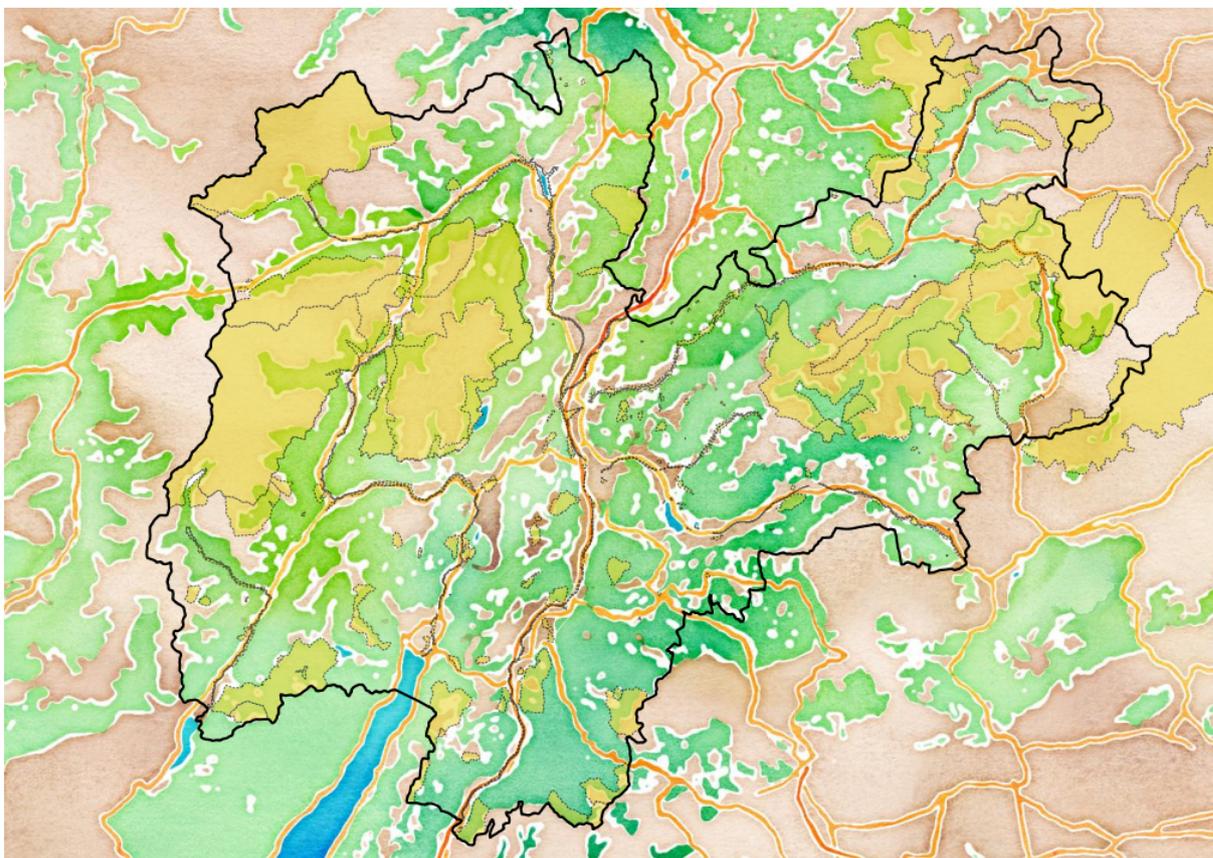




-LIFE11/NAT/IT000187 T.E.N.-

Action A5

Definition of "provincial guidelines" for the implementation of the monitoring in the sites of the Natura 2000 Trentino network
EXECUTIVE SUMMARY



REDACTION

MUSE - Museo delle Scienze, Sezione di Zoologia dei Vertebrati

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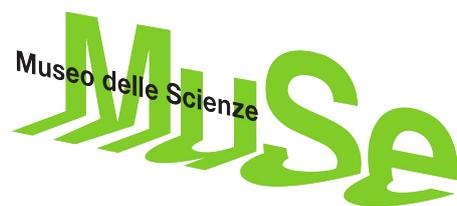
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LIFE+T.E.N. PROJECT

Written by:
Paolo Pedrini
Mattia Brambilla



VERTEBRATE ZOOLOGY DEPARTMENT

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1 General objectives of the guidelines for a monitoring plan of the terrestrial vertebrate fauna

In order to implement its contents, the Habitat Directive highlights the necessity for an improvement in scientific and technical knowledge while underlining the need for research as a key element.

