



**BIODIVERSITY AND NATURAL, AGRICULTURAL AND FOREST AREAS**



*Biodiversity is the wealth of life on the earth and a source of goods, resources and services indispensable to the survival of man.*

*Italy is one of Europe's richest countries in terms of biodiversity, possessing half of the European plant species and a third of the animal species.*

*There are more than 57,000 animal species in Italy. Italy ranks third in Europe in terms of the number of endemic vertebrate species.*

*There are more than 6,700 species of higher plants in Italy, and 15.6% of the flora consists of*

## Introduction

Biodiversity can be defined as the wealth of life on the earth: the millions of plants, animals and micro-organisms, the genes that they contain and the complex ecosystems of which they are the component parts in the biosphere. The Convention on Biological Diversity (CBD), whose guidelines were set during the world summit held in Rio de Janeiro in 1992, defines biodiversity as the variety and variability of living organisms and of the ecological systems in which they live, stressing that the diversity in question involves genes, individual subjects and ecosystems as a whole. Biodiversity is a source of goods, resources and services (ecosystems services) that are indispensable to the survival of man. The priority objectives of the CBD are the preservation of biodiversity and the sustainable and durable use of its components, in addition to a fair and equitable distribution of the benefits it provides.

## The state of the natural and semi-natural environments

Italy is one of Europe's richest countries, in terms of biodiversity, essentially on account of its favourable geographic position, as well as its extensive geo-morphological, microclimatic and vegetative variety, plus the additional influence of factors of history and culture. Italy possesses fully one half of all the plant species currently found in European territory, together with a third of the animal species. According to recent figures (GIS Nature, Ministry of the Environment, Land and Sea, 2005), the number of species of Italian fauna are estimated at more than 57,000, of which 1,265 belong to the *subphylum* of the Vertebrates, meaning Agnates (5), Fishes (568), Amphibians (37), Reptiles (55), Birds (473) and Mammals (127). Roughly 55,000 species are Invertebrates, the majority falling under the Insect class. Italy also holds third place among European countries in terms of the number of endemic Vertebrate species belonging to the classes of Amphibians, Reptiles, Birds and Mammals.

According to the most recent publications<sup>1</sup>, Italy's vascular flora includes 6,711 species, divided into 196 families and 1,267

<sup>1</sup> An annotated checklist of the Italian vascular flora, Conti et al., 2005.



genera, and with a contingent of endemic species that account for 15.6% of the total flora. The greatest number of flora are found in the regions with the most extensive environmental variations and the largest territories, such as Piedmont (3,304 species), Tuscany (3,249), Veneto (3,111), Friuli Venezia Giulia (3,094), Lazio (3,041) and Abruzzo (2,989). Looking at the flora species that are most rare, and found in small areas, the regions that possess the greatest number of endemic species and exclusive species, meaning those found in that region alone, are Sicily (322 endemic species and 344 exclusive ones) and Sardinia (256 endemic species and 277 exclusive ones).

Italy also possesses an especially rich stock of forests, whose quantity, depending on the type of specifications adopted for the statistics, can be estimated at approximately 6,860,000 hectares (ISTAT data 2006 processed by ISPRA) and 8,760,000 hectares (CFS-INFC, 2005), in addition to which there are 1,710,000 hectares of sparse or low forest formations, as well as bushes and shrubs (CFS-INFC, 2005). Taking the most restrictive approach, the national forest area index is equal to 22.8%, with the figure increasing in a gradual but constant manner, based on a trend tied to forestation and reforestation activities and, in recent years, and to an even greater extent, to natural forest expansion in marginal farming areas in hilly and mountainous zones (Figure 2.1).

A negative factor offsetting this expansion is the occurrence of forest fires, regarding which an especially critical period was recorded in the mid 80's, followed by years in which the level of such fires remained high, on the whole, though there was a gradual mitigation until 2006. Unfortunately, a new rise in the incidence of forest fires was recorded during 2007, with more than 10,600 events affecting over 227,000 hectares, of which approximately 117,000 hectares are part of the forest area in a strict sense (CFS, 2007).

