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A methodological protocol for Annex I Habitats monitoring: the contribution of Vegetation science

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Abstract
The methodological foundations of the recently published Manual for Annex I Habitats monitoring in Italy, edited by the Italian Institute for Environmental Protection and Research (ISPRA) with the scientific support of the Italian Society for Vegetation Science (SISV), are here presented, discussed and related to the most consolidated and acknowledged scientific advances in the field of Vegetation science. The proposed methodologies aim at offering simple, yet effective, protocols and procedures towards a harmonized data collection, by way of standardized and shared technical tools, resulting in comparable evaluations of the conservation status of Annex I Habitats. The methodological framework was developed by experts including a large team of members of the SISV. Big efforts were deployed to provide indicators and parameters for biodiversity monitoring able to catch its complexity, yet simple enough to be easily measured. Diagnosis and syntaxonomical correspondences of Habitat types, sampling procedure, plot size, distribution mapping, typical species are among the principal issues here examined through a widely shared scientific discussion. The final product is a comprehensive Manual, which offers practical but scientifically sound methodological tools for an efficient and effective monitoring of Annex I Habitats. The importance of bridging across the science-policy interface is emphasized, in a general will to improve the impact of Vegetation science on conservation policy development in Europe.

Key words: Article 17, Biodiversity, Conservation, FCS, Italy, Natura 2000, Phytosociology, Plant community, 92/43/EEC Directive.

Introduction

Habitats are a key component of biodiversity, resulting from the complex interaction of multiple biotic and abiotic factors. They can be considered important indicators of biodiversity (Bunce *et al.*, 2013a, 2013b), and their intermediate position among the manifold biodiversity levels (from the wide-scale biome to genetic diversity) confers on them a leading role for monitoring nature conservation status. Additionally, in the last two decades, it became increasingly evident that biodiversity can be more effectively represented and monitored by a community-approach than by analysing single species (Noss, 1996; Cowling *et al.*, 2004; Nicholson *et al.*, 2009; Galdenzi *et al.*, 2012; Rodríguez *et al.*, 2012; Berg *et al.*, 2014; Izco, 2015; Keith *et al.*, 2015). Many continental and national-scale projects already followed this well widespread awareness, e.g. the ongoing project for a Red List Assessment of European Habitat Types (Rodwell *et al.*, 2013; Janssen *et al.*, 2014). In this view the Natura 2000 network, covering almost 20% of the EU territory and based on the prominent role of Annex I Habitats[1], can be considered a cornerstone for the European nature conservation policy (Pullin *et al.*, 2009; Evans, 2012), acknowledged also in Italy (Maiorano *et al.*, 2007; Biondi *et al.*, 2012b; Viciani *et al.*, 2014).

To evaluate if the conservation targets are achieved, status and trends of species and habitats need to be measured (Henle *et al.*, 2013). In Europe, Annex I Habitats monitoring is mandatory every six years for every country, arising from Art. 11 and Art. 17 of the 92/43/EEC Directive, often cited as Habitats Directive (hereafter: HD; European Commission, 1992), in order to periodically check their conservation status (CS) and to evaluate if the EU biodiversity policy has been effective (Evans, 2012; Henle *et al.*, 2013). Nevertheless, up to now this task has not actually been neither standardized nor really coordinated, what is more and more urgently needed for policy development and for a successful activity of evaluation and reporting, together with adequate human and financial resources (Pereira *et al.*, 2013; EEA, 2015).

Considering the complex dimension of Habitats and their multiple components, their monitoring is a really challenging task. A methodological framework was published and indicated as an official reference guideline for Habitats monitoring on a European scale (Evans & Arvela, 2011) and big efforts in this direction are carried out by national and regional agencies (Jongman, 2013). However, a detailed formulation of criteria and methodologies that might provide standardized procedures for Habitats monitoring at the national level was still lacking in Italy, in spite of a multiplicity of highly specific territorial studies (e.g. Bonanomi *et al.*, 2006, 2009; Stanisci *et al.*, 2014; Del Vecchio *et al.*, 2016).

In order to fill this gap, in 2014 the Italian Ministry for Environment (MATTM) promoted the development of a national methodological tool for Annex I Habitats monitoring, coordinated by the Italian Institute for Environmental Protection and Research (ISPRA), with the scientific support of the Italian Society for Vegetation Science (SISV)[2], that led to the publication of the volume 'Manuali per il monitoraggio di specie e habitat di interesse comunitario (Direttiva 92/43/CEE) in Italia: habitat' (Angelini *et al.*, 2016).

