Monitoring of protected species and habitats with the involvement of volunteers: the experience of the project

LIFE ESC 360

Project LIFE17 ESC /IT/001, LIFE ESC 360
360 volunteers for monitoring forest biodiversity
in the Italian Natura 2000 Network

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SUMMARY

"Citizen science" is the involvement of members of the public, of "non-professionals" in scientific research. Behind this definition are numerous initiatives that differ in level of investment by the citizen, type of research performed or methodologies of execution.

Citizen science in the environmental field is often linked to the observation of species or habitats in their natural environment and data recording on shared platforms, an example of which is the InNat initiative (www.innat.it) promoted by the Ministry for Ecological Transition (MITE), the Carabinieri Biodiversity Department and the Council for Agricultural Research and Analysis of Agricultural Economics (CREA).

The LIFE ESC360 project, while arising from this experience, goes beyond the simple recording of an observation, envisaging a greater commitment on the part of the citizen, who has been adequately trained for this purpose. Therefore, a mode of direct involvement of the volunteer in implementing a cycle of monitoring on protected species and habitats according to protocols recognized by the scientific community was adopted.

A project like this creates several benefits and results:

1. large numbers of volunteers involved in many study areas guarantees the collection of large amounts of data on the conservation status of species and habitats. This results in a significant expansion of biological information in the areas concerned and improves the knowledge of the ecology and distribution of species.
2. the data collected are essential in monitoring the conservation status of the species in Natura 2000 Sites as required by the Habitats Directive.
3. the education of amateurs and non-professionals, who have a clear knowledge about natural sciences, nature conservation and biology.
4. the professionalization of volunteers, through the acquisition of specific skills related to environmental monitoring techniques and data storage.
5. instruction to respect the ecosystem through raising awareness of environmental issues.

With these protocols in mind, LIFE ESC360 created a volunteer program structured in residential shifts in National Reserves that fosters long-term "cohabitation" among volunteers, managers, and scientific and technical support staff. It is, without a doubt, the most important and distinguishing characteristic of this endeavor.

The project engaged a diverse demographic target of young individuals aged 18 to 30, who are nearing the end of their education, making career decisions, or taking their first steps into the workforce. The project provided students with the opportunity to learn firsthand about the world of environmental protection, ensuring that this knowledge would help them make better decisions in the future, whether at home, at university, or at work.


Photo M. Romano

Natura 2000 Network

Only a systematic approach that extends beyond the conservation of a single area or species can address the worldwide concerns about biodiversity loss that our planet is experiencing. The Natura 2000 Network, which celebrates its 30th anniversary this year, is the most powerful example of a network of protected sites worldwide. Its pillars, the Habitats Directive 92/43/EEC and the Birds Directive 2009/147/EEC, constitute some of the most advanced supranational environmental legislations in the world, binding all EU member countries to rigorously protect habitats and species that play a key role in ensuring the conservation of the biosphere, through effective management of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) respectively.

The Natura 2000 Network is based on the ecological concept of connection, pursuing the goal of ensuring a satisfactory conservation status for species and habitats by considering the entirety of their distribution, thus going beyond the individual protected area. The Network advocates ecological connectivity between Network Sites (SACs and SPAs), which are not necessarily excluded from human activity: in fact, natural protection must also be ensured by taking into account "economic, social and cultural needs, as well as regional and local particularities".

The Network currently protects 18% of European territory. Italy outperforms the European average with a coverage of 21% of its territory. Despite this, half of Italy's protected animal and plant species, as well as two-thirds of its habitats, do not have a favorable conservation status, highlighting the need for a coordinated effort to preserve biodiversity and the ecological benefits it provides.

The LIFE/ESC program

The ESC LIFE projects arise from the combination of two European Commission programs: the ESC (European Solidarity Corps) program, a program that brings together and induces the development of volunteer projects dedicated to young people aged 18 to 30, and the LIFE program, the main funding instrument for projects related to nature conservation and biodiversity.

The objective of this new project strategy was to foster the employment of young volunteers within a "LIFE"-type project, which, in the case of LIFE ESC360, had as its main focus the monitoring of the conservation status of protected species and habitats in Natura 2000 Network sites managed by the Carabinieri Biodiversity Department. The project was developed in relevance to the principles that embody the European Solidarity Corps:

- solidarity and respect for human dignity and human rights, for the promotion of a just and equitable society in which pluralism, non-discrimination, tolerance, justice, solidarity and equality predominate;
- respect for the cultures and traditions of different peoples and creating a community of shared responsibility and mutual support;
- significant contribution to society through solidarity, cooperation and mutual understanding;
- outlawing any action that could endanger one's own or others' physical integrity;
- compliance with the rules, organizational structure and practices of the host organization, including ensuring the health, safety and dignity of the people involved in the activity;
- compliance with the laws in force in the host country;
- voluntary choice behind participation in the European Solidarity Corps and freedom to leave the initiative at any time;
- possibility of refusing an offer of cooperation from the Corps without affecting their chances of receiving more in the future;
- total free of charge for participation in the volunteer project.

These principles, together with clear indications of the conditions of their activity and the tasks to be performed, were signed by the volunteer through a solidarity contract with the partner organization.

The Life ESC360 Project

The LIFE 17/ESC/IT/001 project "360 Volunteers for monitoring forest biodiversity in the Italian Natura 2000 Network" (ESC360) kicked off in November 2018 and ended in June 2022, coordinated by the Carabinieri Biodiversity Department and with the participation of CREA Research, Defence and Certification Center and D.R.E.Am. Italy.

The entire project was developed around the 8 planned volunteer shifts (2 shifts in 2019, 2 shifts in 2020, 4 shifts in 2021), each lasting 42 working days and carried out in 6 study macro-areas that differ in geographical location, naturalistic connotations and biogeographic regions. The main action of the project was monitoring activities applying ISPRA's standard protocols on protected species and habitats and collecting related data. Volunteers, with the assistance of experienced mentors, worked personally in all phases: from identification of sampling sites, to field surveys, to data archiving.

To this end, preparatory and/or supporting actions were carried out:

- project promotion, volunteer recruitment and management through a dedicated platform. Constant work that enabled the recruitment of 345 volunteers, from over 300 Italian municipalities and other European countries (England, Portugal, Spain, France, Germany, Croatia);
- preparation and securing of facilities for receiving volunteers. Volunteers stayed in Carabinieri guest quarters or facilities under agreement within National Nature Reserves, this ensured continuous contact with the reality of the study site and the technical and scientific support staff;
- design and implementation of 8 intensive initial training courses, one for each shift;
- creation of a database for storing collected data.

The project's communication activities, which included the role of volunteers as protagonists of initiatives aimed at dissemination and awareness raising on topics related to biodiversity, the Natura 2000 Network, and National Nature Reserves, are corollary and complementary to the field monitoring activities. In each shift and area, a final event was organized by the volunteers with the cooperation of project partners, testimonials were also collected, diaries, interviews about the activities carried out are available on the project's YouTube channel or in the web-fiction "#biodiversity as you've never seen it".

YouTube Channel

1nd series

2nd series

NATIONAL NATURE RESERVES MANAGED BY CUFA

The Carabinieri, through the Forestry, Environmental and Agri-food Units Command (CUFA) and 28 Carabinieri Biodiversity Departments located throughout the country, directly manages and protects 130 National Nature Reserves and 19 other state-owned areas, covering a total area of 129,972 hectares, of which 79 percent is overlaid with as many as 135 Natura 2000 Network areas. Through the drafting, adjustment and implementation of the Reserves' Management Plans and Regulations, the Carabinieri ensures effective implementation of the objectives and conservation measures set for the habitats and species it protects.

Although the network of National Nature Reserves managed by the Carabinieri covers only 2 percent of the entire national network of protected areas and only 1 percent of the national territory, it enables the effective protection of most of the habitats and species of EU and national interest, thus making a major contribution to the implementation of the EU Strategy for the Protection of Biodiversity and, in particular, the EU Habitats and Birds Directives. Almost all 132 habitats of the Habitats Directive are included in this network. Considering that today 80 percent of biological diversity loss is caused precisely by habitat destruction or deterioration, this action appears to be of great importance.

The first National Nature Reserves were established in the territories of the National Forests starting in 1959 (Sasso Fratino Strict Nature Reserve). At first, the Reserves were established, in order to ensure the protection of intact ecosystems threatened by possible speculation, through internal measures of the Forestry Administration. Subsequently, all other Reserves were established by special Ministerial Decrees, mostly between 1970 and 1990, that is, well before the enactment of the Framework Law on Protected Areas No. 394/1991. The protection regulations for Reserves are thus very different from those for National Parks: Reserves are considered special protected areas, whose almost exclusive purpose is the conservation of Nature, regardless of their formal designation as "strict", "oriented" or "special" Reserves. Development, exploitation or touristic infrastructures are therefore not permitted in these areas. Access to the Reserves is allowed only for study, educational, administrative and supervisory purposes, any other human activity remaining unallowed. This is quite clearly an entirely different model from the one that would later be codified for National Parks by Law No. 394/1991, which protects National Nature Reserves to the level of true Strict Reserves. Only in a few cases, when the ownership of the land is not of the State, are livestock, silvicultural and hiking activities allowed in the Reserves, however, in accordance with the prescriptions of the National Management Authority of the Reserve.

Photo L. Lorenzetti

The Nature Reserves, which have been managed by the National Forest Service (CUFA as of 2017, following its amalgamation into the Carabinieri) for decades, are the central and most naturalistically interesting cores of most of today's national and regional parks, often fighting against interests that would have irreparably compromised their ecological integrity. The Val Grande Reserves, the Belluno Dolomites Reserves, the Casentino Reserves, the Reserves in the Abruzzo National Park and the Majella National Park, the Reserves of Mount Velino, the Reserves of the Gargano National Park, and in Calabria the Reserves of the Pollino National Park, of the Aspromonte National Park, and the newly created Sila National Park are all examples of this.

Photo Staff Life ESC360

THE PROJECT STUDY AREAS

Bosco della Fontana National Nature Reserve (2019)

The Reserve (235.3 ha), managed by the Verona Department, is characterized by a relict lowland oak-hornbeam forest whose main tree species are pedunculate oak (*Quercus robur*), turkey oak (*Quercus cerris*) and hornbeam (*Carpinus betulus*). Management of the forest is aimed at conserving dead wood for the benefit of the associated community of saproxylic organism and thus maintaining the functional balance of the forest itself. Other habitats found in the Reserve are a small prairie, ponds and some streams. The Reserve completely coincides with the SPA-SAC of the same name IT20B011 "Bosco Fontana".

Casentino National Nature Reserves (2019-2021)

Managed by the Pratovecchio Department, they are located along the ridge of the Tuscan-Romagna Apennines, in the heart of the Casentino Forests, Mount Falterona and Campigna National Park. They cover 5,300 ha of forested land, thus representing one of the largest forest complexes in Western Europe. They consist mainly of beech forests (*Fagus sylvatica*), mixed forests dominated by white spruce (*Abies alba*) and beech, and mixed deciduous forests. Many of these forests are of great conservation significance, such as the ancient, centuries-old chestnut forest of Camaldoli, and the Sasso Fratino forest, recognized in 2017 as a UNESCO World Heritage Site among the ancient beech forests. In total, the Reserves involved in the volunteers' activities were: Campigna (1,200 ha), Sasso Fratino (764 ha), Badia Prataglia (2,420 ha) and Camaldoli (1,110.72 ha).

There are numerous Natura 2000 Sites that variously encompass this complex of Reserves: SPA IT5180004 "Camaldoli, Scodella, Campigna, Badia Prataglia"; SAC and SPA IT4080001 "Foresta di Campigna, Foresta la Lama, Monte Falco"; SAC and SPA IT4080003 "Monte Gemelli, Monte Guffone"; SAC IT5180003 "Giogo Seccheta"; SAC IT5180018 "Foresta di Camaldoli e Badia Prataglia".