According to the directive guidelines, in order to implement significant measures for the conservation of nature and living species, it is essential to have a good knowledge of each species, with particular regard to the distribution, biology and ecology, threats and sensitivity to environmental changes, conservation needs, etc. A good knowledge of these factors for the conservation of the species is indeed considered an essential condition for a correct implementation of the directive. Member-states should hence collect and use the best information from all reliable sources when planning their conservation strategies.

The Directive imposes the maintenance or restoration of a favourable conservation status for all species and habitats of community interest. Therefore, as established in Article 11 of the directive, monitoring of the state of conservation of habitats and species listed in Article 2 is required. Description and assessment of the conservation status of habitats and species within the network of Natura 2000 sites is not always enough, especially in the case of species or habitats that are only partially placed into the network sites (such as the species listed in Annexes IV and V of the Habitat Directive, which do not require the designation of special protection areas even though maintaining or achieving a favourable conservation status is still required).

Monitoring should therefore be extended outside the Natura 2000 Network in order to achieve full understanding of the conservation status of species and habitats. According to Article 17 of the Directive, the main monitoring results must be reported to the Commission every six years. The Directive underlines the importance of regular monitoring activities, which are essential for evaluating the conservation status of the network in an organic and systematic way. Monitoring must lead to a clear, knowledge-based and updated framework of the real status of conservation of habitats and species of community interest and of the related trends at various levels, and must indicate the effectiveness of the Directive in terms of achievement of its objectives.

Therefore, monitoring, evaluation of conservation status and dissemination of results should facilitate:

- 1) the evaluation of the effectiveness of the management measures in Natura 2000 sites and of other provisions of the Directive;
- 2) the evaluation of the contribution of the Directive to the conservation strategy for a wider biodiversity, the provision of information and guidelines necessary for setting priorities in the conservation strategy at national and European level;
- 3) the setting of priorities and emergencies situations for the future monitoring (at national and European level);
- 4) the support for the assessment of the impact of plans and projects that are potentially adverse to species, habitats or sites within Natura 2000 network;

- 5) the support for the assessment of the proper use of exceptions, to give guidelines regarding the requirement to adapt the Directive's Annexes (eg with changes in priority level, inclusion or exclusion of species from the lists, etc.).

Ultimately, monitoring is a key tool for evaluating the correct management and good conservation status not only of populations or species, but also of protected areas and of the entire Natura 2000 Network system. Within a national scenario characterized by poor accuracy of the data and of the knowledge relating to the sites and species within Natura 2000 Network, the regional authorities (the provincial government in the case of the Autonomous Province of Trento) are responsible for much of the management of the Network and thus play a key role. They must, in fact, be provided with proper technical structures that facilitate the promotion, coordination and updating of and processing of information by implementing specific programs for the monitoring and detection of species, habitats (or groups of species or habitats) and sites (starting with those of primary importance), thus becoming pro-active actors for conservation of biodiversity in Europe.

Trentino is characterized by its great biological and environmental wealth, with a complex system of Sites of Community Importance and Special Protection Areas which encompass areas of high natural value. Regarding the conservation status, fauna and environment of the sites, our Province has strong base of knowledge of nature deriving from a strong tradition in biodiversity research which is the result of the time invested and particular vigour applied since the early eighties by local Museums - historical institutions dedicated to documentation on nature and values of the area -, by other research Institutions, provincial parks and by Stelvio National Park and competent provincial Departments and Services. This knowledge of nature has been enhanced by the scientific collaboration between many Italian and foreign university institutes.

1.1 Document structure and objectives

The monitoring of vertebrate faunal species is an operational and managerial priority, both given the high number of species included in Annex I of the Birds Directive and Annex II of the Habitat Directive, and given their natural and conservational, ecological, managerial and informational value and the raising of awareness in the general public. The drafting of guidelines aims to achieve two main objectives:

1. the monitoring of community interest species within the sites of the network and the rest of the province;
2. the monitoring of other terrestrial vertebrate species, which in many cases serve as excellent indicators of the health status of the biodiversity in general and of the ecosystems in which they are located or which represent other 'priorities' in terms of conservation at provincial level, without additional costs or work to the monitoring of the species as per point 1.

Several broad guidelines are proposed in order to meet the requirements of monitoring such a large number of diverse species and habitats that are spread over a very large and heterogeneous area in terms of natural environments, altitude, climate, and affected by human activities, etc.

First, it was decided to proceed with a breakdown by taxa of the species to be monitored. This decision was motivated by the wide range of heterogeneity existing between the different classes of Vertebrates in their abilities to move and the areas used by individuals, as well as by profound differences in biological cycles. In particular, with their incredible mobility, the vast areas covered and the complexity of the biological cycle, **Birds** need to be treated as a special case. A specific and broader analysis is dedicated to Birds, both because of their number and ecological value, and secondly, given that these types animal are the subject of a dedicated European Directive a special community-wide attention is paid to them. Given their close similarities in the ability to move and, in some cases, in the ecological requirements and methods of analysis, **Amphibians and Reptiles** are instead considered together. Finally, Mammals are treated independently and divided into the three groups; **Chiroptera, Rodents, Carnivores** (the only orders that include species listed in Annexes II and IV of the Habitat Directive), which are profoundly different in ecology and biological cycles.