*endemic species.*

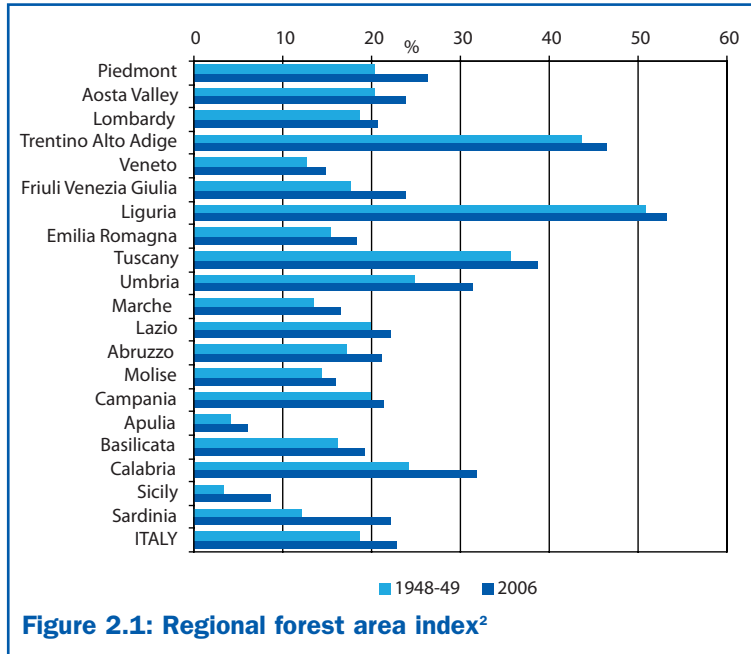
*The national forest area index is 22.8%, and it is constantly growing.*

*In 2007 a resurgence of forest fires was recorded.*



Italy has an especially rich stock of forests, and its forest area index is constantly on the rise, thanks to activities of forestation and reforestation, plus the natural expansion of forests.

Running counter to this trend, however, are forest fires, which registered a marked resurgence in 2007, after having gradually declined through 2006.



**Figure 2.1: Regional forest area index<sup>2</sup>**

In cities with more than 150,000 inhabitants, public urban green areas rise by an average of 2.1% between 2000 and 2006.

In addition to natural and semi-natural environments in the strict sense of the terms, Italy also possesses urban vegetation that constitutes an important component of its natural assets, in light of the increasing expansion of urban areas. Green areas within cities serve a variety of functions: in addition to improving appearances and setting the stage for recreational activities, they also mitigate pollution in the different environmental matrices (air, water, soil), in addition to improving the micro-climate and contributing to the preservation and enrichment of biodiversity. But despite the importance of urban green areas, there is still a shortage of data, both on account of a lack of shared databanks and due to the failure to arrive at a universally accepted definition of “urban green areas”. In 24 cities that are provincial seats, and that have populations of more than 150,000 inhabitants, the quantity of urban greenery managed (directly or indirectly) by government entities (municipalities,

<sup>2</sup> Source: ISTAT data processed by ISPRA



provinces, regions, the central government) showed a positive trend between 2000 and 2006, in terms of both percentage of municipal surface area and per capita availability (ISTAT, 2007). In the 24 cities in question, an average increase of 2.1 percentage points was observed in the quantity of greenery as a ratio of the municipal surface area, with the highest increases in the cities of Naples, Cagliari and Turin. Per capita availability also rose, by an average of 6.9 m<sup>2</sup>/inhabitant, especially in the cities of Naples, Foggia and Turin.

This wealth of biodiversity, however, is seriously threatened, with the risk of it being lost forever. The outlook in terms of threats to animal species within the national territory has been illustrated by a number of different authors in specific Red Lists, especially with regard to autochthonous Vertebrate species. In evaluating the different categories and levels of threats, the authors make reference to the IUCN categories<sup>3</sup>. An analysis shows that the percentage of Vertebrate species at risk fluctuates, depending on which author is consulted, from 47.5% to 68.4%<sup>4</sup> (Figure 2.2). In the specific cases of Cyclostomes and Fishes in inland waters, more than 40% of the threatened species were found to be in an especially critical condition (the IUCN categories of CR – critically endangered and EN – endangered), while, with regard to Birds and Mammals, respective percentages of 23% and 15% of the threatened species were in serious danger of extinction. A further analysis, carried out on endemic and sub-endemic species, confirmed the overview just formulated. A third of the threatened Fishes species, and a sixth of the Reptiles species at risk, are endemic. But the most critical situation is that of the Amphibians, which show the highest percentage of all for endemic species in danger, at more than 66%. As of today, for obvious reasons, there exists no similar evaluation for the levels of threat faced by Invertebrates. Nevertheless, considering the elevated number of species, plus the fact that the percentage of endemic species is higher than in the case of Vertebrates, being