Photo Compagnia delle Foreste

National Nature Reserves and other areas in Abruzzo and Molise (2019-2021)

This is a vast network of Reserves and state-owned areas, mainly managed by the Castel di Sangro Department. The overall study area is geographically located between the Alta Val di Sangro, the Quarto Santa Chiara plateau, and the Sirente-Velino area, in mountainous and sub-mountainous territories, placed, from a phytoclimatic point of view, between the "climax" of the downy oak (*Quercus pubescens*) in the lower elevation areas (932 m a.s.l.), that of beech (*Fagus sylvatica*), and high-altitude grasslands and alpine tundra at the highest elevations (2,487 m a.s.l.). Vast are the portions of the territory located beyond the upper limit of forest vegetation, which fluctuates, depending on exposure and anthropogenic disturbance, between 1,800 and 1,900 m a.s.l. The high elevation belt (1,800-2,500 m) is mostly occupied by primary grasslands and pioneer scree vegetation, characterized by the presence of numerous endemic, rare and threatened species.

The six Nature Reserves involved: Monte Velino (3,550 ha), Feudo Intramonti (908 ha) and Colle di Licco (95 ha), Quarto Santa Chiara (485 ha), Pantaniello (2 ha) and Montedimezzo (276 ha; managed by the Isernia Department). There are five National Forests: Feudozzo (138 ha), Chiarano Sparvera and Valle Cupa (a total of 5,070 ha), Feudo Carceri (428 ha) and Val di Canneto (264 ha).

Eleven Natura 2000 Sites are involved, of which 7 are SACs (IT7110104 "Cerrete di Monte Pagano e Feudozzo"; IT7110205 "Parco Nazionale d'Abruzzo"; IT7140043 "Monti Pizi - Monte Secine"; IT7110206 "Monte Sirente e Monte Velino"; IT7110204 "Majella Sud Ovest"; IT7140203 "Majella"; IT7212124 "M.te di Mezzo - M.te Miglio - M.te Capraro - M.te Cavallerizzo") and 4 are SPAs (IT7140129 "Parco Nazionale della Majella"; IT7110132 "Parco Nazionale d'Abruzzo"; IT7110130 "Sirente Velino"; IT7221132 "Montedimezzo").

Photo Staff Life ESC360

THE PROJECT STUDY AREAS

Murge orientali National Nature Reserve (2020-2021)

The Reserve, managed by the Martina Franca Department, consists of 5 disjointed "sections" spaced several kilometers apart, occupying a total area of 732.65 ha. Project activities took place in 4 of these sections (Galeone, Gorgofreddo, Signorella and Trasconi). The main forest environment is made up of oak trees and characterized by the Macedonian oaks (*Quercus trojana)*, an oak that in Italy is present only in Apulia and Basilicata. Other oaks present are the downy oak (*Quercus pubescens*) and the holm oak (*Quercus ilex*). These woods belong to the Mediterranean scrub and garrigue, and also occupy areas managed by the Equestrian Selection Center of the Department. The entire area of the Reserve is included within the SAC IT9130005 "Murgia di Sud Est".

Circeo National Nature Reserves (2020-2021)

These reserves are managed by the Fogliano Department. The Comprensorio di Fogliano-Laghi di Fogliano, Monaci e di Caprolace Reserve (1,545 ha) is characterized by three shallow coastal lakes, covering an area of 725 ha, and flooded grasslands and pastures. In continuity, lies the Pantani dell'Inferno Reserve (40 ha), also characterized by periodically flooded reed beds and pastures. The two Reserves are included in the Sites: SPA IT6040015 "Parco Nazionale del Circeo"; SAC IT6040012 "Laghi Fogliano, Monaci, Caprolace and Pantani dell'Inferno".

The Riserva Foresta Demaniale del Circeo (3,077 ha) hosts a lowland forest (the largest in size in Italy) with the presence of pedunculate oak (*Quercus robur*) and Italian oak (*Quercus frainetto*), with some areas which are periodically flooded. The Reserve overlaps with Sites: SPA IT6040015 "Parco Nazionale del Circeo"; SAC IT6040014 "Foresta Demaniale del Circeo".

Maremma National Nature Reserves (2020-2021)

These are 5 Reserves managed by the Follonica Department, representative of both coastal and more inland habitats of the Maremma.

Duna Feniglia (474 ha) protects a dune cordon in the southern part of the Orbetello Lagoon and is included in Sites: SPA IT51A0028 "Duna di Feniglia"; SPA-SAC IT51A0026 "Laguna di Orbetello". The Scarlino Reserve (51 ha) and the Tre Cancelli Strict Reserve (99 ha) are located near the coast, in the Gulf of Follonica, on low-hill terrain and host forest habitats with a predominance of holm oak and turkey oak (*Quercus ilex and Q. cerris*). The two Reserves overlap with the SAC IT51A0008 "Boschi di Monte d'alma" and the SPA IT51A0004 "Poggio Tre Cancelli", respectively. Marsiliana Reserve (442.9 ha) consists of 3 separate sections on hilly land characterized by forest cover and open areas related to horse breeding. Belagaio (157.2 ha) is the most inland Reserve and is located in hilly terrain in the catchment area of Farma Creek. The forest occupies the majority of the area (125 ha) and is characterized by the thermal inversion phenomena caused by the particular orography of the territory: it ranges from thermophilic turkey oak forests, beech areas (*Fagus sylvatica*) and birch (*Betula pendula*) at low altitudes. The reserve is included in the SAC IT51A0003 "Val di Farma".

TRAINING

The volunteers, before arriving in their respective study areas, were involved in a training period (5 days in 2019 and 2021; 10 in 2020) in which general topics related to nature conservation, the Natura 2000 Network, and European protected species and habitats were covered.

A total of more than 250 hours of lectures were conducted, involving more than 20 lecturers (identified from the project staff and other experts involved for the occasion), with the following objectives: (i) to provide basic ecological information regarding the monitoring activities that would be carried out during the shift, (ii) to create uniformity of language, smoothing out cultural differences among the different participants. (iii) to provide information on safety in the workplace.

In particular, we opted to use a hybrid method consisting of lectures, discussion times and practical exercises, trying to take into account the heterogeneity of volunteers, both in terms of age and background.

In 2019, round I and II courses were held in-person, at the "Torre di Feudozzo" location (Castel di Sangro Department). In the following years (2020 and 2021), due to the COVID-19 emergency, it was not possible to gather all volunteers and faculty, so the classes were held online, trying to comply as best as possible with the methods used the first year.

Photo Staff Life ESC360

Photo G. Damiani

THE PROJECT TARGETS

Monitoring activities carried out by volunteers on various objectives (targets) were at the center of the Life ESC360 initiative.

Individual habitats and species, both plant and animal, were the primary targets, but targets related to animal communities (e.g. butterflies and bats), environmental indices (Index of Potential Biodiversity), indirect estimates of biodiversity (e.g. Bioacoustics), and forest surveys were also taken into account.

In the following pages, these targets are presented through fact sheets that illustrate their main generalities, macro areas investigated, monitoring methods used and main results obtained. In addition, with regard to individual species and habitats, assessments of the level of protection (annexes of the Habitats Directive and the Birds Directive), conservation status according to the Red Lists (national when present), and listing within the CITES (Convention on International Trade in Endangered Species) appendices are given schematically.

Habitats Directive (DH)

Annex I: natural habitat types of community interest whose conservation requires the designation of Special Areas of Conservation

Annex II: animal and plant species of community interest whose conservation requires the designation of Special Areas of Conservation

Annex IV: animal and plant species of community interest in need of strict protection

Birds Directive (DU)

Annex I: list of species for which special conservation measures are required concerning their habitat in order to ensure their survival and reproduction in their area of distribution.

LC: least concern; **NT:** near threatened; **VU:** vulnerable; **EN:** endangered; **CR:** critically endangered

DD: data deficient; **NA:** not applicable ; **NE:** not evaluated.

CITES

App. I: species threatened with extinction which are or may be affected by trade (in general, all international trade is prohibited for such species, although some cases may be allowed under exceptional circumstances).

App. II: includes species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation.

THE MAIN TAXONOMIC GROUPS ARE IDENTIFIED BY THE FOLLOWING SYMBOLS:


HABITATS


PLANT SPECIES


MAMMALS


REPTILES


AMPHIBIANS


BIRDS


INSECTS

Habitats

4060 Alpine and Boreal heaths. Alpine and subalpine shrub formations of Ericaceae and dwarf junipers. Normally present in the altitudinal range between the upper edge of the forest and primary grasslands.

6210(*) Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites). Secondary thermo-xerophytic grasslands dominated by grasses.

6170 Alpine and subalpine calcareous grasslands. Primary grasslands of ridges and slopes, on limestone substrate, often subject to prolonged snow cover. The dominant species are *Gramineae* and *Cyperaceae*.

6230* Species-rich *Nardus* grasslands. Closed, mesophilic grasslands located in flat or gently sloping areas with prolonged snow cover. The predominant species is usually matgrass (*Nardus stricta*).

8130 Western Mediterranean gravels and thermophiles scree. Habitats characterized by boulders and rocks of different sizes, found on mountain and hill slopes. The spaces between the rocks, where a minimum of soil is formed, are colonized by thermophilic vegetation mainly herbaceous.

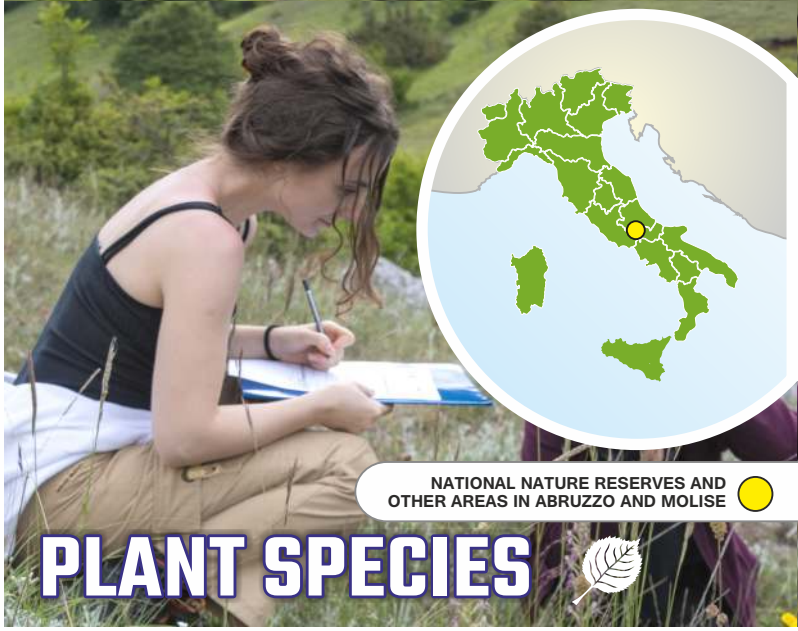
8240* Limestone pavements. Alpine tundra habitat consisting of gently sloping or flat surfaces of limestone rock, with intense periglacial phenomena (ice needles, rock glaciers).

9210* Apeninne beech forests with *Taxus* and *Ilex*. Forest habitat dominated by beech (*Fagus sylvatica*) and with local presence of holly (*Ilex aquifolium*) and yew (*Taxus baccata*).

*** Priority habitat**

To assess the conservation status of the seven target habitats, volunteers made site visits to predetermined areas, analyzed the specific vegetation composition and measured the extent of the occupied area of the habitat of interest. Finally, any pressures exerted by anthropogenic activities were identified.

At the end of the three years of surveys conducted in the Monte Velino and Quarto Santa Chiara Reserves, and in the Chiarano-Sparvera Regional Forest, it was found that: habitats 4060, 6210, 6170 and 8130 are in inadequate conservation status, habitat 6230 is in poor and deteriorating condition, while habitats 8240 and 9210 are to be considered in favorable condition.



Adonis distorta, a rare high-altitude endemic Ranunculaceae, found only in the Central Apennines in small isolated populations whose conservation status is considered favorable by the latest ISPRA Report carried out under the Habitats Directive. The only threats to its conservation status are related to the possible construction of ski infrastructures.

Iris marsica, a very rare endemic Iridaceae found only in the Central Apennines in small isolated populations whose conservation status is considered favorable by the latest ISPRA Report. The only threats to its conservation status are related to possible gathering by collectors or for ornamental purposes.

Himantoglossum adriaticum, a rare and showy Orchidacea of xerophytic grasslands, found in Central Europe and Italy. The conservation status of this species, reported in the latest ISPRA Report is considered inadequate, due to the gathering of the plants for collecting or ornamental purposes.

In 2019 and 2021, volunteers joined Castel di Sangro Department staff in systematically monitoring the conservation status of these three plant species. Specifically, monitoring was carried out by total count of individuals present and their perimeter, in the Monte Velino, Quarto Santa Chiara, Feudo Intramonti Reserves and the Chiarano-Sparvera Regional Forest.