The document is, thus, divided into sections corresponding to the taxonomic groups listed above; each section is drafted according to a general scheme which envisages a specific introduction, a 'state of art' knowledge about a specific group, the description of the criteria used for the selection of species to be monitored, the list of selected species and a comprehensively detailed description of the methods envisaged for the monitoring of the various groups (or groups of species), followed in some cases by synthetic data sheets.

In the case of **Birds**, the species are grouped into categories according to macro-environments defined on the basis of the structural characteristics of the vegetation. These categories are further subdivided. For each of them, the species identified for monitoring are listed for each of these categories. The species list is followed by a list of Natura 2000 Habitats that are part of that category and a list of habitats excluded from those identified by the Habitat Directive but nevertheless worthy of monitoring because they play host to substantial populations of community interest species (which are included in Annex I of the Birds Directive). The document outlines the methods to be used for conducting a census of the identified species; these counting techniques factor in distribution, ecology, species ethology, as well as their biological calendar. Thus, the effectiveness of the census is maximized in order to obtain significant results with minimum fieldwork necessary. The document envisages the use of specific methodologies (eg emissions of recorded territorial songs to induce responses in species that are otherwise difficult to sample) and census methods (from the visit to the Galliformes calls area to the census of wintering aquatic species by the lakes) in order to optimize the sampling work. The document, then, outlines, in data sheet summary form, the procedures envisaged for individual or groups of species and a summary of the bibliography (for community interest species).

For **Amphibians** and **Reptiles** subdivision by type of environment is much simpler than the one adopted for Birds and is based essentially on the altitude, a determining factor in the distribution of the species belonging to these classes of Vertebrates. Following the list of species and the breakdown by type of environment, the document outlines the counting techniques to be used for these species, discussing the pros and cons in terms of results and required work.

No distinction on the basis of environmental type is made for **Mammals**. Instead, the document evaluates the different techniques to be adopted for the census of groups as diverse as Chiroptera, Carnivores and Rodents, taxa including species belonging to Annex II of the Habitat Directive.

The activities already in place and initiated by the APT will be taken into consideration for all taxa; in some cases, and with particular regard to Galliformes and large Carnivores, the document refers explicitly to monitoring programs and techniques currently used by the APT Wildlife & Parks Service.

Finally, it should be noted that the community interest species have been the subject of focus also within the scope of Action A.2 of LIFE project, which defined the priority for the realization of the provincial ecological network and of Vertebrates mentioned in "Birds" and "Habitat" Directives Annexes; for further details please refer to the relevant document that can be downloaded in pdf format from the LIFE + TEN website.

2 Procedures for the monitoring of the vertebrate fauna within Natura2000 Network in Trentino

The monitoring of the vertebrate fauna initially envisages the definition of the current state of knowledge relating to the species of community interest in Trentino, both with regard to the abundance and trend of populations, and the link between the species and the various provincial ecological contexts.

Therefore, **the first step** is to conduct a census and to classify and, where possible, to standardize the data already collected from previous information gathered from the Eighties onwards. This objective has been achieved in the province of Trento thanks to the database organized under Action A1, which provided for the creation of a WebGIS in order to share information among the various research actors in Trentino. Previous summaries regarding the conservation status of avifauna over the last 25 years and a comparison with historical data prior to the Eighties were instead summarized and represented in faunal atlases edited by Trento Museum of Natural Sciences, which is today called the Science Museum of Trento (MUSE). The APT faunal Plan (2011) has been used as reference for species of specific managerial interest.

The **second step** envisages the actual monitoring, with collection of field data aimed at defining the distribution of the species, at understanding their population trends, at monitoring environmental quality using certain species as indicators. The data collected by the monitoring process should be accurately georeferenced, ensuring that both the species type and number of individuals, and the exact location and the date and ecological or census notes (type, area of interest, any other data worth documenting) are reported/documented. The geo-referenced data can then be easily integrated within the WebGIS.