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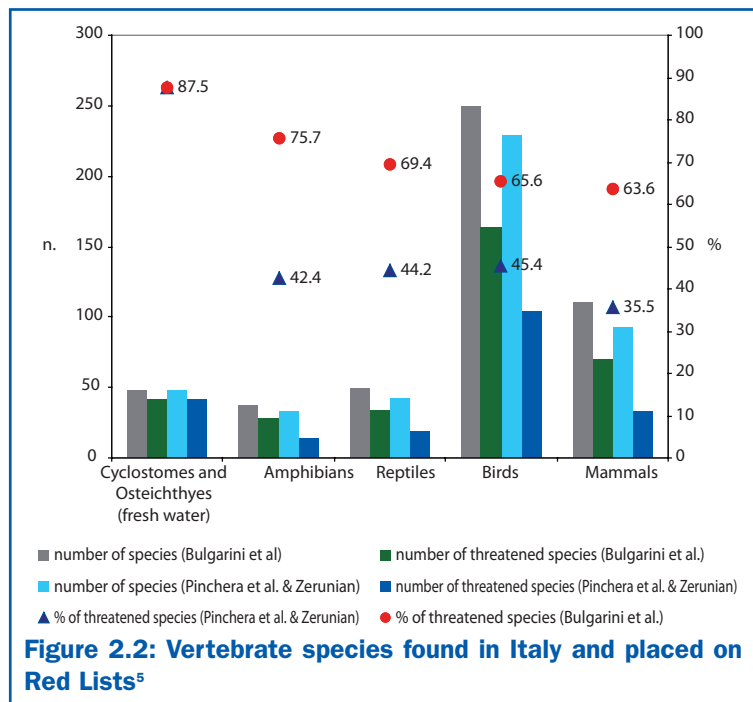
<sup>3</sup> The World Conservation Union, 1994.

<sup>4</sup> *Libro rosso degli Animali d'Italia*, Bulgarini et al., 1998; *Application to the Terrestrial Vertebrates of Italy of a System Proposed by IUCN for a New Classification of National Red List Categories*, Pinchera et al., 1997; *Condannati all'estinzione? Biodiversità, biologia, minacce e strategie di conservazione dei Pesci d'acqua dolce indigeni in Italia*, Zerunian, 2002.



equal to more than 10% of the total, as well as the elevated niche specialisation and the limited areas of distribution of many species, it can reasonably be assumed that, when faced with the same conditions as the Vertebrates, in terms of threats, the level of danger for the Invertebrates, and thus the threat of extinction, will prove decidedly higher.

The percentage of Vertebrate species at risk fluctuates, depending on the author consulted, from 47.5% to 68.4%. The situation is especially critical for freshwater Fishes, Amphibians and Reptiles.



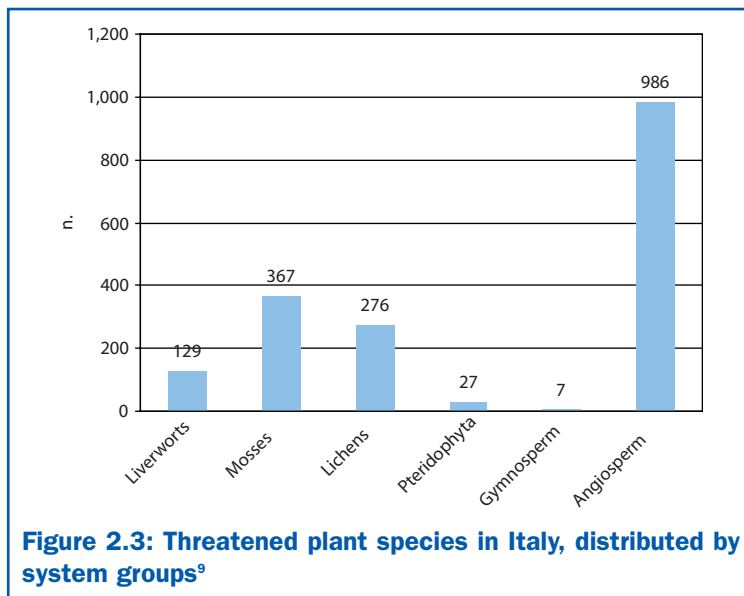
The statistics on the threat faced by plant species in Italy are also taken from Red Lists published by specialists. In 1992 the