Results

Adonis distorta. Sixteen stands were surveyed (all in the Velino Reserve), with a total area of 58,415 m^2 and 4,658 plants; no particular threats were identified to the species' conservation status, which was found to be favorable.

Iris marsica. The following have been detected: one stand at the Velino Reserve (total area of 200 m^2 and about 100 plants); one stand at the Feudo Intramonti Reserve (total area of 1,600 m^2 and about 1,200 plants); one stand at the Quarto Santa Chiara Reserve (total area of 300 m^2 and about 200 plants); and five other important stands are located outside the Reserve in the partially overlapping SAC IT7110204. In addition, two further stations (total area of 2,700 m^2 and about 1,500 plants) located a very short distance from the boundaries of the Chiarano-Sparvera Regional Forest in territory falling within SAC IT7110205 (where two other stations were already known and surveyed) were identified for the first time. A total of 12 stands were surveyed, with a total area of 21,040 m^2 and about 10,300 plants; the conservation status of the species was favorable.

Himantoglossum adriaticum. Of the 17 stands detected at Velino (total area of 560 m^2 and 101 plants), only 10 are located in the territory protected by Reserve and SAC IT7110206 (440 m^2 and 67 plants) while the other 7 are protected only by SPA IT7110130. Four stations (total area of 550 m^2 and 62 plants) located a short distance from the boundaries of the Chiarano-Sparvera Regional Forest but found to be outside any protected area, were identified for the first time and surveyed. Overall, significant threats to the conservation status of the species, which was found to be inadequate, were identified (all related to illegal livestock activities).

MARSICAN BROWN BEAR

Ursus arctos marsicanus **Altobello, 1921**

The Marsican brown bear is a subspecies of the brown bear, endemic to the central Apennines.
Depending on biological needs and food availability, this animal occupies different habitats: from high-altitude grasslands to deciduous and coniferous forests. It has an omnivorous diet that varies greatly with the seasons: it feeds on grass, berries, acorns and beans but also on insects and carcasses of wild and domestic ungulates. In winter, the species enters hibernation in which it alternates between sleeping phases and times of reduced activity.
The population is currently reduced to a few dozen specimens (about 50-60 individuals) found mainly in Abruzzo, and other small mountainous areas of Latium, Marche and Molise.

The presence of bears has been monitored in Abruzzo, in an area adjacent to the Abruzzo Lazio e Molise National Park (the central area of presence of the species, also called the core area), which is characterized by ecological corridors important for the expansion of the species.
Activities were conducted by volunteers following the monitoring guidelines defined by the "Monitoring Network of the Marsican Brown Bear in Abruzzo and Molise (RMAM)", through a combination of opportunistic sampling and systematic sampling, based on predefined transects for tracking and photo-trapping.

The monitoring allowed obtaining reliable information about the distribution of the target in the survey areas. Specifically, by integrating the information obtained with the monitoring techniques promoted by the RMAM, the presence of the Marsican bear was confirmed, albeit sporadic, in the eastern sector of the Monte Velino.

Reserve and a gradual intensification of the species' presence near population centers, especially during the summer season, in the Val di Sangro area.

WOLF

Canis lupus italicus (Linnaeus, 1758)

The Apennine wolf is a subspecies of the European grey wolf, which is endemic to Italy.

The most interesting characteristics of this charismatic carnivore are certainly its sociality and territoriality: the wolf lives in discrete family groups, the packs, which defend a defined area.

As in many other European countries, the wolf has long been persecuted in Italy with edicts, bans and bounties, so much so that by the 1960s, the species had reached a critical situation and an all-time low in numbers of individuals. As a result of careful protection and conservation programs, today we are witnessing its recovery and a rapid expansion of its range throughout Italy. The main threats to the Apennine wolf are human-related mortality (illegal killing and road traffic) and the phenomenon of hybridization with dogs.

In order to monitor this territorial, elusive and difficult to contact species, a combination of different sampling strategies was applied in the survey areas: tracks on snow were followed (*snow tracking*), howls were listened to in the summer months (*wolf-howling*), food remains in droppings were analyzed, and video-traps were used that were appropriately located in the territory. Part of the activities were carried out as part of the national wolf monitoring plan coordinated by ISPRA

The monitoring activity provided reliable information about the distribution of wolves in the survey areas, obtaining data extremely useful for their conservation and management. Some reproductive sites, rendezvous areas (places of refuge where pups grow in the months following weaning) have been located and information on the shape and size of the territories of the different packs has been obtained. Specifically, in the Reserves in Abruzzo and Molise, more precise information was obtained on the shape and size of the territories of the different packs, while in the Murge Orientali and Circeo Reserves, areas colonized by the species only a few years ago, the first data on the reproduction of the packs present were collected. Monitoring has also confirmed the presence of the species in the Maremma (Poggio Tre Cancelli) and Casentino Reserves.

Bats, after rodents, constitute the mammalian order with the largest number of currently described species (about 1,276 species) worldwide, including nearly a quarter of all extant mammals.
Bats are primarily nocturnal animals that have the capability to fly and "see" in complete darkness thanks to their ultrasonic echolocation abilities. They are mainly insectivorous and, in the winter months, when prey is scarce and temperatures become too cold, they enter a state of hibernation. The different species live both in natural habitats (e.g. forests and caves) and in man-made environments where they find shelter in attics and other building cavities. Their high degree of specialization makes them one of the most vulnerable groups to rapid environmental changes and interaction with human activities. In Italy, bats represent the order of terrestrial mammals with the largest number of threatened species; in fact, the 34 species present are all strictly protected.

Populations in the study areas were surveyed by bio-acoustic sampling. This method is based on the identification of individual species by surveying the ultrasound emitted by individuals during their movements and hunting activities. To detect them and make them audible to the human ear, bat detectors were used, devices that can also identify individual bat species through special comparison software. The surveys were carried out by volunteers at night, in listening stations lasting 10 minutes; these stations were distributed in the areas investigated so as to cover the territory homogeneously and represent the different environmental types present. In this way, in the areas, it was possible to detect the presence of active bats and obtain an estimate of their numbers.

Between September and November 2021, 84 listening points were located and sampled, 37 percent of which fell within the Monte Velino Reserve and 63 percent within the Feudozzo State Forest. A total of about 14 survey hours were spent and 413 bat contacts were obtained, attributable to 19 species (all individuals were identified to species level).

The results obtained made it possible to compile an initial check-list of the bat fauna present in the survey areas, to obtain preliminary information on the choices of foraging habitats of some species, and to provide insights into the management of the species and the habitats frequented.

WILDCAT

Felis silvestris silvestris Schreber, 1775

The European wildcat is a small feline and could be confused with some domestic cat breeds (*Felis silvestris catus*), however, it has some unique characteristics that set it apart. It has a broad dark stripe with a well-marked dorsal black stripe and a very thick tail with 3-5 black rings.

It is a rather shy and elusive species and lives mainly in mixed broadleaf forests, although it has also been observed in a variety of habitats, such as riparian forests, Mediterranean scrub, along the margins of marshes and coastlines. Felis silvestris occupies a very wide area, encompassing much of Africa, Europe, and southwestern and central Asia. In Italy there are 3-4 distinct populations distributed between Liguria and Piedmont, in Friuli, on the peninsular territory (from Marche to Calabria), in Sicily and Sardinia.

Threats include hybridization with the domestic cat, habitat loss and fragmentation, road mortality, and poaching.

For this species, direct observation is often impossible due to its elusiveness and predominantly nocturnal habits. Therefore, the method of photo/video-trapping and searching for traces of presence (e.g. feces, hairs, carcasses) was adopted. The photo-traps, which were checked every 15 days, were placed in the forest near points of passage of the species. A hair trap was also installed at each photo-trap: a wooden stake sprinkled with attractant (valerian extract).

Monitoring confirmed the presence of the wildcat in the two macro study areas in the Casentino Forests and Abruzzo. In addition, thanks to photo-trapping activities, the presence of the species was recorded for the first time in the macro area of Maremma, within the Belagaio Reserve.

Diurnal raptors make up a large group of birds belonging to the accipitrid and falconid families. Characterized by a curved, sharp beak and powerful legs with sharp claws, they are all predators, with the exception of vultures, which are instead necrophagous. In Italy, raptors are found almost everywhere, occupying many different environments, from the coast to high mountains. Different species may nest in open habitats, forests or rock walls. Many are migratory; the Italian territory is in the wintering range of some species, and in the summering or breeding range of others.

NATIONAL NATURE RESERVES AND OTHER AREAS IN ABRUZZO AND MOLISE

Photo G. Damiani

DAYTIME RAPTOR COMMUNITY

To monitor the raptor community, volunteers carried out systematic observations along linear routes (previously mapped out on maps) through the use of optical instrumentation (binoculars and spotting scope) and making photographic documentation. The observations were carried out from favorable elevated locations. The survey was carried out for all species present in the study areas.

The surveys took place in the years 2020 and 2021, and a total of 14 species of raptors were detected. The area of the Chiarano – Sparvera Forests proved to be the richest, both in terms of number of species (14, compared to 7 in Feudozzo – "Alto Molise" and 5 in Velino) and in terms of individuals detected (334, compared to 45 and 54). In fact, this area offers raptors a more diverse and vast environment, ensuring, at the same time, larger hunting territories, greater availability of prey and more nesting sites.

B. Hasani

G. Damiani

G. Damiani

G. Damiani

L. Lorenzetti

G. Damiani

RUPICOLOUS RAPTORS

GRIFFON VULTURE

Gyps fulvus (Hablytz, 1783)

RED LIST CR | NATURA 2000 ANN. I | CITES APP. II

GOLDEN EAGLE

Aquila chrysaetos (Linnaeus, 1758)

RED LIST NT | NATURA 2000 ANN. I | CITES APP. II

PEREGRINE FALCON

Falco peregrinus Tunstall, 1771

RED LIST LC | NATURA 2000 ANN. I | CITES APP. I

Rupicolous raptors are birds belonging to the accipitrid and falconid families that live, and especially nest, on rock faces. The project focused on monitoring three species: the golden eagle, griffon vulture and peregrine falcon.

The golden eagle is a large accipitrid (180–230 cm wingspan). It is a skilled predator of vertebrates but will also feed on carcasses if given the opportunity. It nests on rock walls, forming stable pairs throughout its life. It is extremely territorial and does not tolerate the presence of other eagles within its hunting area; therefore, overlapping pairs of eagles are quite rare and their nests are several kilometers apart.

The griffon vulture is a large vulture (up to 280 cm wingspan) belonging to the Accipitridae family. It feeds exclusively on carcasses that it spots by sight during long patrol flights at high altitudes. These birds are gregarious and social, living in large colonies on rock faces. The breeding season begins in the winter and ends in the summer with the fledging of young (one per nest). All Italian populations, with the exception of the Sardinian, became extinct between the 19th and 20th centuries. Today, thanks to reintroduction projects promoted by the former National Forest Service, the species is again present with breeding colonies in the Carnic Alps, the central Apennines between Abruzzo and Lazio, the Pollino massif and the Nebrodi Mountains.

The peregrine falcon is a medium-sized bird of prey (80–120 cm wingspan), belonging to the Falconidae family. It is a predator mainly of birds that it hunts in flight, even reaching very high speeds (up to 320 km/h in a dive). It lives on rock walls and nests on small ledges without building a proper nest. Each year a pair raises 2 to 6 young.

Monitoring of rupicolous raptors was done through periodic observations of the nesting sites of the target species from vantage points. During the breeding season, data were collected on the behavior of breeding individuals, the number of nests, and reproductive success. All observations were carried out at an appropriate distance, avoiding any form of disturbance.

Over the three years of the project, the target species were monitored at 11 sites. For the eagle, only one nest in the study area was monitored, and only one fledgling was observed in 2019. For griffon vultures, 44 juveniles were recorded in 2019 and 46 in 2021 (a record number of fledglings since the species was reintroduced in the central Apennines). Finally, for the peregrine falcon, 11 fledglings were counted in 2019 and 9 in 2021.

ROCK PARTRIDGE

Alectoris graeca (Meisner, 1804)

NATIONAL NATURE RESERVES AND OTHER AREAS IN ABRUZZO AND MOLISE

The rock partridge is a medium-sized (35 cm long) fasianid. The species frequents mountainous and hilly, rocky and sunny slopes with herbaceous cover, prostate bushes and small shrubs. At the end of autumn and during winter, individuals from the same area aggregate in groups called "coveys", while in spring breeding pairs form and become isolated. During this period the male performs intense singing to demarcate the territory and attract the female, performing characteristic courtship dances.