The **third phase**, which runs in parallel with and follows annual archiving, must be supervised by the persons responsible for of each monitoring process and envisages the collaboration of the science Museums (the MUSE for vertebrate fauna). The archiving process takes place every year after validation and archiving of data using the tools provided and shared through the WebGIS of Natura 2000 Network, created within the scope of Action A1. The Museum, in collaboration with the relevant work groups and monitoring bodies, will be responsible for ensuring data analysis and the periodic creation of technical and scientific summary documents provided locally by the EU for periodic technical reporting. The data collected in accordance with the envisaged modalities will facilitate the development of environmental models in order to define the potential habitats of the species and to evaluate the faunal assets at provincial level.

3 The objectives of avifauna monitoring

The monitoring of bird communities should become a standard procedure in order to understand the evolution of biological communities in general and the trends of bird populations, which are often completely unpredictable. Bird communities change at different rates, often very quickly, thus an apposite monitoring process is crucial in understanding the ongoing demographic trends and to identify species that are a priority target in ensuring their conservation.

Monitoring is also a key tool for evaluating the correct management and good state of conservation both of populations or species and of protected areas, and of the entire Natura 2000 Network system. Thus, bird species are particularly suitable as indicators of the general state of the biodiversity: a set of target species may in fact be used as a "thermometer in order to measure the positive impact of actions" of the conservation and management of a specific areas or system of habitats, or the impact of human activities on them.

Indeed, birds are often used in different contexts as 'biomarkers', both in terms of rich and diverse or particularly valuable biological community indicators, and quality or ecological functionality indicators of ecosystems. This is due to the fact that the ecology of individual species is generally well known, that the bond between bird communities and the landscape and plant communities has been amply demonstrated, that the trophic levels occupied within the 'ecological pyramid' are multiple in any environment, and finally, a census can easily be conducted on most species and accurate data regarding their presence and number can be obtained relatively quickly.

Moreover, in many cases the mere presence or quantity of certain species can be an important indicator of the health status of an environment, or of biological diversity in a specific context. Thus, "the establishment of an organic and nationally coordinated monitoring network" would represent the ideal tool to facilitate reliable, updated and scientifically apposite assessments in function of assessments of species presence and other instruments, regulatory or otherwise, of Natura 2000 Network.

3.1 Requirements imposed by reporting requirements

The reporting system provided by Art. 12 of the Birds Directive asks for:

- population size;
- regional population trends, in the short and long term, and information regarding method used and estimate quality;
- species distribution and related information regarding the reference period, surface area , method used, quality of data;
- range trends, in the short and long term, method used for calculation, data quality.

These elements were taken into consideration during the establishment of the described monitoring methods herein, whose correct implementation should result in field data that meets to the above-mentioned requirements imposed by the Directive.

Other requirements of the reporting procedure pursuant to the Directive have a greater scope than the monitoring techniques and include assessments on presence and application of any action plans, description of pressures on and any threats to the species. Finally, monitoring is expected to ensure good coverage of provincial SPAs and to allow an assessment of the conservation measures implemented for bird species.

3.2 Species of Birds Directive (Ann. I) and other conservation priorities on a local scale

The document provides a summary of the methods envisaged for monitoring species of community interest and for those selected with regard to their role as bio-indicators, based on ecological role and rarity on a European and local scale. The species were selected and listed according to subdivision of environmental type. The description of census techniques is not a technical summary of the different methods used for the study of avifauna, but rather provides a synthetic and clear indication regarding the ideal modalities for monitoring the various bird species.

The description of the methods and of the envisaged fieldwork provides some useful information regarding the species to be surveyed and the areas to be monitored in order to determine the amount of sampling work needed and provide a framework of the techniques to be applied for each of the areas.

The possible skills and synergies, envisaged in the chapter that summarizes the sampling methods, are based, in part, on the experiences and ongoing monitoring projects established by APT Services within the protected areas, and museums and/or other provincial research bodies. The aim is to contribute to the establishment of a provincial network for the realization of monitoring of fauna, flora and habitats as required by the Habitat and Birds Directives.

The aim of this section is:

- 1) to direct the monitoring actions to design a plan useful to conservation;
- 2) to ensure management of the monitoring and its repeatability over time while limiting the costs and making the work functional;
- 3) to ensure updating and divulgation via the WebGIS, and the assessment of the conservation status of the species throughout the entire province.

3.3 The monitoring of nesting avifauna categorized by macro-environments

Due to the reasons stated above, the monitoring of Natura 2000 Network in Trentino, as elsewhere, focuses predominantly on nesting Birds since they represent the most characteristic category and principal conservation interest at provincial level; this category also includes species that play the role of indicator of biodiversity or environmental quality.

In parallel to the monitoring of the nesting Birds communities, a census of wintering aquatic birds at main provincial water bodies and the percentage in transit during pre-nuptial and post-breeding migrations is envisaged.