A large number of experienced SISV members shared their knowledge, skills and expertise in order to outline and provide practical and scientifically validated tools for an efficient and effective monitoring activity of Annex I Habitats occurring in Italy. Among the main objectives of the process that led to the elaboration of the Manual, the most prominent ones may be evidenced: i) the identification of standardized, repea-

[1] In the text, the Habitats included in the Annex I of the 92/43/EEC Directive are written with capital initial, to distinguish them from the many other possible uses of the word 'habitat'.
[2] The SISV is a scientific Society established in 1964, that brings together experts in the field of vegetation studies, promotes the research in Geobotany, Phytosociology and Plant ecology, and encourages the cooperation with national and international institutions for the study, preservation and recovery of plant communities (www.scienzadellavegetazione.it).

table, updated and scientifically grounded methodological tools, based on the European guidelines (Evans & Arvela, 2011) but adapted to the ecological and biogeographical features of the Italian territory; ii) the gathering of comparable data at national and European level; iii) the harmonization and improvement of the territorial knowledge, presently still rather fragmented; iv) the pursuit of measures, shared at the national level, for the conservation of terrestrial, brackish and freshwater Habitats.

On these bases, the main aim of the present paper is to point out protocols, parameters and indicators selected for assessing the CS of Habitats. They have been derived from the most recent and consolidated methodological approaches of Vegetation science and are, at the same time, easily accessible for field operators who are not necessarily scholars and certainly need agile although robust sampling tools. The main methodological issues and the adopted solutions for the monitoring protocols are analysed, and the selected sampling tools are briefly described and discussed.

The Habitats Monitoring Protocol: methodological basis and technical tools

Background information

According to the explicit indications of Art. 1 of the HD, the criteria to be considered to assign (or not) to a Habitat a 'Favourable Conservation Status' (FCS) include: 1) its distribution (in terms of both its natural range and covered area), 2) its structure and functions, and 3) the conservation status of its 'typical' species (European Commission, 1992). Future trends and likely future status of these parameters concur to define the 'future prospects', which should reflect the CS of a Habitat type over a period of 12 years (= 2 reporting cycles), according to Evans & Arvela (2011). Future trends are dependent on threats which will have a negative influence, while on the other hand action plans, conservation measures and other provisions can have positive influence. The parameters area, range, structure and functions and future prospects are firstly assessed separately, eventually combined in an evaluation matrix thus providing the overall assessment. This logical frame is clear and consistent, however its use can be adequate and fruitful only when grounded on a robust and shared methodological approach, which is crucial and is actually missing in the European protocol, being out of the scope of such a general document. As properly pointed out by Dale & Beyeler (2001), 'management and monitoring programs often lack scientific rigor because of their failure to use a defined protocol for identifying ecological indicators'.

In order to pursue a more detailed scientific frame for the above mentioned parameters, several critical issues have been examined through a largely shared scientific discussion, including: diagnosis and syntaxonomy of Habitat types; the selection of proper methodologies for area, structure, function; the concept of 'typical' species; the most suitable Habitat-specific sampling methods and procedures (Gigante *et al*., 2016a). In the here presented Monitoring Manual, all these key points have been elaborated from a Habitat-specific point of view, starting from the current state of knowledge in the field of Vegetation science and Plant ecology, and referring to the latest scientific advances.

Preliminary steps: Diagnosis and Syntaxonomy of Habitat types

Although not directly part of the monitoring protocol, the diagnosis and syntaxonomic frame of Habitat types can have important consequences on the evaluation process of their CS. For this reason, some basic references are here discussed.

The Annex I Habitats are mostly vegetation-based (Evans, 2010; Biondi *et al*., 2012a). Their diagnosis, recognition in the field and monitoring require a phytosociological approach which, starting from Braun-Blanquet's formulation (1932) and including its most recent advances (e.g. Rivas-Martínez, 2005; Géhu, 2006; Willner, 2006; Dengler *et al*., 2008; Biondi, 2011), is probably the most suitable and coherent framework for the classification of plant communities. The detection and precise recognition of each Habitat type is a crucial, preliminary step for any monitoring project.