In Italy, the rock partridge is distributed with three distinct geographic populations, found in the Alps (*A. g. saxatilis*), the central-southern Apennines (*A. g. graeca*), and Sicily (*A. g. whitakeri*), respectively.

During the project, the presence of the rock partridge was detected in the Monte Velino Nature Reserve and the Chiarano-Sparvera Forest. Monitoring of the species was accomplished through direct sightings along predetermined transects and induced sound stimulation (*playback*) on geolocated plots; the latter method was used during the breeding season when the species is most easily contacted.

During the project 36 field-days were employed to monitor the species. In the three years, presence data of 9 individuals were collected by *playback* and 20 records were occasional sightings.

NIGHTJAR

Caprimulgus europaeus Linnaeus, 1758

NATIONAL NATURE RESERVES AND OTHER AREAS IN ABRUZZO AND MOLISE

The nightjar is a migratory bird belonging to the family Caprimulgidae.

In its summer range (Europe, northern Africa, and western and central Asia) it occupies open, xeric environments with patchy tree and shrub cover. In winter, however, it is found on the coasts of central, and southeastern Africa.

The species is predominantly crepuscular and nocturnal and feeds on insects it catches in flight. During the breeding season (May–August), individuals emit a characteristic metallic-sounding call (*churring*), especially in the hours after sunset.

The nightjar in Italy is found throughout the peninsula, and on large islands, from sea level to mountainous areas.

Project volunteers detected the presence of nightjars during the breeding season, when the species is most easily contacted through spontaneous churring or through response solicitation with sound stimulation (*playback*). The activities were carried out in the twilight hours, at peak activity. At listening points, after waiting for spontaneous vocalizations, and in case of nonresponse, calls were solicited with sound stimulation. Playbacks were directed along three axes placed 120° apart to completely cover the survey area. Each *playback* was interspersed with approximately 2 minutes of silence/listening.

Within the three survey areas, 109 listening points were conducted, of which 25 provided positive results (individuals in the area responded to the recall).

NATIONAL NATURE RESERVES AND OTHER AREAS IN ABRUZZO AND MOLISE

MEADOW VIPER

Vipera ursinii (Bonaparte, 1835)

The meadow viper is a snake of the Viperidae family, characterized by a dark, articulated line along the entire dorsal axis, and circular dark spots on the flanks of the body; the physiognomy is squat and robust and does not exceed 50 cm in length. The coloration of the back varies between brown, gray and reddish, while the belly is white or light ochre.

The species is associated with high-altitude grasslands and pastures, and in Italy it is present only with relict populations in the Abruzzi and Umbro-Marchigiano Apennines, where it is distributed on uncovered slopes with zones of twisted, prostrate shrubs and abundant outcrops of limestone rocks and scree, from 1,400 to over 2,300 m a.s.l.

The meadow viper is active from April to November and is strongly linked to the abundance of orthopterans (especially grasshoppers), on which it feeds. With a diet of insects and small vertebrates, the meadow viper has a very weak venom at its disposal compared to other Italian viper species: in fact, the venom is not dangerous to humans.

Reproduction occurs between April and May, on average every two years, and the young, which emerge from the egg inside the mother's oviduct, are born between late August and September.

Degradation caused by overgrazing of livestock in a semi-wild state, reduction of shrub cover, and destruction of high altitude habitats by anthropogenic causes and intentional killing are the most frequent disturbance factors.

Monitoring was carried out in summer by searching for specimens by sight (visual encounter survey) within sampling plots, with a radius of 25 meters, randomly selected within areas with suitable habitat.

During the project years, 69 plots were explored in the Monte Velino Reserve. Here, more than 20 specimens were identified, all found in open areas with rocky outcrops and dwarf juniper. The monitoring provided important information on the number of individuals in the population in the study area (poorly investigated until 2019) and the specificity of habitat required by the species.

Photo M. C. Magnano

KOTSCHY'S GECKO

***Mediodactylus kotschyi* (Steindachner, 1870)**

MURGE ORIENTALI NATIONAL NATURE RESERVE

The Kotschy's gecko is a small gecko, about 10 cm in length including tail, found in dry, rocky habitats with partially diurnal habits.

It is characterized by legs with long toes equipped with claws, lacking the classical lamellar structure of geckos and more similar to those of lacertids, which favor hunting on flat surfaces. The species, active between late February and early November, is found in Italy exclusively in eastern Apulia and Basilicata, in rural and moderately anthropized environments with fair tree cover (thickets, orchards), up to about 500 m a.s.l. According to some scientific evidence, this species may have been introduced unintentionally into Italy through timber shipments (some isolated populations located in northern Italy are certainly the result of anthropogenic introductions).

Photo A. Romanato

Populations are threatened by habitat alteration and destruction, removal of hedges or dry stone walls, and increased use of chemicals (pesticides) in agriculture.

Monitoring was conducted, in spring and autumn, by repeated counts along transects walked on foot. Individuals were sighted and counted in the thermoregulation phase in the open, on the rocks of dry-stone walls, the main shelter and breeding structure of this species.

The method involves 2 field days in spring and 2 in fall for each transect. To correctly identify the species, without causing disturbance, the use of binoculars can help.

Four transects were identified within two sites, for a total of 16 transect walks. An average of 30 individuals per transect was recorded, mostly active in the early morning hours, confirming the substantial population of Kotschy's gecko linked to anthropogenic structures and dry-stone walls within the study area.

Photo M. Romano

NATIONAL NATURE RESERVES AND OTHER AREAS IN ABRUZZO AND MOLISE

CASENTINO NATIONAL NATURE RESERVES

APENNINE YELLOW-BELLIED TOAD

Bombina pachypus (Bonaparte, 1838)

The Apennine yellow-bellied toad is a small toad (3-5 cm long) with a camouflaged back and characteristic yellow-stained belly. It is an endemic species of the Italian peninsula, south of the Po River. Present in hilly and mountainous habitats, during the breeding season (late March to September), it frequents warm, shallow waters, both still and weakly running. Here males emit the characteristic call to attract females and mate. Up to four spawning events can take place in a season, in each of which the female lays up to 50 eggs at a time.

For monitoring, potential breeding sites were investigated, during the April/August period, with at least 3 visits per season. Individuals were searched by sight along rivers and streams on predetermined stretches of at least 200 meters in total, and by careful scouting of the bottom and walls at natural or artificial standing water sites (fountains, watering holes, watering holes). In order to monitor reproduction, the presence and number of eggs and any tadpoles were always noted in the field sheets.

The species was monitored in the years 2019 and 2021. Forty-eight surveys were made at 11 different sites and reports were collected for a total of 460 observations between adult larvae and eggs, confirming the presence of the species in both study areas.

Thanks to the valuable collaboration with **the LIFE project WetFlyAmphibia**, monitoring of specimens reared and released ex-situ was also carried out in one of the Reserves of the Casentino Forest, the Camaldoli Reserve. Volunteers monitored the development and successful dispersal of the released tadpoles on a daily basis. In the 2021 activities, it was also possible to verify the success of the first reintroduction, confirmed by the presence of young individuals (one or two years old) that derived from the first releases.

Photo S. Bellacchi

NORTHERN SPECTACLED SALAMANDER

Salamandrina perspicillata (Savi, 1821)

There are two species of salamandrina, both endemic, found in Italy: the northern spectacled salamander in the north-central Apennines up to northwestern Campania, Molise and Puglia (pre-Dauno Apennines); the spectacled salamander in the rest of Campania, Basilicata and Calabria. They are ecologically and morphologically very similar. Caudate amphibians, thus provided with a tail, are very small in size (7-11 cm long) and have prominent ribs and vertebrae. The pale area above the eyes, as well as the brilliant white, black, and red ventral colors, are very distinctive. The species breeds in cool streams and spends the remainder of its live in damp and shady forests.

Monitoring was carried out by visual searches for adults, larvae and egg clusters on predetermined stretches of 200 m total, along streams and creeks during the period between April and August. Adults are generally observed from April, egg clusters remain visible for about a month, and larvae may remain in the water until late August. Therefore, at least 3 surveys per site were made during the indicated period on a regular basis to record the possible presence of the species and of reproductive success.

A total of 101 transects were carried out at 18 different stations. At two of these stations the species was never found, while at the remaining stations there were more than 350 reports of adults and thousands of eggs, confirming the presence of the species in all three macro areas investigated. Important data on other amphibian species that share the same environments, such as the fire salamander (*Salamandra salamandra*), Italian stream frog (*Rana italica*), common frog (*Rana temporaria*) and agile frog (*Rana dalmatina*), as well as the common toad (*Bufo bufo*), were also collected at the sites visited for the salamander.

NATIONAL NATURE RESERVES AND OTHER AREAS IN ABRUZZO AND MOLISE

CASENTINO NATIONAL NATURE RESERVES

MAREMMA NATIONAL NATURE RESERVES

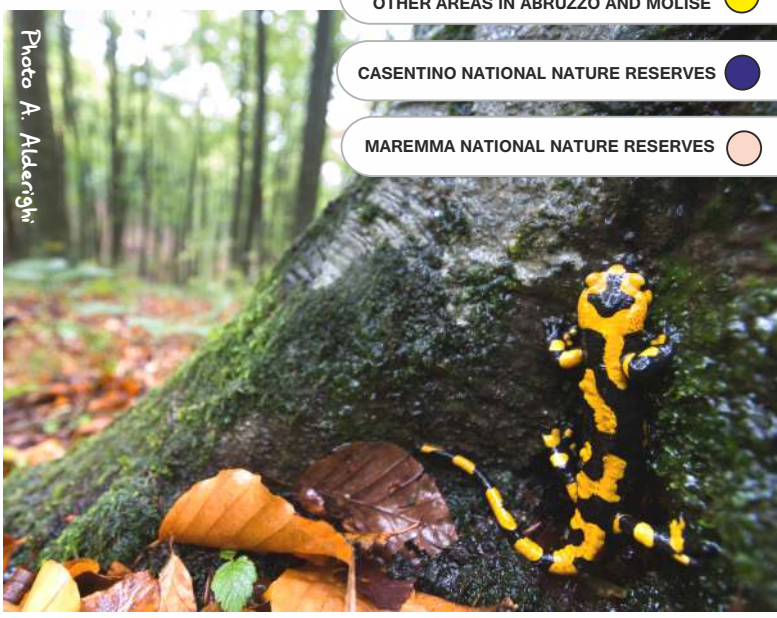


Photo M. Romano

ITALIAN NEWT

Lissotriton italicus (Peracca, 1898)

The Italian newt is a species endemic to our peninsula. It has a distribution from Marche to Lazio to Calabria. It is an amphibian of the order Caudata, with camouflage coloration on its back and a darkly speckled orange belly. It is usually found in small water bodies, including those of artificial origin, where courtship and spawning take place in the spring period. It is morphologically very similar to the spotted newt, with which it partially shares its distribution range, but differs from it in smaller size (about 8 cm in length), throat coloration and tail shape.

Monitoring was done by searching for adult individuals and larvae at suitable predetermined sites with at least three field visits per site from April to June, although the species can be detected year-round in the case of permanent aquatic sites. In biotopes with good visibility, a visual search for adults (also using binoculars) was opted for.

A total of 9 sites were investigated: 3 at the Murge Orientali (2021) and 6 for the Abruzzo and Molise area (2019, 2021). A total of 350 adult individuals and more than 500 larvae and subadults were surveyed, attesting to the breeding and success of this species at the monitored sites. Also as part of the project, in the Casentino Forests, Bosco Fontana and Abruzzo and Molise National Reserves, data were also collected on the spotted newt (*Lissotriton vulgaris*). In particular, in the Abruzzo and Molise area, the two species have an overlapping area of their distribution, and the data collected will also be very important to better delineate this aspect.