<sup>5</sup> Source: ISPRA processing of data taken from: Zerunian S., 2002, *Condannati all'estinzione? Biodiversità, biologia, minacce e strategie di conservazione dei Pesci d'acqua dolce indigeni in Italia*; Bulgarini F., Calvario E., Fraticelli F., Petretti F., Sarrocco S., (Editors), 1998, *Libro rosso degli Animali d'Italia*; Pinchera F., L. Boitani & F. Corsi, 1997, *Application to the Terrestrial Vertebrates of Italy of a System Proposed by IUCN for a New Classification of National Red List Categories*. Biodiversity and Conservation 6, 959-978



number held to be in risk of extinction was 458<sup>6</sup>, a figure that rose to 1,011 in 1997, with publication of the Regional Red Lists on Plants in Italy<sup>7</sup>, to which the IUCN categories of threat (version 2.3) were applied. This list was subsequently revised and combined with the Atlas of Species at Risk of Extinction<sup>8</sup>, resulting in the identification of 1,020 species, whose precise distribution is also indicated. At present, therefore, 15.2% of Italy's vascular flora are threatened with extinction, a situation that proves even more acute for lower plants, approximately 40% of which, out of all the known species, were found to be in danger (Figure 2.3).

15% of the higher plants are at risk and 40% of the lower plants.



15% of the vascular flora in Italy are threatened with extinction, while the situation is even more critical for the lower plants, with approximately 40% of all known species found to be in danger. In detail, the Italian plants at risk include 772 species of Hepaticae, Mosses and Lichens, plus 1,020 vascular plants.

<sup>6</sup> *Libro Rosso delle Piante d'Italia*, Conti et al., 1992.

<sup>7</sup> Conti et al., 1997.

<sup>8</sup> Scoppola and Spampinato, 2005.

<sup>9</sup> Source: Conti, Manzi, Pedrotti, 1992 - *Libro Rosso delle Piante d'Italia*. Ministry of the Environment, WWF Italy. Conti, Manzi, Pedrotti, 1997 - *Liste Rosse Regionali delle Piante d'Italia*. WWF Italy, Italian Botanical Society, University of Camerino. Scoppola, Spampinato, 2005 - *Atlante delle specie a rischio di estinzione (CD-ROM)*. Ministry of the Environment, Nature Protection Department, Italian Botanical Society, University of the Tuscia, University of Rome, "La Sapienza" Campus



*Based on the Habitat Directive, over 50% of the European habitats to be protected are found in Italy.*

Current knowledge of Italian plants at risk is far from complete, and so the state of preservation of the *taxa* of Italian flora should be evaluated according to the most recent IUCN criteria, in order to draw up a New Red List for Italy. To this end, the Italian Botanical Society undertook the “Italian Initiative for the Implementation of the IUCN Categories and Criteria (2001) for Formulation of new Red Lists” in 2006. The experts involved in this initiative recently published the initial results of application of the IUCN criteria to 40 target species of Italian flora<sup>10</sup>.

Closely connected with the state of preservation of the different species is the state of preservation of habitats. As we shall see further on, in applying the “Habitat Directive” (92/43/EEC), which constitutes one of the most important regulatory instruments for preserving habitats and biodiversity, Italy plays a role of noteworthy importance. In fact, the country’s geographic characteristics place it within three different bio-geographic zones (Alpine, Continental and Mediterranean), while, according to the Directive, over 50% of the habitats to be protected are found in Italy. Of these, 33 habitats - 15 of them given top priority - are found only in Italy within their bio-geographic region of reference<sup>11</sup>. As a rule, the habitats at risk in Italy are uniformly distributed throughout the national territory, with this being true for the quantities of the different types of habitats as well<sup>12</sup>. Worthy of separate mention are the marine habitats protected under the Directive: though 8 out of the 9 habitats indicated are found in Italy, the only marine habitat, in the strict sense of the term, is that of the Prairie of Posidonia, regarding which, for that matter, the European Commission holds that the 2000 Nature Network is not complete, meaning that the regulatory instrument for evaluating and preserving the biodiversity of this environment is rendered insufficient.