An important support for Habitat recognition has been provided by the European Interpretation Manual (European Commission, 2013). In Italy, a National Interpretation Manual of Annex I Habitats was also specifically developed, offering a helpful tool for the identification of the Habitats in the national territory (Biondi *et al*., 2009, 2012a; Biondi, 2013).

In the Monitoring Manual, this National Interpretation Manual has been indicated as the official and updated reference for the diagnosis and interpretation of the Habitats occurring in Italy. The Monitoring Manual does not treat the interpretative problems that still exist for some Habitat types.

Additionally, being mostly defined according to phytosociological criteria, Annex I Habitats often use both the language and the units of syntaxonomy, with the most frequent correspondences to the level of alliance (Evans 2006; 2010; Biondi *et al*., 2012a). Syntaxonomy is a hierarchical classification system whose basic unit is the plant community (association), and where the main ranks are alliances, orders and classes, defined on the ground of shared characteristics, firstly the floristic composition, but also physiognomy, structure, dynamic relationships, ecology, biogeography (Weber *et al*., 2000; Dengler *et al*., 2008; Biondi, 2011).

In the Monitoring Manual, the recently published Prodrome of the plant communities of Italy (Biondi *et al.*, 2014; Biondi & Blasi, 2015) has been indicated as the official and updated reference for the syntaxonomic arrangement of the Habitats occurring in Italy. Standard references for species nomenclature have also been indicated, basically Conti *et al.* (2005, 2007), integrated with the latest taxonomic updates (e.g. Lucarini *et al.*, 2015).

Sampling procedure

The phytosociological relevés have been acknowledged as appropriate tools for monitoring both floristic and ecological changes in plant communities (Dengler *et al.*, 2008). In the Monitoring Manual, the minimum basic recommended information for Habitats monitoring is the vegetation relevé. It is here defined as 'a representative portion of the Habitat's vegetation, placed in a homogeneous vegetation stand based on a stratified random criterion, including a complete list of the vascular species (and possibly of mosses and lichens) and their abundance (expressed with Braun-Blanquet's scale or as cover percentage), physiognomic and structural attributes, and site characteristics'.

Further information derivable from the vegetation relevés, useful to detect additional details about the CS of a Habitat, are also indicated in the Monitoring Manual, e.g. the total vegetation cover, the structural layers cover, the presence/cover of dominant/typical/relevant species, of invasive/alien species, of species indicating disturbance (e.g. nitrophilous and synanthropic species), environmental changes (e.g. xerophilous species in wet environments), ongoing dynamic processes (e.g. perennial species in annual Habitats, or woody species in grassland Habitats), etc.

Relevés in the field should be positioned in homogeneous vegetation stands (sampling plots), with reference to structure and species composition, that can be defined using a stratified random sampling design (Michalcová *et al.*, 2011; Marcantonio *et al.*, 2012). For each plot, the collection of GPS data, land use and complementary information is strongly encouraged. Permanent plots, to be repeatedly sampled at Habitat-specific fixed time periods, are highly recommended to point out floristic and structural changes in plant communities (Bakker *et al.*, 1996). In case of complex vegetation mosaics (e.g. for the coastal dune systems), the transect is indicated as the best tool to point out the environmental and vegetational heterogeneity (Prisco *et al.* 2015; Sciandrello *et al.*, 2015; Buffa *et al.*, 2016).

Sampling plot size

In the European phytosociological literature, the vegetation types have frequently been sampled in plots of different size (Chytrý & Otýpková, 2003; Dengler *et al.*, 2008), thus affecting results when comparing data, a bias particularly significant with data collected at different times by different surveyors. Indeed, vegetation and Habitats are intrinsically scale-dependent units, basically ruled by species size, growth patterns and interactions among plant individuals, as well as by the physical and ecological heterogeneity (Greig-Smith, 1979; Palmer, 1988; Dale, 1999; Turner *et al.*, 2001; Gigante *et al.*, 2016b). For some Habitat types the sampling plot size is a crucial issue, also to avoid the risk of pseudo-turnover when monitoring annual-rich plant communities, e.g. for the Habitat 6220* whose temporal stability is not necessarily related with its demographic inertia (Guarino *et al.*, 2005; Guarino, 2006).