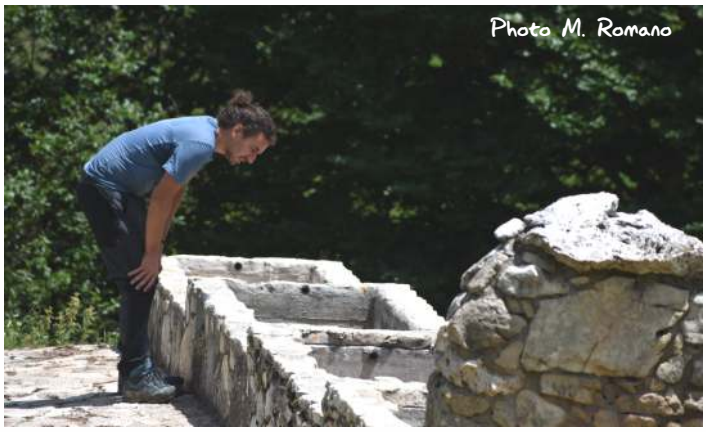


Photo M. Romano


Photo G. Gagliardi


Photo G. Gagliardi


Photo M. Romano

Photo G. Damiani

BALEARIC GREEN TOAD

Bufotes balearicus **(Boettger, 1880)**

The term green toad refers to a "species complex", the taxonomy of which is still somewhat under discussion: within the macro study areas of the project Bufotes balearicus is present. The common name is derived from its dorsal coloration, which usually has yellow-green spots. It is an adaptable and thermophilic species that prefers low-lying areas and wetlands. Adult green toads (about 7 cm long) are terricolous. They visit temporary pools throughout the breeding season (March to early May) and are easily located, especially at night, when the males emit their distinctive and well audible calls.

Monitoring was carried out by recording the number of adult individuals observed and the number of calling males at precise sites (point counts) or, in the case of extensive habitats, along a transect of about 500 m. Monitoring was carried out during the breeding season of the species and during night hours, preferring nights with mild temperatures preceded by rainy nights (preferably after dry periods).

The species was monitored at 3 stations, during a total of 45 field visits. From the data collected, more than 85 individuals were identified. As with every amphibian species monitored, in the case of the green toad protocol, every other species of interest was noted on the field sheets. This allowed the reporting of, for example, Italian tree frog (*Hyla intermedia*), Lataste's frog (*Rana latastei*) in Bosco Fontana, green frogs and common toad in the Murge Orientali.

STAG BEETLE

Lucanus cervus (Linnaeus, 1758)

Photo S. Bellacchi

BOSCO DELLA FONTANA NATIONAL NATURE RESERVE

CASENTINO NATIONAL NATURE RESERVES

MAREMMA NATIONAL NATURE RESERVES

RED LIST LC

NATURA 2000 ANN. II

The stag beetle is the largest European beetle and owes its name to the massive mandibles of males. Notable are also the sexual dimorphism (females' mandibles are much less prominent than those of males) and intraspecific variability (length: males 30-89 mm; females 25-49 mm). In Italy, the species is present in the north and center (up to Tuscany, Umbria, northern Latium), while the congeneric *L. tetraodon* is present in central and southern areas.

Adults are observed between May and September (peak activity: June-July). Males are most active at dusk, when they make dashing and noisy flights in search of females.

The species is found in habitats, with the presence of rotting dead wood on the ground (larval habitat), mainly in deciduous forests (oak forests), up to about 1,000 m a.s.l.

Monitoring is based on counting adult individuals, sighted along standard transects (500 m long and up to 10 m wide) walked at dusk at a constant speed by the operator. Departure is 15' before dusk and arrival is 15' after, for a total of 30 minutes. The monitoring protocol involves 6 consecutive sessions (one per week) between June and July, choosing the exact period according to the site being monitored (peak activity tends to lag with increasing altitude). The monitoring protocol does not involve capturing individuals, so volunteers were trained to recognize the species in flight in the field.

The monitoring carried out at Bosco Fontana Reserve and at Badia Prataglia Reserve (Foresta della Lama), confirmed the presence of a good population; of note, the peak of activity at Bosco Fontana that occurred with the last monitoring session, which is why volunteers carried out 3 additional "extra" monitoring sessions. Very interesting

Photo Staff Life ESC360

were the results obtained at Scarlino and Belagaio Reserves, where monitoring was applied for the first time and where there were no "certain" data: at Scarlino there were 22 total sightings (2 transects, 10 sessions carried out) , while at Belagaio there were 24 sightings (4 transects, 8 sessions).

GREAT CAPRICORN BEETLE

Cerambyx cerdo Linnaeus, 1758

The great capricorn beetle is a medium to large cerambycid beetle (body length: 17–56 mm). The antennae exceed the length of the body in males while equaling it in females (reaching the apex of the elytra). The coloration is black, except for the apical portion of the elytra, which is reddish instead. It is a saproxylic species, whose larvae develop for 3–5 years inside old oaks (but sometimes other deciduous species) that are senescent but still alive. Adults have nocturnal habits and are active from late May to early August. The species is widespread throughout Italy up to hilly altitudes and is found in both natural environments (e.g. mature oak forests) and urban parks.

Aerial traps activated with an alcohol-sugar mixture (based on wine and sugar) were used, placed in pairs on oaks larger than 50 cm in diameter (spaced at least 100 m apart): one trap placed on the trunk at a height of 1.5 to 2 m and one higher than 10 m among the branches of the canopy (using a forestry sling and a system of ropes for retrieval and repositioning). The traps are constructed so as not to be lethal to captured individuals. The protocol defines 5 weeks of monitoring: activation on Monday and deactivation on Thursday, with daily checks (three times a week).

At the Bosco Fontana Forest Reserve, monitoring allowed for a total of 128 captures (almost exclusively with traps placed over 10 m high), with a peak of activity between June 18 and June 20. At the Fogliano National Forest Reserve the monitoring allowed for 17 captures (18 considering an additional week of monitoring carried out at the end of the shift) between June 16 and July 8, 2021, and, again, most of the captures were made with high traps; this is the first monitoring of the species carried out in this Reserve (the protocol was applied the first time in 2018 but without results), which confirms the presence of the species, which is present in the Standard Form of the Natura 2000 Site that contains the Reserve.

Photo G. Damiani

ALPINE LONGHORN BEETLE

Rosalia alpina (Linnaeus, 1758)

Rosalia alpina is a conspicuous medium to large (body length up to 4 cm) cerambycid beetle. It has an unmistakable coloration, the body is ash-blue with black spots on the elytra. The species is closely associated with old beech forests. The larva is xylophagous, thus feeding on dead wood, and develops for about 3 years inside the trunks of large dead or dying trees exposed to the sun.

The adult emerges between May and August and lives a few weeks. The only difference between the sexes is the length of the antennae, which the males likely use to track the females for mating.

In Italy the species is distributed with localized populations throughout the Alps and Apennines and is also present in Sicily.

Monitoring of the species was carried out by searching and counting adult individuals in some sample areas. In each of these, 15 trees were selected that were suitable for the species, partially dead, had a diameter greater than 20 cm and showed signs of the presence of the species (emergence holes).

In each survey area, one check was made per week, for 5 weeks, during the times of the target's peak activity day (10:00 a.m. – 1:00 p.m.).

A total of 9 sites were monitored in two years of monitoring (2019 and 2021). The 4 sites in Casentino recorded 9 sightings, while the 5 sites in Abruzzo totaled 122. These data reflect two different conditions of the populations: in the Abruzzo study area, the beech forests are more open and contain large trees and therefore populations are more concentrated; in the Casentino Forests, suitable trees are less concentrated and immersed in a more continuous and dense forest matrix.

Photo M. Romano

SOUTHERN FESTOON

Zerynthia polyxena (Denis & Schiffermuller, 1775)
Zerynthia cassandra Geyer, 1828

BOSCO DELLA FONTANA NATIONAL NATURE RESERVE

CIRCEO NATIONAL NATURE RESERVES

CASENTINO NATIONAL NATURE RESERVES

RED LIST LC

NATURA 2000 ANN. IV

Photo S. Hardersen

Zerynthia cassandra and *Zerynthia polyxena* are medium-sized butterflies (wingspan of 50-60 mm). Until a few years ago they were considered a single species, as they were indistinguishable in external morphology; however, recent studies have shown significant differences at the genetic level and in the male genitalia.

The habitats of the two species are forest clearings and riverbanks (0-1,200 m. a.s.l.) with the presence of the host plants of the genus *Aristolochia*. Adults fly a few weeks, between March and June; after mating, they lay eggs on the host plants, which the monophagous caterpillars feed on (April-July) until the pupal stage. The latter develops at ground level, attached to stems and twigs of dry grasses and surrounding shrubs. Overwintering then occurs at the chrysalis stage.

Zerynthia polyxena is found in continental Europe and northern Italy north of the Po River, while south of the Po River, *Zerynthia cassandra* is found, thus constituting an Italian endemism.

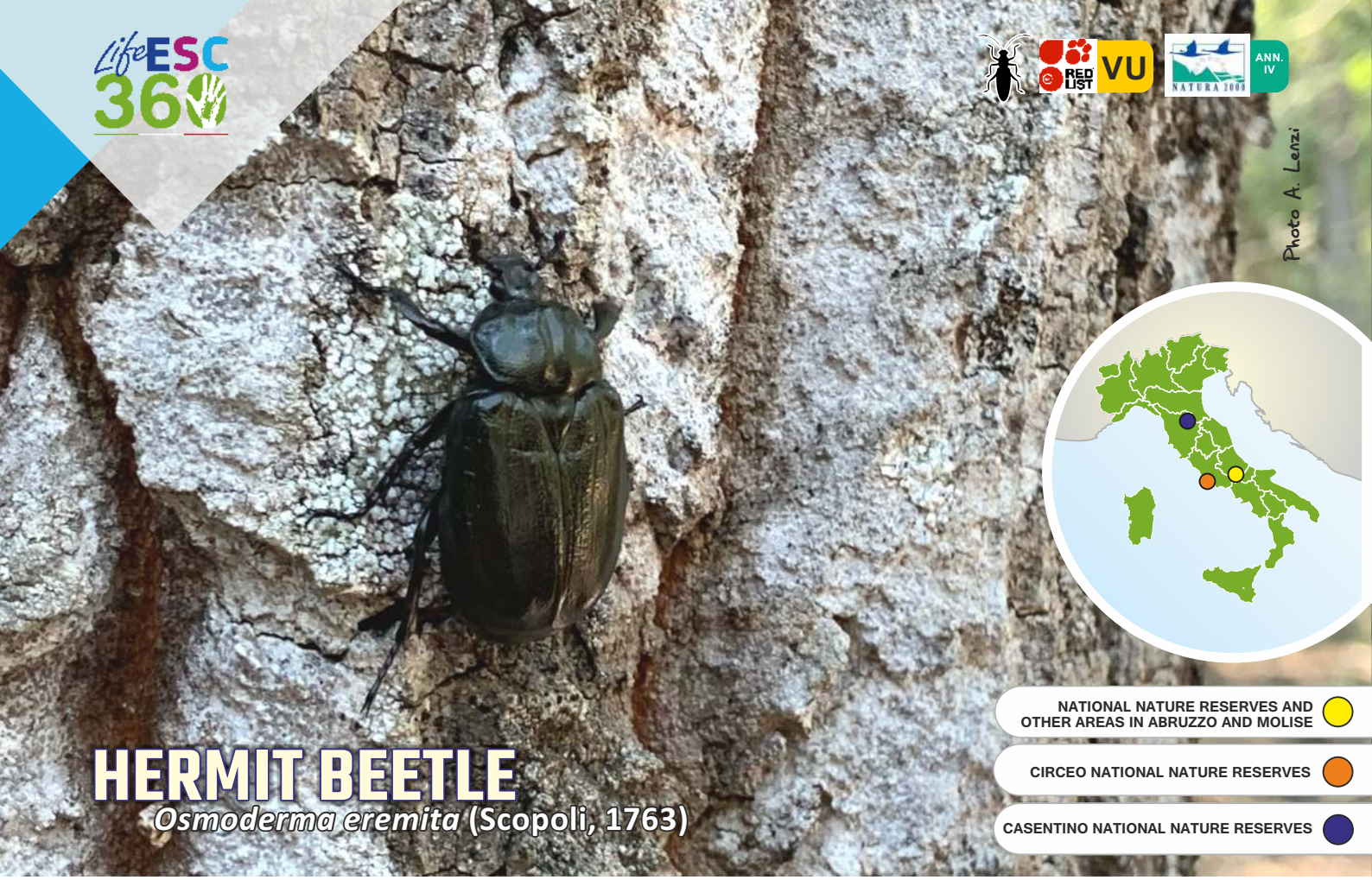
The two species were monitored by searching for eggs, larvae, and adults.