A monitoring method is envisaged also for species not mentioned in Annex I of the Birds Directive. Due to their value as biomarkers or to their unfavourable conservation status at European or continental level, and to their presence in environments frequented by species that are already subject of attention since they are included in Annex I and the former can, potentially, be surveyed using the same methods as envisaged for community interest species.

The procedure for the selection of species to be monitored is as follows.

3.4 Criteria

Taxa have been selected in order to satisfy the following conditions.

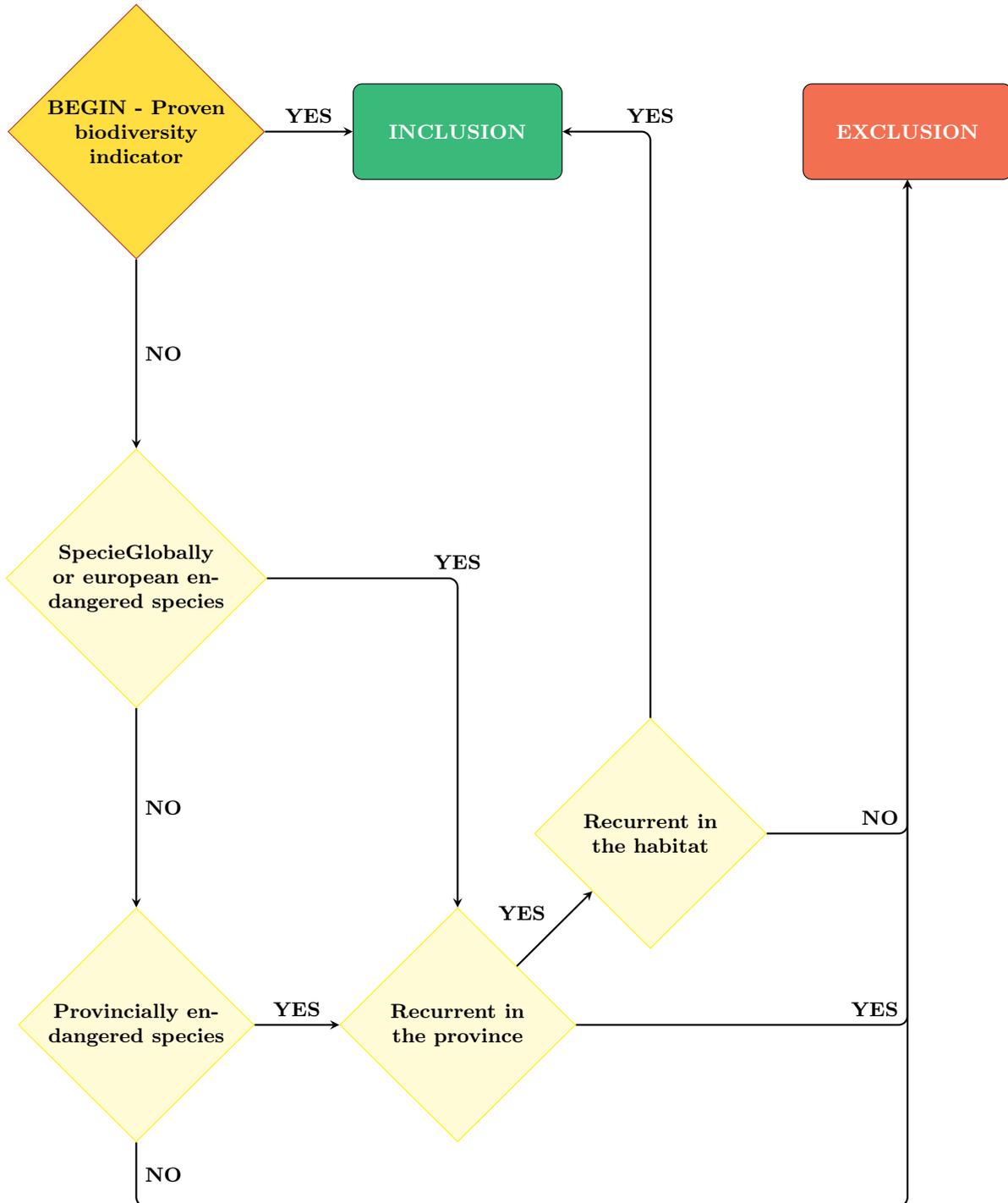
- A) indicators of diversity or specific richness;
- B) indicators of natural environments in a good state of conservation
- C) species with unfavourable status at global or continental level;
- D) species with unfavourable status at the provincial level, but without a point source distribution.

Therefore, the selected species included are:

1. species listed in Annex I of Birds Directive (2009/147/EC), except those accidental or completely erratic in Trentino;
2. indicators of biodiversity and environmental quality/functionality of the ecosystem, based on available scientific knowledge;
3. other species with unfavourable conservation status at European level according to the report published by BirdLife International in 2004;
4. species with unfavourable status at provincial level, according to the Red List of nesting Birds in Trentino.