The opportunity of sampling standard areas, specific for each Habitat type (or macro-type), has been suggested in the Monitoring Manual as the best prerequisite for an effective comparison. This issue becomes important especially when analysing large data sets, an increasingly likely process, thanks to the development of large databases such as the National DB 'VegItaly', a public repository of vegetation plots owned and managed by SISV itself (Gigante *et al.*, 2012; Landucci *et al.*, 2012; Venanzoni *et al.*, 2012), or the Italian National Vegetation Database (Casella *et al.*, 2012).

Following Chytrý & Otýpková (2003), who strongly recommend the use of fixed-size sampling plots in vegetation analysis and propose four standard dimensions for as many macro-typologies of vegetation, in the Monitoring Manual the indication of standard, Habitat-specific plot sizes has been reported. In case of Habitats with several subtypes, e.g. those with a high floristic richness and variable from region to region, a modest range of size is suggested, allowing the surveyor to adopt the most appropriate dimension.

Distribution mapping (area, range)

Mapping is an integral part of Vegetation science (Küchler & Zonneveld, 1988; Pedrotti, 2013), although only recently it acquired a key role for Habitats monitoring (Bunce *et al.*, 2013a). Indeed, due to their vegetation-based identity, the spatial distribution of Habitats can be suitably represented with the aid of distribution maps of the plant communities (Viciani *et al.*, 2016a). This distribution is mainly the result of spatially distributed environmental gradients and land use. Its recognition and delimitation can be based on intrinsic features, such as structure, physiognomy and floristic composition of the plant community, combined with external ones, such as discontinuity with respect to the surrounding vegetation (Van der Maarel & Franklin, 2013).

A very important aspect is the spatial pattern of occurrence of each Habitat, which plays a crucial role in assessing the CS and in estimating the potential distribution and the inherent vulnerability. In the Monitoring Manual, the specific pattern of spatial distribution has been indicated for each Habitat, with reference to the three main types (areal, linear and point) proposed by Gigante *et al*. (2016b).

Further Habitat-specific requirements, such as the best scale of representation, have been included. The recommended representation scale is generally 1:10,000. In case of point or linear elements (or areal elements with a surface smaller than 400 m^2), hardly matching with this scale, the occupied area should be indicated as an attribute of the cartographic element, in the table associated with the vector file. If the Habitat is located along very steep surfaces (e.g. chasmophytic Habitats), it is appropriate to quantify not the projected surface but the real one. Under optimal conditions, Habitat mapping should undergo statistical validation (Lea & Curtis, 2010).

'Typical' species

The HD uses the term 'typical' species (European Commission, 1992) without providing neither a univocal definition nor any theoretical reference (European Commission, 1992). This issue was considered in the preparation of the Manual, and a strong effort was made to point out possible overlapping/differences with similar terms already in use. In Phytosociology, the concept of characteristic species originally developed by Braun-Blanquet (1932) has been modified in time and improved, e.g. by that of 'preferential' species (Biondi, 2011) statistically and structurally concurring to the 'characteristic specific composition' of each plant community. According to Dengler *et al*. (2008), the 'diagnostic' (characteristic or differential) species can be recognized in a vegetation type and their validity should be based on the concept of fidelity (see, e.g., Chytrý *et al*., 2002). However, the idea of 'typical' species developed by Evans & Arvela (2011), in spite of later interpretative efforts (e.g. Maciejewski, 2010), significantly differs from the ones used in the phytosociological school, being not strictly focused on the species diagnostic value, but rather on identifying those *taxa* having the role of synthetic indicators of the CS of a Habitat. It is the case, for instance, of the so-called 'early warning species' or 'sentinels' (Caro, 2010) which, in most cases, are not typical *taxa* but rather indicators of environmental alterations.

The need for synthetic indicators does not always combine well with biodiversity (Dale & Beyeler, 2001). This is particularly true when considering an area with high biodiversity such as Italy, whose territory is for large part considered one of the world 'hot spots' (Médail & Quézel, 1997; Myers *et al*., 2000). Actually, there are many Habitats in Italy featured by an intrinsic wide floristic variability in the different territories of their distribution range. Fixed lists of 'typical' species (in phytosociological sense), even if long and expert-based, would certainly be not exhaustive for the whole Italian peninsula and, additionally, would have rather a diagnostic value, which not necessarily indicates a good CS.

For these reasons, in the Monitoring Manual, based on each Habitat structure and species richness, three main categories of 'typical' species (*sensu* HD) have been identified and as many solution models have been adopted (Tab. 1). In all the cases, but especially for the species-rich Habitats (Case 3), a strong indication has been given to consider the whole floristic pool as the best proxy for evaluating the CS, and not only a few 'typical' species, emphasizing the indication value provided by the whole flora of any Habitat type.