Early life stages (eggs and caterpillars) were counted within quadrats containing the host plant (*Aristolochia* sp.) (year 2019), or along fixed transects (5x1,000 m) and subdivided into 100 m long sections with *Aristolochia* present (year 2021). For adults, on the other hand, the semi-quantitative transect method was used, repeated weekly, in the middle hours of the day, throughout the flight period.

Zerynthia polyxena was monitored in a lowland area near Bosco Fontana, while *Zerynthia cassandra* was monitored in Camaldoli Reserve (2 stations) and Circeo National Forest Reserve (2 stations).

In the latter area, it was interesting to note the great abundance of eggs and caterpillars (more than 500, respectively) one year and then a limited number of adults the following year (less than 20). Thus, the high mortality of the species in the early stages of development is confirmed. One of the main causes is generally related to the vulnerability of the host plant along forest ecotonal areas (where it is subject to trail clearing and trampling by wild ungulates), or along riverbanks (managed by mowing).

Photo S. Hardersen



HERMIT BEETLE

Osmoderma eremita (Scopoli, 1763)

The hermit beetle is a medium-sized scarab beetle (24-30 mm long) that lives primarily in mature deciduous forests (0-1,800 m a.s.l.), but also in urban areas (parks) and agricultural settings (e.g. mulberry tree rows). In particular, the species is closely associated with old trees with cavities and wood mould: within these, the larva develops for 2-4 years. The adult emerges in summer and remains active 4-5 weeks, moving little away from the tree from where it emerged. Unlike most insects, it is the male that attracts the female for mating, luring her back by emitting an attractive pheromone ((R)-(C)-γ-decalactone).

In Italy, *O. eremita* s.str. is present in the north and center, while a subspecies (*O. e. italicum*) is present in the southern peninsular. In Sicily, on the other hand, there is an endemic congeneric species (*O. cristinae*). All three taxa are protected by the Habitats Directive.

Monitoring involves simply counting individuals caught with intercept traps, consisting of two dark panels crossed over each other and arranged above a funnel to which a collection bottle is attached, activated with the pheromone of the species (a synthetic form is commercially available). The protocol involves the exposure of 15 traps arranged along a transect (min. 100 m apart), for 5 weeks: each trap is activated at the beginning of the week, checked every other day so as not to damage the captured animal (released immediately after the check), and deactivated at the end of the week.

During the two summers of sampling (2019 and 2021), a total of 5 specimens were captured. This confirms the elusiveness of the species and the difficulty (at least as far as Italian populations are concerned) in capturing individuals, despite using attractive traps. This small number, however, contains a very important record for the Circeo National Forest Nature Reserve: the 2 male specimens captured in summer 2021 constitute the first record of the species in the Pontine lowland forest.

EUROPEAN BUTTERFLY MONITORING SCHEME (eBMS)

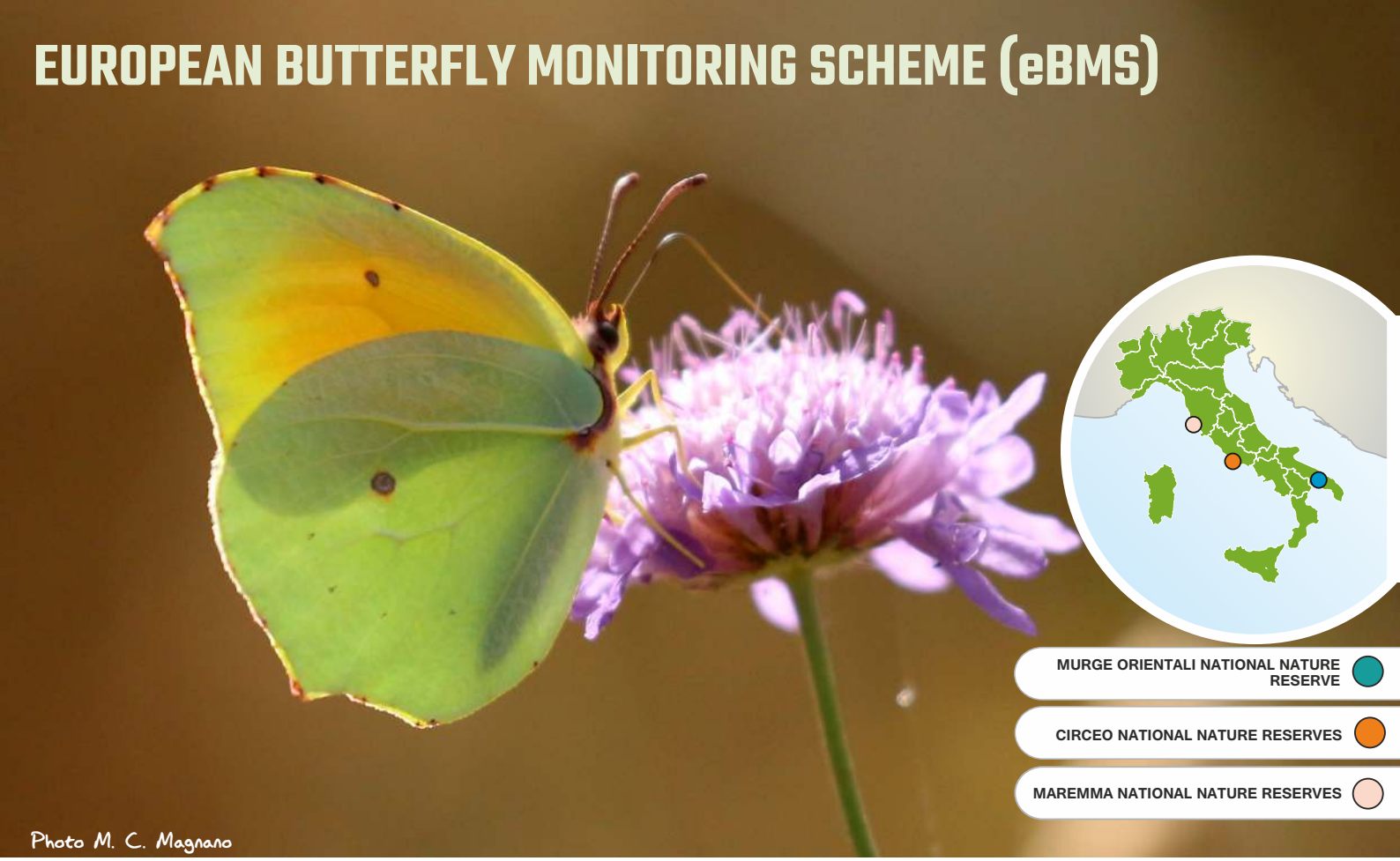


Photo M. C. Magnano

The Butterfly Monitoring Scheme is a European network for monitoring diurnal butterflies. It is based on the application of a standard method for counting individuals and species along fixed routes to assess the abundance and diversity of butterfly populations in order to establish appropriate conservation strategies. The entire initiative relies on the participation of volunteers who autonomously collect data, supported by project experts, training materials and field recognition manuals.

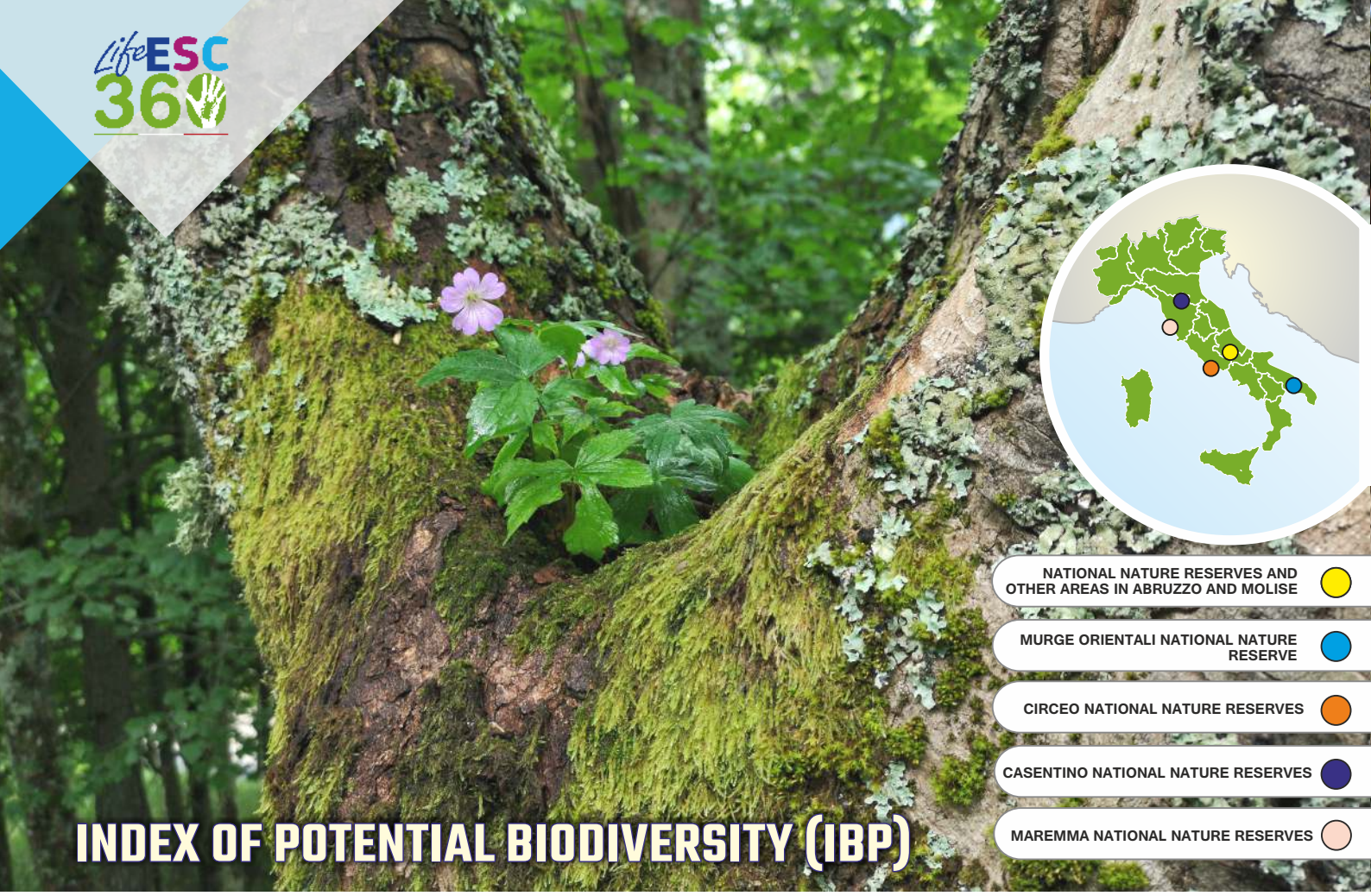
Photo G. Damiani

Counting and identification of specimens of each species along predetermined and fixed transects. Each transect is 1 km long and extends 5 m in width; it is also divided into sections corresponding to different habitats, or of fixed length (e.g. 50 m). The transect is walked for observation during the hours of greatest butterfly activity.

During the last year of the project, 8 BMS transects were activated and in total nearly 1,000 specimens belonging to about 120 species were counted and identified.

These data are not only valuable for our project but are in addition to those collected by dozens of other transects distributed throughout Italy, thus going to enrich a national database included in a long-term European monitoring program.

Photo P. Perone



INDEX OF POTENTIAL BIODIVERSITY (IBP)

The Index of Potential Biodiversity (IBP) is based on 10 factors to evaluate Forest Biodiversity, it is a tool that is well suited to be integrated into a sustainable forest management approach. The IBP was developed in France in 2008 by the National Forest Property Center and first applied in Italy by the LIFE GoProFor project – LIFE17 GIE/IT/000561.

The 10 IBP factors are divided into 7 forest-related (native species, vertical structure of vegetation, large dead trees standing or on the ground, large living trees, living trees with dendro-microhabitats, open habitats) and 3 context-related (temporal continuity of forest, aquatic and rocky habitats). A score from 0 to 5 is given for each factor; the sum of the points determines an overall score representative of the forest stand analyzed; their graphical representation is useful for management purposes. Volunteers applied IBP in different forest stands in all project areas during the 2020 and 2021 volunteer shifts.