It should be reiterated that the monitoring of the species, as per paragraphs 2, 3 and 4, does not result in a any extra sampling work than already envisaged for the monitoring of the species as per paragraph 1, since the data collection systems, necessary for monitoring of the species as per point 1 allow the simultaneous to monitoring of the other species without further fieldwork being required.

Logic scheme for the inclusion of a bird species on the list for monitoring a potential nesting habitat



3.5 Priorities for species not included in Annex I of the Birds Directive

Priority was given to species representative of communities in good state or to already known biodiversity indicators (indicators, umbrella species, focal species). These species were chosen according to the environment frequented at the provincial level (frequency in different environments inferred from the atlas).

3.6 Objectives of the monitoring actions

1. check population trend and distribution of the species listed in Annex I of Birds Directive (2009/147/EC) and of other species of significant ecological or conservation interest;
2. obtain indirect information about the state of health of the environment (or habitat or types or groups of priority habitats) by using indicators.

The monitoring of species that act as indicators of biodiversity (eg some species of diurnal birds of prey) or of high environmental quality and of ecosystem functionality (eg several Passerines) can provide more general information than the specific distribution of a single organism, and lead to a number of important outcomes in terms of conservation and management of the natural environment. In particular, the use of biomarkers in general facilitates the interpretation and monitoring of the quality of a habitat in ecological terms.

The use of appropriately selected indicator species represents a practical, relatively quick and effective way of resolving issues relating to the conservation, management and any re-naturalization of ecosystems. The indicator species can also act as an umbrella species when the management actions, necessary for these taxa, allow at the same time the preservation of the species both present within the same environment and affected by the same ecological and human factors.

The species selected on the basis of the above mentioned criteria for the monitoring of Natura 2000 Network in Trentino, are listed below. The species are listed and subdivided by macro-environment; these macro-environments include potentially different habitats of community interest in accordance with Habitat Directive (92/43/EEC), or environments that are not included in the Directive but that host significant populations of bird species included in Annex I of Birds Directive (2009/147/EC).

The macro-environments, identified on the basis of macroscopic features of the vegetation and of biotic and abiotic factors that characterize the different habitats, are as follows: agricultural and meadow areas; wetlands; forest environments; environments of high altitude; rocky areas and detrital mountain slopes.

The systematic lists are subdivided in the following order:

- A) species listed in Annex I of Birds Directive (2009/147/EC);
- B) biomarkers according to scientific literature (papers published in international journals, other specialized research studies);
- C) species with unfavourable status at a European level according to BirdLife International;
- D) species with unfavourable status at a provincial level according to the provincial Red List.

The “reasons” column cites the reason (or reasons) for the choice of a given species as per sections B, C, D mentioned above, with appropriate references. This column also provides the SPEC classification of BirdLife International that summarizes the conservation status of a species (in summary: SPEC 1: globally endangered species; SPEC 2: species with unfavorable conservation status in Europe and concentrated in Europe; SPEC 3: species with unfavorable conservation status in Europe but not concentrated in Europe). Those species that do not fall into SPEC categories but are in decline in Europe are also indicated.

4 Guidelines for monitoring of herpetofauna within the Natura2000 network in Trentino

The term herpetofauna is used to designate two distinct classes of Vertebrates, Amphibians and Reptiles. These animals are frequently grouped within faunal and ecological studies mainly because of the application of certain study methods common to both and the similar spatial scale in which they respond to ecological factors and conservation actions.

Nevertheless, Amphibians and Reptiles are quite different in terms of eco-ethology; for example, Reptiles have mostly diurnal habits, while Amphibians tend to be nocturnal. Furthermore, Amphibians usually lay gelatinous eggs in water and thus hatch into a larval form, while most Reptiles lays eggs on land which never transform into larvae. Moreover, Reptiles have relatively thick waterproof skin, while Amphibian skin is rich in glands, moist and permeable. Amphibians typically produce a greater number of hatchlings, with a much greater mortality rate. The key elements that these two classes have in common are: an ectotherm (ie dependence on external sources of heat due to an inability to increase body heat independently), small body size, absence of social behaviour in a strict sense and reduced ability of dispersal, ie to make long journeys in search of new territories.