Additional information and field tests

Additional specifications have been indicated for each Habitat type, e.g. the overall expected number of working days per person to perform a standard number of surveys, the minimum number of relevés or transects (typically proportional to the total area of the Habitat and its biogeographic and regional diversity),

Tab. 1 - Different cases and criteria for the selection of 'typical' species (*sensu* HD) adopted in the Monitoring Manual.

Case	Habitat typology	Criteria for selecting the 'typical' species (*sensu* HD)
1	Habitats clearly distincted by the sharp dominance of 1 to few species, e.g. 2120 'Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)', 2160 'Dunes with *Hippophaë rhamnoides*', 3230 'Alpine rivers and their ligneous vegetation with *Myricaria germanica*' etc.	Only the main (physiognomy-shaping) species, which often comes in the name of the Habitat or related vegetation type, is indicated among the 'typical' species (*sensu* HD); in the reported examples, respectively: *Ammophila arenaria*, *Hippophaë rhamnoides*, *Myricaria germanica*
2	Habitats clearly distincted by the dominance of a restricted group of species belonging to 1 or few genera, e.g. 1310 '*Salicornia* and other annuals colonizing mud and sand', 3140 'Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.', 7220 'Petrifying springs with tufa formation (*Cratoneurion*), etc.	Only the main (physiognomy-shaping) genera (which often come in the name of the Habitat or related vegetation type) are indicated among the 'typical' species (*sensu* HD); in the reported examples, respectively: annual species belonging to the genera *Salicornia* and *Suaeda*; species belonging to the genera *Chara* and *Nitella*; species belonging to the genera *Palustriella* (syn.: *Cratoneuron*) and *Pellia*
3	All the other Habitats, more or less species-rich, more or less diversified across the country	The whole floristic combination should be considered as the best proxy for assessing the CS; only in few cases, 1-2 dominant species have been indicated among the 'typical' species (*sensu* HD) including, when possible, *taxa* with a clear ecological role in detecting the CS; the target 'typical' species should be pointed out at regional or even local scale

other biological quality parameters to be considered (such as animal *taxa* relevant for the assessment of the CS), the optimal sampling period intrinsically connected to the phenology of each phytocoenosis (Tomaselli *et al*., 2016).

Eventually, the developed monitoring procedures have been tested by expert staff on 10 selected Habitats: 2120 'Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)', 2130 'Fixed coastal dunes with herbaceous vegetation (grey dunes)', 2210 '*Crucianellion maritimae* fixed beach dunes', 3150 'Natural euthrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation', 3170* 'Mediterranean temporary ponds', 6220* 'Pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*', 91B0 'Thermophilous *Fraxinus angustifolia* woods', 9220* 'Apennine beech forests with *Abies alba* and beech forests with *Abies nebrodensis*', 9330 '*Quercus suber* forests', 9340 '*Quercus ilex* and *Quercus rotundifolia* forests'. Representatives of the Regional Offices and local managers have been involved in this field activity: a fundamental opportunity for enhancing a cooperation aiming at harmonizing the whole process.

Open issues

Some open issues, such as the appropriate threshold values for most of the considered parameters to determine whether the CS is favourable or not, are still under discussion at European level and represent an important scientific challenge for the next future. These thresholds are referred to as 'Favourable Reference Values' (FRV) and are key concepts in the assessment of the CS (Evans & Arvela, 2011).

As concerns animal species, a fruitful debate has already produced different proposals (e.g. Brambilla *et al*., 2010; McConville & Tucker, 2015; Epstein, 2016). With regards to Habitats, the European Commission (2005) provided some suggestions, e.g. for the parameter 'range' the FRV should be 'sufficiently large to allow the long term survival of the habitat' and 'must be at least the range when the Directive came into force'. It is evident that, as also suggested by Evans & Arvela (2011), the expert judgment will have to be used again while waiting for realistic calculated figures.

Just like in several other countries, in Italy a large part of the Natura 2000 Sites lie close to densely populated areas, characterized by pervasive urbanisation and infrastructures. In most cases, what is under protection in Europe is not a pristine nature (of which very few traces remain), but the surviving elements of a traditional cultural landscape where the establishment of Natura 2000 Sites tries to salvage the most significant relicts (Guarino *et al*., 2015). In such a context, the assessment of FRV remains an intricate issue.