The IBP was applied between 2020 and 2021 in 414 locations of 1 ha or 0.5 ha in 13 different forest stands. After an online and field training phase, volunteers tested their knowledge by analyzing the 10 factors by scoring each factor and filling out a field form. The scores obtained were later represented in graphical form at individual survey levels. These representations gave volunteers the opportunity to analyze the ability of a given forest stand to host biodiversity. A general analysis showed that the factors of large dead trees standing or on the ground were the lowest scoring and therefore most absent in the forest stands analyzed.


Photo M. della Valle


Photo L. Azzaro

FOREST SURVEYS

Forest surveys are complete censuses of the tree and shrub vegetation of a forest over predetermined areas. The data collected consist of measuring the diameter at breast height of all standing, living and dead plants present having diameters greater than 5 cm and measuring the total height of each tree. For each plant sampled, the location is also recorded using a GPS.

Data acquisition was done independently by volunteers following an appropriate training period.


Photo Staff Life ESC360

In **Bosco Fontana**, 3 complete forest plots were surveyed in 2019, totaling 9 hectares of the Reserve. Comparing the data obtained with previous data, collected from 1965 onward on a 10-year basis, following the abandonment of active management of the Reserve, we found the following:

- a general increase in the number and diversity of plant species;
- a change in the balance between pedunculate oak (*Quercus robur*) and hornbeam (*Carpinus betulus*), unbalanced in favor of the latter due to the decline of *Quercus robur* (ageing population and lack of regeneration);
- an increase in woody necromass at different stages of decomposition (with volumes locally even greater than 100 m^3/ha).

In **Belagaio**, a 1-hectare assay area was surveyed in 2020-2021, intended to become a permanent area so that the same surveys could be repeated every 10 years. Within it, 1,048 live trees and 375 dead trees belonging to 15 different species were surveyed. Through this activity we obtained the following information:

- the predominant species are beech (*Fagus sylvatica*), manna ash (*Fraxinus ornus*) and chestnut (*Castanea sativa*);
- the forest stand (set of woody plants) is medium dense (basal area of 23.5 m^2/ha, total woody volume of 213.7 m^3/ha);
- the total volume of dead wood is 26 m^3/ha with predominance of standing dead trees mostly chestnut trees;
- several habitat trees (mainly beech) with their associated dendro-microhabitats were identified and recorded (noteworthy is the presence of the lichen *Lobaria pulmonaria*).

BIOACOUSTICS

Bioacoustics originated as an addition to ethology to study different forms of communication in animals, eventually broadening its scope to the study of actual soundscapes. A soundscape is the set of sounds that interact in the same environment and that, in addition to conveying particular sensations to us, are indicative of the level of naturalness and biodiversity of the ecosystem examined. The goal of the study of soundscapes is therefore to provide a new tool for monitoring and managing the environment, one that can provide an index of how much it is more or less degraded compared to a fully natural condition.


Photo Staff Life ESC360

Monitoring was carried out only in 2019, during the summer season. In some previously located forest areas, special loggers were installed on trees about two to three meters high. The loggers, active 24 hours a day, were checked by volunteers once a week. At each control session, in addition to device maintenance, the memory card was removed and replaced in the field. The data were then transferred to special digital archives and processed with dedicated software. Preliminary to the field phase, much care was taken to train volunteers, instructing them in special training courses, not only about the application of the technique but also about the limitations and potential sources of error related to it. The acquired sound files returned a detailed "picture" of the soundscape and biological activities in the areas investigated. Using the appropriate software, data from entire days down to a few seconds were processed, transforming the detected sounds into "graphic images" distinguished by species, based on the specific vocal signature, recognizable to the human ear. This type of analysis provides us with a useful tool for understanding how the acoustic environment also evolves based on the impact of human activity by offering a diagnosis of the quality and richness of each ecosystem.


Photo M. Romano

ALL-ROUND ACTIVITIES

These are various in-depth thematic, monitoring or dissemination activities not strictly related to the project targets but in which volunteers were able to participate during their two-month stay in the project areas, thus enriching their training experience.

Photo V. Fondi

Photo M. Tondi

ENTOMOLOGICAL ACTIVITIES

Community studies

In 2019 at one of the areas within the National Reserves in Abruzzo and Molise (Valle di Teve) and in 2021 at the Sasso Fratino Reserve (Nature Reserves in the Casentino Forests), volunteers were able to support their respective Biodiversity Departments (Castel di Sangro and Pratovecchio) in activities aimed at studying particular insect communities through the setting of specific traps. In Abruzzo, the flying insect community was studied using "Malaise" intercept traps (similar to a Canadian tent) placed in ecotonal areas at the edge of beech forest during the summer months. In Casentino, following the recognition of a number of Italian ancient beech forests (including Sasso Fratino) as a UNESCO World Heritage Site, saproxylic entomofauna monitoring was activated through the installation of window traps, exposed from April to October.

Photo G. Damiani

Volunteers have on both occasions contributed to both the installation and management activities of the traps.

In addition, in 2021, a number of exploratory sessions of nocturnal insect communities were carried out in different project areas (Maremma and Circeo Reserves and in the Murge Orientali), using light traps, during which volunteers learned monitoring techniques for the target groups and tried their hand at recognizing the most characteristic species.

Systematic insights

Thanks to the availability of specialized technical personnel from various Departments, it was possible for volunteers to attend thematic lectures on the biology and ecology of certain groups and then go out into the field to identify, collect and recognize the main species of interest.

In particular, at the Circeo Nature Reserves, beetles typical of lowland forest and backdune areas were treated with a main focus on saproxylic biodiversity and that related to temporary waters; at the Murge Orientali Nature Reserve and the Maremma Nature Reserves, some entomological insights on Italian odonates were organized, with a focus on species listed in Annex II and IV of the Habitats Directive; at the Bosco Fontana Nature Reserve, on the other hand, volunteers carried out some activities focused on orthoptera and butterflies.

MONITORING AND/OR CONTROL OF INVASIVE ALIEN SPECIES

Over the course of the three-year project, volunteers were involved in monitoring, and on some occasions controlling, non-native, invasive species that are considered a threat to natural habitats and native species. The interventions were carried out in support of curricular activities carried out by Carabinieri Biodiversity Departments.

Eradication of *Callinectes sapidus*

The blue crab is a large crustacean from the western coasts of the Atlantic Ocean. Introduced accidentally in different geographic areas, it has been present on Italian coasts since 2008 and populations are growing rapidly. It lives at sea, along estuaries or coastal lakes, easily adapting to rapid changes in temperature and salinity. Voracious and very hardy, it causes damage to benthic communities both as a predator and as a competitor.

Capture traps for adult individuals were installed within Fogliano, Monaci and Caprolace Lakes (managed by Fogliano Department) to estimate the population present on the Pontine shoreline.


Photo Staff Life ESC360


Photo A. Lenzi

Eradication of *Procambarus clarkii* - Louisiana crayfish

The Louisiana crayfish is a decapod crustacean from the south-central United States, and it is currently considered the most widespread crayfish in the world. In Italy, it is present throughout the country. It lives in freshwaters, and due to its high ecological plasticity it is able to survive rapid temperature changes and periods of drought. The Louisiana crayfish exerts numerous pressures on the ecosystem in which it lives as a predator, competitor, disease vector and alterer of environmental structure (e.g. river banks).

During the 2019 volunteer shifts, *P. clarkii* populations within the Bosco Fontana Nature Reserve were monitored through traps. In the spring months of 2021, on the other hand, within wetlands of the Circeo Nature Reserves, volunteers participated in active capture and removal of individuals in order to eradicate the population.

Plants

A major threat of natural environments, often underestimated, is the rapid expansion of invasive plant species. Project volunteers participated in identifying areas at risk and assessing the level of infestation of some allochthonous target species in protected sites. Subsequently, they were also involved in targeted removal, control and/or eradication actions of some isolated and easily managed populations. Target species include tree of heaven (*Ailanthus altissima*), ombú (*Phytolacca dioica*), managed in the Circeo Nature Reserves, South African ragwort (*Senecio inaequidens*) subject to repeated interventions in Nature Reserves in Abruzzo.

PARTICIPATION IN OTHER MONITORING ACTIVITIES

White-winged snowfinch (*Montifringilla nivalis*)

Volunteers working in National Reserves in Abruzzo and Molise took part in monitoring the white-winged snowfinch, a high-altitude sparrow with a fragmented distribution and highly threatened by the ongoing increase in average temperatures. Activities were carried out during the post-reproductive period, between September and October, searching for flocks of individuals by sight, along transects at altitudes higher than 1,700 meters a.s.l. with suitable habitat for the species.

Loggerhead sea turtle (*Caretta caretta*)


Photo G. Damiani

During the summer of 2021, following a rare sea turtle laying event of a few individuals on the Pontine coast, volunteers from the third shift of the Circeo Nature Reserves supported TartaLazio and Circeo National Park Authority technicians in managing three nests within one of the protected sites.

Specifically, volunteers were involved in nest surveillance activities and, subsequently, in collecting biometric data of newly emerged young turtles.

Census of deer (*Cervus elaphus*) in the period of rut


Photo M. Romano

In the weeks of late summer and early fall, volunteers from the Casentino Forest Nature Reserves and Reserves in Abruzzo and Molise devoted several days to deer census activities during the rutting period. Male deer, in fact, during the breeding season (September/October) emit a typical vocalization to face each other and secure a harem of females with which to mate. Operators during these times, usually twilight or night, listen to the roar emitted by different males, locate and count the individuals present in the area.

CON.ECO.FOR (FOREST ECOSYSTEM CONTROL)

In 2019 and 2021, volunteers supported the Biodiversity Department at Castel di Sangro during some activities related to the CON.ECO.FOR. project, which involved the systematic collection of rainwater data in some beech forest areas of the central Apennines, with the aim of analyzing its components and identifying levels of atmospheric pollution. The activities were part of a broad national program aimed at studying the ecological interactions between the structural and functional components of Italian forest ecosystems.

Kentish plover (*Charadius alexandrines*)

Volunteers from the 2021 shifts were involved in the curricular monitoring activities carried out by Follonica Department staff on the Kentish plover, a bird nesting on sandy shorelines and highly threatened by human activities and the destruction and fragmentation of the dune environment. The Maremma population was monitored by counting the number of individuals along transects walked at regular intervals, every 15 days.

COLLABORATION IN ENVIRONMENTAL EDUCATION ACTIVITIES

In addition to essential monitoring and research activities in National Reserves, volunteers on each shift engaged in important environmental education and outreach activities. During these events, volunteers joined Biodiversity Department staff in describing the LIFE ESC360 experience and running nature-themed hands-on workshops for children and young people. Examples of the various initiatives in which the project participated include "A Tree for the Future", "Biodiversity White Night" and "Friendly Reserve".

NETWORKING

The Natura 2000 Network teaches that only by "networking" can great results be achieved. This is why the LIFE program promotes networking with other LIFE projects focused on similar topics or using similar methodologies. This action, called "networking" turns out to be of fundamental importance to disseminate project results and stimulate their application in other contexts, to create relationships between people and institutions also with the aim of drafting future projects and to compare methods of solving the same problems.

During the 3 years of the project, LIFE ESC360 came into contact with several LIFE projects, national projects or specific initiatives, either as promoters or invitees.

- LIFE eremita (LIFE14 NAT/IT/000209)
- LIFE Claw (LIFE18 NAT/IT/000806)
- LIFE ASAP (LIFE15 GIE/IT/001039)
- LIFE WetFlyAmphybia (LIFE14 NAT/IT/000759)
- LIFE GoProFor (LIFE17 GIE/IT/00056)
- LIFE ESC CHOONA (LIFE16 ESC/IT/002)
- LIFE STREAMS (LIFE18 NAT/IT/000931)
- LIFE GREEN4BLUE (LIFE 18 NAT/IT/000946)

DISSEMINATION EVENTS

Volunteer participation in project activities also included actions concerning the promotion of the project and dissemination of the results obtained, through the design and participation in events aimed at the local community. In the course of these initiatives, topics concerning the ecology of the species and habitats being monitored, biodiversity conservation, National Nature Reserves and the Natura 2000 Network were explored in depth. In this context, the goal of the project was to provide volunteers with the tools to enable them to organize a dissemination event, leaving them free to choose the best format to use.