Even though they have been subject of relatively little study, these animals can provide important information in ecology that extends beyond the simple faunal characterization of a site. In fact, many species can serve as ecological indicators, usually at a scale that makes them complementary to the use of bio-indicators chosen among Birds. Amphibians and Reptiles share a pronounced sensitivity to environmental changes, an often very high ecological specialization and poor mobility, the former, in particular, having declined drastically on a global scale during the last decades. Among the Vertebrates community, it is the Amphibians who, due to a pronounced sensitivity to changes in the environmental chemical and physical parameters in which they live, probably reveal a more marked trend of decline. Scientific literature, both national and international, reports numerous cases of local or global extinction of Amphibians, in some cases with no clear causes.

Another serious threat to the conservation of many Amphibian species comes from the spread of diseases related to *Chytridiomycota* infection (Chytridiomycosis) which can exert a strong impact on the populations of various species. This type of situation, thus, requires interventions aimed at monitoring the species, and improving the understanding of and mitigation of negative effects on the populations caused by human activity. Sixteen species or subspecies of Amphibians and Reptiles present in Trentino are included in Annexes II, IV and V of Habitat Directive (92/43/EEC):

- A) **Amphibians:** alpine salamander *Salamandra atra* (Ann. IV), golden alpine salamander *Salamandra atra aurorae* (Ann. II *, IV), Italian crested newt *Triturus carnifex* (Ann. II, IV), yellow-bellied toad *Bombina variegata* (Ann. II, IV), green toad *Bufo viridis* (Ann. IV), Italian tree frog *Hyla intermedia* (Ann. IV), pool frog and edible frog *Pelophylax (Rana) lessonae* and *Pelophylax (Rana) kl. esculentus* (Ann. IV, V), agile frog *Rana dalmatina* (Ann. IV), common frog *Rana temporaria* (Ann. V). Focused research may detect, in the future, the presence of the Italian agile frog *Rana latastei* (Ann. II, IV) in particular in the area of Valsugana;
- B) **Reptiles:** western green lizard *Lacerta bilineata* (Ann. IV), common wall lizard *Podarcis muralis* (Ann. IV), green whip snake *Hierophis (Coluber) viridiflavus* (Ann. IV), smooth snake *Coronella*

austriaca (Ann. IV), Aesculapian snake *Zamenis longissimus* (*Elaphe longissima*) (Ann. IV), dice snake *Natrix tessellata* (Ann. IV). In addition, the marsh frog *Pelophylax ridibundus* (*Rana ridibunda*) (Ann. V), illegally introduced in recent times and therefore considered as a non-native species, the European pond turtle *Emys orbicularis* (Ann. II, IV), in all probability already extinct in historical times and the horned viper *Vipera ammodytes* (Ann. IV), whose presence has not been confirmed in recent decades and therefore could effectively be extinct in the province.

The list of species reported in Trentino, related Annexes and status in Trentino according to the provincial Red List, is provided in Table I.

It is necessary to consider the different ecological requirements of Amphibians and Reptiles present in the province in order to plan a monitoring process which is to representative, the greatest possible extent, of herpetofauna in Trentino. Thus, a summary description of the environments frequented (Table II) is provided on the basis of current knowledge, in terms of altitude (factor of primary importance in determining the distribution of these cold-blooded species) and frequentation of open environments, forests or wetlands. Thus, the information required to verify the inclusion of all major macro-habitats frequented by species of Amphibians and Reptiles at the time of the definition of monitoring sites is provided: biotopes, Community Interest Sites, Special Protection Areas and other restricted areas of presence, selected for counting identified species, should represent the different combinations of environments and altitudes frequented by Amphibians and Reptiles in Trentino.

The monitoring should focus primarily on species of community interest (ie those included in Annexes II, IV and V of Habitat Directive), of which priority is given to species included in Annex II and that occupy high positions in the provincial scale of priorities for the ecological network. In particular, the golden alpine salamander occupies first place among the Vertebrates (1th, priority index: 77.8); among the most highly ranking are the Italian crested newt (8th, priority index: 64.8), because of its rarity on a local scale, and followed by the yellow-bellied toad, under threat but still widespread in Trentino although in obvious decline, especially due to loss of habitat (14th, priority index: 56.5).

The precarious state of conservation of Amphibians and Reptiles in Trentino suggests, however, continuing in the detection of other species that are not included in Annex II of the Directive 92/43/EEC, and in particular of those under threat on a local scale or otherwise of nature and conservation interest (such as the smooth newt *Lissotriton vulgaris* or Carniola viviparous lizard *Zootoca vivipara carniolica*). The monitoring of these species requires an additional limited effort, which can be envisaged within the most suitable parks and sites of Natura 2000 Network in Trentino. It should be remembered that all species of Amphibians and Reptiles in Trentino are also protected by the Berne Convention of 1979, ratified by Italy in 1981 with the Law 503 and the Provincial Law no. 11 of 23 May 2007 (Provincial Law on Forests and Nature Protection). Many of these species are also included in various Red Lists, on a global, national and in particular provincial scale.