In addition to natural environments, agricultural areas also play an important role. Not only do they support the production of food and fibres, but they are closely tied to the environment, giving rise to

<sup>10</sup> *Informatore Botanico Italiano*, vol 40, suppl. 1, 2008.

<sup>11</sup> *Reference list of habitat type*, EU Commission and EEA, 2001.

<sup>12</sup> *Libro rosso degli Habitat d’Italia*, WWF, 2005.





extremely complex relations, at times in contradiction the one with the other. In demonstration of the importance of agriculture with regard to natural resources, it should be remembered that almost 44% of the national territory is earmarked for agriculture (ISTAT, 2003), and that a portion of this area, the equivalent of approximately 21% of the UAA (Utilised Agricultural Area) (EEA, 2004), presents characteristics of noteworthy naturalistic value, in terms of genetic and species biodiversity, as well as that of the landscape, serving as zones of connection with natural spaces. Italy, together with Spain, Greece, northern Great Britain and Scandinavia, preserves an elevated percentage of agricultural areas of significant natural worth, such as Alpine meadows and pastures.

In recent decades, running parallel to the stagnation in demographic growth and in the demand for agricultural products, as well as to the exodus from rural areas and the rise in productivity per unit of surface area, Italy has registered a noteworthy decrease in the number of farming enterprises and in the UAA. This last measure fell by 2.3 million hectares between 1990 and 2007, meaning a loss of more than 15% (ISTAT). It is important to note, however, that this decrease has been accompanied by a gradual rise in the UAA of the average enterprise, which went from 6.1 hectares in 2000 to a figure of 7.6 hectares in 2007, making for an increase of 25.1%.

The reduction in the overall UAA frequently corresponds to an operational abandonment of farmlands, which can then undergo processes of renewed colonisation on the part of tree, bush and herbal vegetation (re-vegetation), though they can also be subject to processes of soil deterioration, erosion and desertification. The process of vegetative renewal can be sharply limited by a loss of natural qualities caused by agricultural activities, with the extent of the loss depending on the characteristics of the agricultural activities and their duration. The fertility of the soil in abandoned farmland always proves to be impoverished, while the composition of the original seed bank of the soil is totally compromised. These factors, together with the situations of deterioration and fragmentation typical of the agricultural areas of industrialised countries, block or slow the natural dynamics of vegetative succession.

*Almost 44% of the national territory is devoted to agricultural activity, and approximately 21% of the UAA (Utilised Agricultural Area) presents characteristics of noteworthy naturalistic value.*

*Between 1990 and 2007 the UAA fell by 2.3 million hectares, a decrease that frequently corresponded to the operational abandonment of agricultural soil, following which processes of vegetative renewal were possible, also through processes of soil deterioration.*



*The primary threats to biodiversity are human activities and the growing demand for natural resources and ecosystem services.*

*The transformation and modification of natural habitats constitutes a threat for 50.5% of the Vertebrate animal species.*

