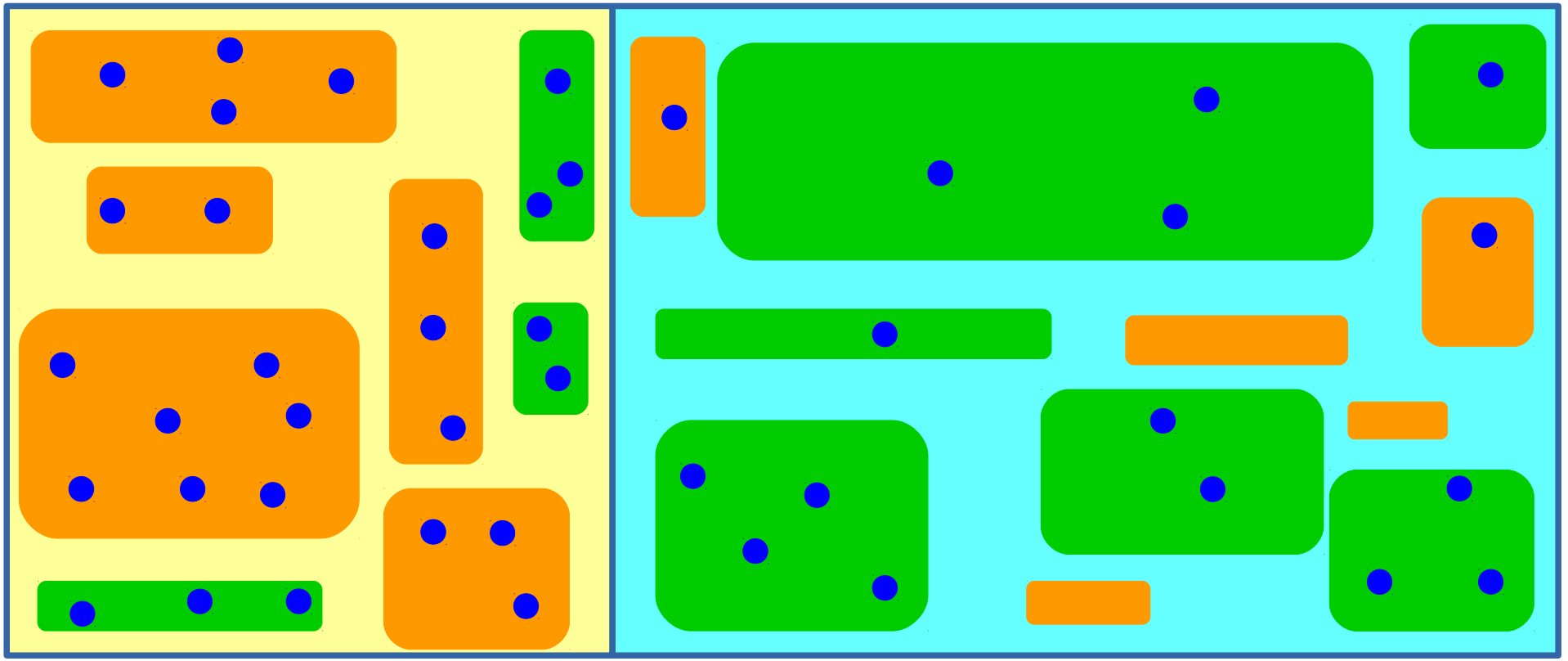
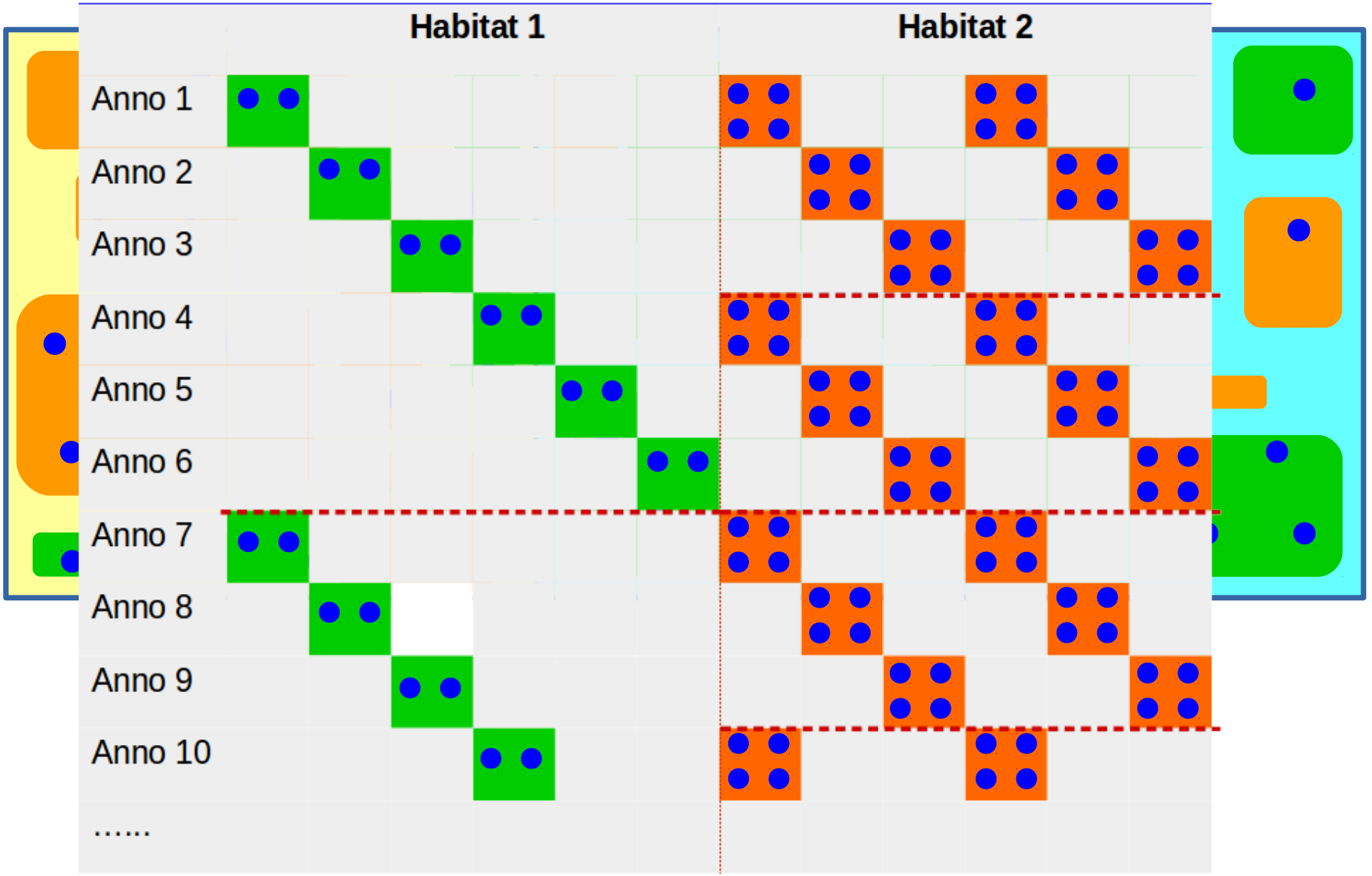