Volunteers from each shift, with the support of the host Department, organized "Final Events" aimed at multiple targets (tourists, families, teens, children) and with different modalities (booths, public lectures in presence or online, guided excursions, educational modules in schools), but with the same purpose: to describe the LIFE ESC360 project from the perspective of their experience, to make people aware of the National Reserves in which they worked and the biodiversity that characterizes them, and to explain to the public the importance of conservation and monitoring of species and natural habitats.

A few examples...

Casentino Forest Nature Reserves
Year 2019

Shift: 2

Event name: Come Discover the Natura 2000 Network

Audience: General

Activities: Guided tours of the Museum and the Historic Arboretum "Carlo Siemoni" of the Pratovecchio Biodiversity Department, educational workshops, informative activities

Nature Reserves in Abruzzo and Molise
Year 2019

Shift: 2

Event name: A Nature Trail

Audience: General

Activities: Science games; simulation of monitoring activities with public involvement

Circeo Nature Reserves
Year 2021

Shift: 3

Event name: The forest and its inhabitants

Audience: Children

Activities: Environmental education activities through thematic tests and games on species found within the Reserve

DISSEMINATION EVENTS

Maremma Nature Reserves
Year 2021


Photo Staff Life ESC360

Shift: 2

Event name: Let's clean, discover, protect

Audience: General

Activities: Beach cleanup action and guided excursion to dune habitats


Photo Staff Life ESC360

Murge Orientali Nature Reserve
Year 2021

Shift: 3

Event name: The Night of Biodiversity

Audience: General

Activities: Games, activities and guided tours within the Reserve

MILAN'S PreCOP-26
Year 2021

On Sept. 29, 2021, the LIFE ESC360 project participated in the "All4Climate" event organized in Milan as a corollary to PreCOP-26, the preparatory meeting preceding COP-26, the United Nations summit, held in Glasgow in November 2021.

The event was titled "Climate change: is the future green?! The experience of the LIFE ESC360 project" and was hosted by the Civic Museum of Natural History in Milan.


Photo Staff Life ESC360

Through the reports of representatives of the project, institutions, environmental associations, the testimonies of volunteers and the projection of videos they made, the theme of the risks and effects of climate change was explored in depth, also reflecting on the professional opportunities that this has, however, generated. The event was especially aimed at students about to choose their academic or professional path.

A full recording of the event is available at this address:

https://www.youtube.com/watch?v=ts9IBPnwDNs.

EXPERIENCES AND CONCLUSIONS

Three years passed, eight shifts for a total of 336 days of field activities, dozens of protected areas visited, hundreds of field trips and field sheets filled out, thousands of data collected, and thousands of kilometers traveled through lowland forests and steep slopes in high mountains.Now we have come to the end of the journey, but what did this project leave behind for the volunteers who took part in it?

Certainly an intense experience, in close contact with nature and at the same time with other people with whom to share two months of activities, with all the benefits and difficulties that this entails. Each participant gained greater knowledge of protected species and habitats, new technical skills, a real connection with the area in which they worked, and a different sensitivity to biodiversity and the importance of its conservation.

But perhaps, the "truest" testimony may come from their own words:

LIFE ESC360 for me is ...
"living the forest"
"expand my knowledge of nature, which was zero before I came here"
"the opportunity to work with people from all over Italy and Europe"
"meet rare and protected species"
"having a chance to put my studies into practice"
"getting to know lovely places and our forest heritage"
"getting to know new people and discovering different realities"
"miss the forest and not wifi"
"having made new friends"
"love of nature, the blending of the sound of footsteps with the sound of the forest, the marvelling at the shade filtered through the foliage of trees"
"is to put yourself out there, to overcome your limits, to share your passions with others, and to laugh in company"
"is to run to chase a butterfly and stand still to admire a short-toed snake eagle"
"is the coldness of water from a stream and the warmth of the sun on the transect"
"it is when you take off your boots at the end of the day and still feel full of energy"
"it's a cold beer shared between starlight and a sky of fireflies, it's good night given to friends I'll never forget"

"We were all different, two foreigners and seven from all over Italy, some athletes, some not, with different studies.... However, then we might think it would be a problem, it was a strength: everyone can discover the culture of others, learn of others, and during the work, we were complementary. I especially learned Italian, Italian cooking and Italian music from this crazy group: we laughed so much!" (words of a French volunteer)

"And nothing, this adventure is also over...and to think that at first I didn't even want to leave...I was reflecting on all the things I should have left out in this month and wondering if it was really worth it. In retrospect I say that I couldn't have made a better choice, because I learned a lot more in this month than I could have learned in college, but most of all I had a real adventure full of emotions with some terrific companions: Los Chicos de Verdad.
[...] at Los Chicos de verdad les gusta to see the world through different eyes: Why two little black dots in the sky turn into a pair of eagles to be admired, little frogs inside a watering hole become adventurous companions to be visited every day, a small swampy pond turns into a meeting place to discuss and talk, the simple uphill climb of a rocky stream becomes a fierce treasure hunt, a large rock in the middle of the meadow turns into a possible treasure chest full of surprises, and an old tree turns into a wise friend who brings memories of times past upon himself.
Because a los Chicos de verdad don't les gusta stop at appearances, but les gusta live life with the eyes of an explorer always ready for new discoveries.
Thank you for everything."

But ESC360 was also an important experience for all the project staff: more than sixty people who, at different levels, had the opportunity to confront a new reality, that of nature volunteerism included in the ordinary activities of managing a National Nature Reserve. An experience that is not limited exclusively to following the volunteers in carrying out scientific monitoring activities but that is enriched with the values brought by the volunteers themselves.

Enjoy the continuation of the journey!


Foto di M. Romano

THANKS

Heartfelt and due thanks go to the staff of the Carabinieri Biodiversity Central Department in Rome and the Carabinieri Biodiversity Departments of Castel di Sangro, Fogliano, Follonica, Martina Franca, Pratovecchio and Verona, the staff of D.R.E.Am Italy and CREA-DC staff, who at various levels, from tutors to logistics assistants, from administrative staff to technical and management personnel, contributed to the full success of the project.

But all this could not have been accomplished without the participation of all our volunteers, who have been the soul of this project:

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Matteo, Castrovilli Maria, Cavallo Maria Rosaria, Caviglia Laura, Ceci Michela, Celentano Francesca, Cerofolini Andrea, Cesaroni Vanessa, Chunga Calero Walter Gabriel, Cipriani Claudio, Cittadino Simone, Collepardi Ilaria, Colucci Matteo, Consorti Elena, Contadellucci Martina, Cordova Luis, Cornacchione Alessia, Corneo Valentina, Costantino Roberto, Coviello Margherita, Crapanzano Antonino, Cristiani Matteo, Crocenzi Leonardo, Cucchietti Asja, Cuda Emilio Matteo, Cunegatti Alessandra, Da Valle Jamila, D'Alessandris Naomi, Dalla Bona Riccardo, Dalle Nogare Paolo, Damiani Gianluca, D'Annunzio Giulia, De Agostini Carla, De Cecio Irene, De Ioris Elena, De Lucia Flora, De Lucia Federico, De Pascalis Lorenzo, De Santis Antonietta, De Silvestri Mara, De Vivo Mattia, Della Roscia Laura, Demitri Annalisa, Denaro Agnese, Dessi Roberta, Di Bari Giovanna Miriana, Di Profio Alessia, Di Russo Edoardo, Di Santo Carmela, Di Vozzo Loris, Domalain Jules, Donatelli Aurora, Droghei Sarah, Dutto Fosca, Errico Erica, Espinos Gisbert Julia, Fabbri Martina, Farris Simone, Fassina Nausicaa, Favarin Sebastiano, Favaro Giulia, Fazzini Noemi, Febbi Carlo, Fenoglio Elisabetta, Ferri Doriana, Ferri Nicola, Ferrone Fiamma, Finetto Valentina, Flore Alessia, Fondi Lavinia, Fondi Velia, Fontani Mattia, Forcellini Irene, Foschi Valeria, Franceschini Sofia, Franzò Flavia, Frassineti Marta, Fundarò Davide, Gagliardi Giulia, Galanti Lara, Galizia Francesca, Gallinaro Lorenzo, Gandini Gabriele, Gargano Noemi, Gasparini Giacomo, Gatti Anna, Giacomelli Franco, Giannini Arianna, Gigliotti Andrea, Gioia Marika, Giordano Jan, Giornetti Marcella, Giovanardi Sara, Giovannini Silvia, Giove Rosita, Girivetto Virginia, Giubilei Irene, Gnappa Serena, Gomes Eshna, Goracci Chiara, Gorga Claudia, Grasso Giulia, Grieco Michel, Guttadauria Edoardo, Hasani Blerina, Hourfari Ruzbeh, Iacuaniello Rita, Iazzetta Martina, Imbriani Carolina, Infuso Alessandro, Ingarra Francesca, Intaglietta Maria Chiara, Izzo Mario, Kataoka Leila, La Russa Lorenzo, Lallo Alessandro, Lamarra Chiara, Lanzi Mazzocchini Deborah Mary, Lavezzo Ingrid, Leggieri Alessia, Lenzi Alice, Leo Andrea Brian, Lerda Lorenza, Li Tianshi, Litto Valeria, Loche Arianna, Loi Ludovica, Lombardi Elena, Longarini Arianna, Longo Gabriele, Longo Roberta, Lopez Dayron, Lorenzetti Lucrezia, Lorenzoni Francesca, Lucas João, Luccini Simone, Lucesole Cristina, Lusetti Maria Letizia, Maciocco Martino, Magnani Sofia, Magnano Maria Chiara, Malcangi Francesca, Marassi Lidia, Marcelli Eric, Marchetto Alessia, Marchignani Enrico, Marconi Matilde, Maresca Mariano, Marino Fabio, Marinoni Tommaso, Marmugi Alessandro, Marsy Audrey, Martignon Federica, Martinello Andrea, Martinucci Clara, Matarazzo Martino, Matarazzo Elena, Mazzotta Giulia, Mazzucchelli Francesca, Menci Silvia, Menegaldo Irene, Meroni Eleonora, Messori Veronica, Micci Virginia, Minervini Stefano, Monacchia Rebecca, Monticelli Marco, Morandi Pier Francesco, Morbidelli Marco, Morè Nicola, Moschetti Luca, Muro Federico, Necchi Rossana, Neirotti Giovanna, Noce Cecilia, Novina Petra, Nuti Leonardo, Oggioni Alessandro, Paciello Claudia, Pagano Francesca, Paglione Gabriella, Pala Francesca, Palmas Francesco, Palmerani Giulia, Pasquali Lorenzo, Pastacaldi Sara, Pasutto Chiara, Pepe Titomanlio, Pepe Giulia, Perda Giulio, Pernice Riccardo, Perone Paolo, Perrino Alessia, Petricelli Massimo, Picozzi Enrico, Pigni Elisabetta, Pinna Alessia, Piroli Chiara, Polizzi Marta, Pontrelli Sara, Porpora Camilla, Pozzi Jasmine, Prezzi Alessandro, Priori Paola, Qualizza Giorgia, Rainero Chiara, Ranucci Maddalena, Rigon Elvio, Riva Edoardo, Romanato Alessandro, Romeo Daniele, Ronchi Federica, Rossi Barbara, Rossi Claudia, Rotella Lorenzo, Ruggirello Francesco, Ruozzi Maria Laura, Russo Francesco, Sacco Alessia, Salsi Lorenzo, Salvatori Leonardo, Salvino Teresa, Sannikov Artur, Santacroce Vincenzo Francesco, Scalco Linda, Scarnecchia Giorgio, Sergenti Alessandro, Sgorlon Federico, Smargiassi Stefania, Somma Simona, Spadafora Anna, Spallacci Claudia, Sparro Ludovica, Sperone Edoardo, Stifani Maria Emilia, Stocco Dalì, Suanno Domenico, Tacchella Eleonora, Tanese Gabriele, Tartaglia Federica, Terraneo Edoardo, Tessari Alice, Tironi Sara, Toma Sara, Tondi Mario, Torresi Aurora, Trombin Denise, Tumiatti Fabiana, Turaccio Paolo, Vagnoli Sara, Vecchione Biagio, Venti Alessandro, Vescio Manuela, Vesco Emma, Vezzoli Orlando, Vietti Francesco, Vignoli Fabrizio, Villa Federica, Villaverde Michele, Volpe Anja, Volpe Alecsandra, Zaccaro Stefano, Zanzi Gaia, Zeqja Anisa.