For some Habitat types (e.g. forests and primary vegetation), precious information can be derived from the Potential Natural Vegetation (PNV) concept (Tüxen, 1956; Rivas-Martínez, 2005; Farris *et al*., 2010; Biondi, 2011; Biondi *et al*., 2011), already applied in relation to Natura 2000 (e.g., Rosati *et al*., 2007, 2008; Gigante *et al*., 2014; Viciani *et al*., 2016b). The PNV can play a precious role not only for detecting the potential range but also for giving account of the rate of Habitat fragmentation. It is well known that fragmented ecosystems are those more at risk of decline in distribution or ecological function (Rodríguez *et al*., 2011).

Data on the distribution of all the climatophilous vegetation series at the national scale are already available for Italy (Blasi, 2010) and may represent a robust tool for evaluating the PNV and the potential range of the corresponding mature stage (the so called 'head of the series').

Additionally, it can be expected that once the monitoring activity will become regular, the stratification of data will allow to define the actual trends of the CS for each Habitat, and will represent the most stringent and objective information to detect changes and infer future prospects, providing an important tool for policy makers across the EU (Bunce *et al*., 2013a).

Conclusive remarks

The Convention on Biological Diversity (CBD), signed by almost 200 countries with the aim to halt the loss of biodiversity by 2010, missed the fixed goal that was later extended to 2020 (Balmford *et al*., 2005; Butchart *et al*., 2010; European Commission, 2011; Henle *et al*., 2013). In such a discomforting scenario for nature conservation, a clear definition of models and parameters is crucial for a proper application of any scientifically based monitoring protocol. The development of efficient monitoring systems became particularly urgent to ensure success to the vast operation for halting biodiversity loss initiated in Europe with the HD, both within the Natura 2000 Network and outside.

Large-scale policy regulations, such as the HD or the Water Framework Directive (European Commission, 2000), were able to embody the integrated features of landscapes, human societies and their use of natural resources (Pullin *et al*., 2009). However, as often happens when dealing with biodiversity, it is necessary to establish priorities and to make choices (Guarino *et al*., 2011). It should be considered that the Habitat features and needs may be locally different from the national/supranational indications (Bensettiti *et al*., 2005). The various patches of a Habitat may play a different role for its overall survival, giving rise to national and regional responsibilities and priorities for conservation, as also pointed out by Schmeller *et al*. (2012, 2014). In this sense, a prominent role should be given to the regional level, as suggested in recent works (Benavent-González *et al*., 2014; García-Madrid *et al*., 2014; Angiolini *et al*., 2016). In Italy several projects, such as FORESTPAS 2000 (Urbinati *et al*., 2014), GESTIRE (AA.VV., 2014) or SUN LIFE (Gigante *et al*., 2015) have already provided detailed insight at the regional scale, producing *ad hoc* tools and protocols for monitoring the peculiar characteristics of Habitats at the local level.

Conservation science in its widest acceptation is more and more called to provide the basic understanding of natural systems and processes and to address proper investigations matching with the policy need of detecting changes and inferring future trends. Indeed, suitable indicators for biodiversity monitoring should catch its complexity yet remaining simple enough to be easily measured (Dale & Beyeler, 2001). In this frame, the importance of a methodological tool like the Monitoring Manual is even bigger, bridging across the science-policy interface and proposing a proactive interaction among policy makers, scientific community, local stakeholders and citizens.

The third report on the CS of species and Habitats in Italy (period 2007-2012) promoted a harmonized use of the European evaluation format (Genovesi *et al*., 2014), although still suffering for a generalized lack of territorial data for large parts of the country. Similarly to many other European countries, the assessment had to be mostly based on the use of the expert opinion (EEA, 2015). The fourth report (period 2013-2018) is at present under construction and will try to fill a number of gaps still affecting the national knowledge. We believe that the here presented Monitoring Manual will represent a useful tool to support nature conservation, in Italy and Europe. The proposed simple, but effective, protocols represent a solid starting point and will allow, from now on, a harmonized data collection by way of standardized and shared methodologies, resulting in comparable evaluations of the CS of each Habitat. Such an integrated approach should improve the impact of Vegetation science on policy development in Europe (Pullin *et al*., 2009).

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