Fig. 1 Effects of experience in field identification of plant species. Four different crews (each composed by four operators), with different expertise, independently sampled the plant species within the same 10 m × 10 m plot (divided into sixteen 2.5 m × 2.5 m subplots). G and S: crews composed by undergraduate students (very low experience); F: crew composed by PhD students; Q.A.: composed by two researchers with more than two years of field experience in the same area (expert crew).

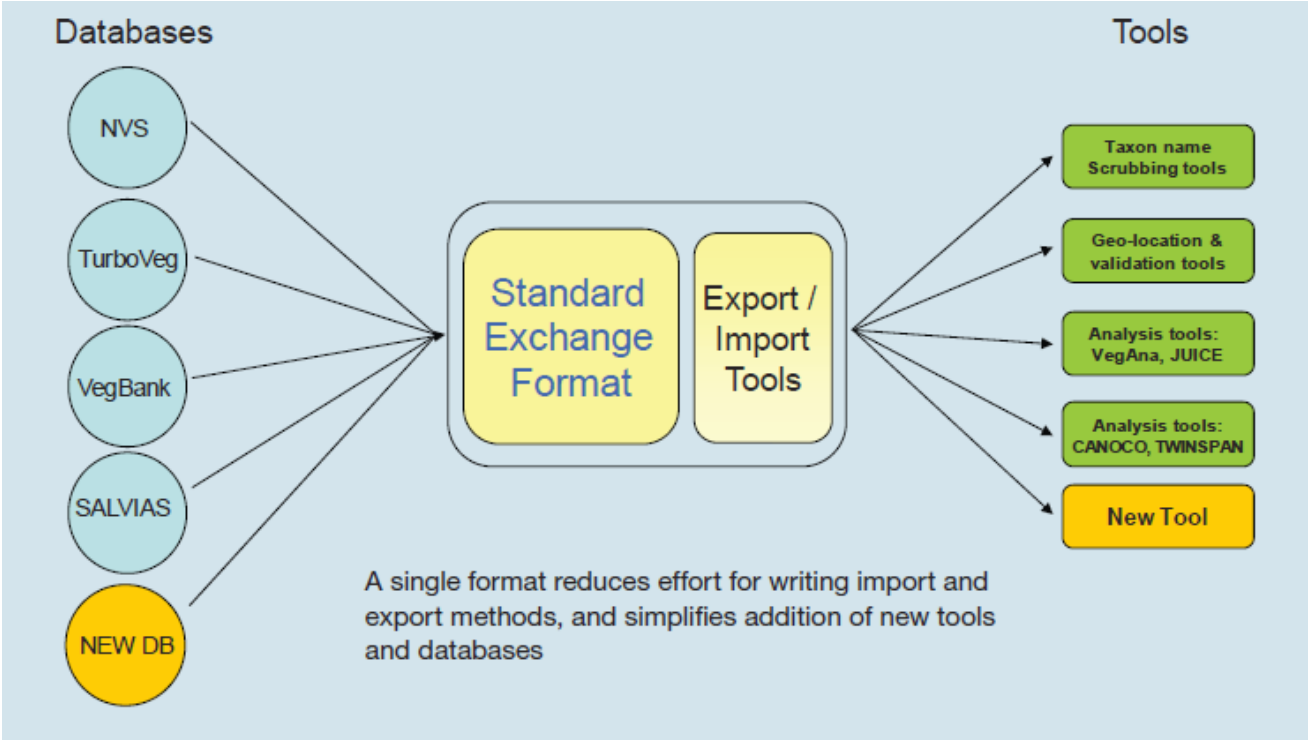
Quanto campionare?



Quanto campionare?



Archiviare e preservare i dati



Veg-X – An exchange standard for plot-based vegetation data

Elementi di sintesi su cui riflettere

- **Prospettiva** di Medio e Lungo Termine
- Poche **Variabili Fondamentali**
- Disegno di **Campionamento Nazionale** Concordato
- Programma di **Quality Assurance**
- Sicurezza e Gestione **Banca Dati**
- Ruolo Preciso dei **Diversi Specialisti**