In addition to collecting data regarding the conservation status of local Amphibian populations within the territory of the province of Trento, it is important to initiate in parallel, without any additional sampling work required, the **monitoring of their health status**, through observation of individuals bearing signs of diseases and, in particular, of any *Chytridiomycota* infections.

The monitoring of Amphibians and Reptiles species envisages, firstly, the definition of the current state of knowledge regarding the species in Trentino (with particular reference to those of community interest), both as regards abundance and population trend, and the link the various species have with the various provincial ecological contexts. Therefore, the first step, in order to develop the monitoring of these species, consists in conducting a census and, as far as possible, in the standardization of data already collected in previous projects from the eighties onwards; this project was achieved within the scope of Action A1 which led to the creation of WebGIS.

The second step envisages the collection of field data aimed at defining species distribution, understanding their population trends, monitoring the environmental quality through indicator species. These studies must also necessarily be able to identify any negative trends over time to find a solution to them. Other objectives are to evaluate the effectiveness of projects or conservation and/or management actions.

5 Guidelines for monitoring theriofauna within the Natura2000 network in Trentino

Trentino Mammals include a total of 37 species of Community interest, in addition to an accidental one and two extinct ones. These faunal species may provide important information in ecology that exceeds the simple characterization of a faunal site. These species are relatively poorly studied, with some exceptions regarding species of hunting interest, the large Carnivores (brown bear, wolf and lynx) and the 'charismatic' species; in particular, the bear has been well studied because it was, in the recent past, object, of the reintroduction project "LIFE URSUS", as well as of a constant monitoring by the Forestry and Wildlife Service of the APT.

As true ecological indicators and because of their poor conservation state, the Chiroptera are worthy of attention. As is well known, this group is among the most sensitive to environmental changes and to the loss of habitat mosaics, to which many species are inextricably linked because of special ecological requirements related to their particular life cycle. Given their biology, Chiroptera require the presence of different environments for feeding, breeding, wintering, etc., and these complex needs make them very sensitive to the loss of landscape diversity and to the excessive habitat fragmentation, and therefore they represent good indicators of environmental changes.

Other species included in Annexes II, IV and V of Habitat Directive are now rarely studied mainly due to their crepuscular or nocturnal habits or to their elusiveness and/or rarity; examples are the forest dormouse *Dryomys nitedula*, the hazel dormouse *Muscardinus avellanarius*, the European polecat *Mustela putorius* - almost extinct - and the European pine marten *Martes martes*, all species proposed here as worthy of attention as they are valid biological indicators within the macro-environmental typologies being studied (see action A3). Finally, of the Mustelidae the European otter *Lutra lutra* deserves to be mentioned. This is a species thought to be extinct in Trentino, but recently in expansion in the Alps, with first observations reported in South Tyrol in Val Pusteria.

The monitoring of Mammals, of Orders that are very different in size, ecology, trophic requirements, need for natural areas, etc, should be structured according to the species to be monitored. The monitoring must, therefore, be subdivided into monitoring of Chiroptera, which must be conducted using specific actions required for the study of these animals, and monitoring of large Carnivores, small Carnivores and some Rodents by applying census techniques that are totally different from those required for the Chiroptera.

The first monitoring step is achieved by establishing the current state of knowledge regarding the species in Trentino, both as regards abundance and population trend, and the link between species and the different provincial ecological contexts. Therefore, the first step, in order to develop the monitoring of these species, consists in conducting a census and cataloguing and, to the greatest possible extent, in the standardization of data already collected in previous projects from the eighties (the seventies for the brown bear) onwards. This project was achieved within the scope of Action A1 and A3, and reported for information purposes in the LIFE+T.E.N. WebGIS.

The second step envisages the drafting of the actual monitoring guidelines, based on the information collected from the previous step, aimed at collecting field data necessary for the definition of species distribution, the understanding of their population trends, and the monitoring of environmental quality by indicator species function.

Among the Mammals species in Trentino, 15 are included in Annex II of Habitat Directive (92/43/EEC): 11 species of Chiroptera and four species of Carnivores, the Eurasian lynx *Lynx lynx*, the brown bear *Ursus arctos*, the gray wolf *Canis lupus* and the European otter. A list of those species considered during the drafting of these guidelines is provided below. The following are not included in the list; Lagomorphs (mountain hare *Lepus timidus*) and *Artiodactyla*, chamois *Rupicapra rupicapra* and Alpine ibex *Capra ibex*, as they are not included in Annexes II and IV of Habitat Directive and are already given thorough consideration in the APT faunal Plan (2011). European pine marten and European polecat are included as they are not sufficiently considered in existing documentation.