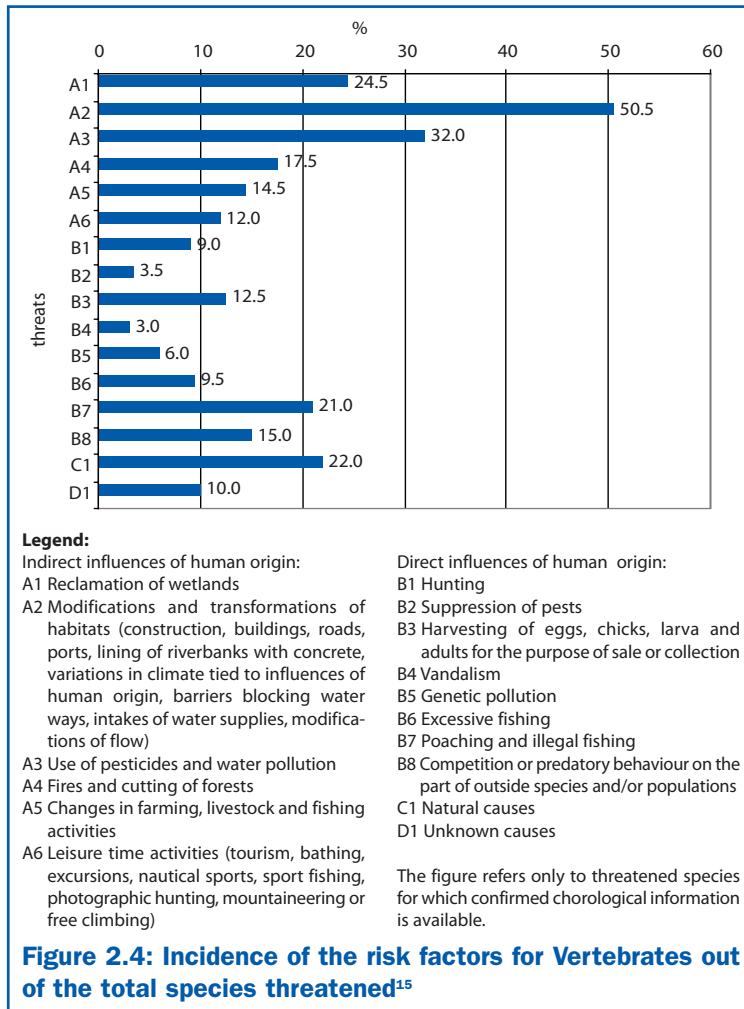
## **The main causes of threats to biodiversity**

The main threats to the natural heritage are tied to the impact of human activities and to the growing demand for natural resources and ecosystem services. In Western and Central Europe, and throughout the Mediterranean basin, the presence of man from ancient times has led to alterations in the natural ecosystems and habitats, which today, in the majority of cases, appear fragmented and subject to various types of disturbances. Five main causes for the loss of biodiversity are particularly worthy of note<sup>13</sup>: fragmentation, deterioration and destruction of habitats, the introduction of exotic species and the excessive exploitation of resources and species. This last factor is traceable, first and foremost, to a lack of adequate regulation for governing, according to ecological criteria, the procurement of supplies of resources, plus, as a secondary consideration, the collection and sale of wild species. These threats lead to a reduction in biodiversity, as a result of the deterioration and impoverishment of ecosystems, together with the local extinction of many species, primarily the most sensitive, the endemic species, the rare ones and those that prove most vulnerable. At times there is a turnover involving different types of species, with the often irreversible disappearance of many species typical of a natural habitat being accompanied by the entry of species that are exotic, competitive, generalist, ruderal or synanthropic.

With respect to Vertebrate animal species, Figure 2.4 shows the overall outlook for the various factors of risk and their relative incidence on the state of preservation, determined on the basis of the Red Lists published to date on the different categories of threats by the IUCN. Generally speaking, the analysis shows that the most frequent threat (50.5% of the species at risk) of all the indirect influences of human origin consists of the transformation and modification of natural habitats (A2), while poaching and illegal fishing (B7) constitute the predominant threat among direct influences of human origin.<sup>14</sup>

<sup>13</sup> *Conservazione della natura*, Primack and Carotenuto, 2007.

<sup>14</sup> *Libro rosso degli Animali d'Italia*, Bulgarini et al., 1998; *Application to the Terrestrial Vertebrates of Italy of a System Proposed by the IUCN for a New Classification of National Red List Categories*, Pinchera et al., 1997; *Condannati all'estinzione? Biodiversità, biologia, minacce e strategie di conservazione dei Pesci d'acqua dolce indigeni in Italia*, Zerunian, 2002.



*In Italy the primary threats to biodiversity are human activities and the growing demand for natural resources. Of all the indirect influences of human origin, the most frequent types of threats (50.5% of the species at risk) involve the transformation or modification of natural habitats (A2), while poaching and illegal fishing (B7) constitute the primary type of threat among the direct influences of human origin.*

<sup>15</sup> Source: ISPRA processing of data taken from: Zerunian S., 2002, *Condannati all'estinzione? Biodiversità, biologia, minacce e strategie di conservazione dei Pesci d'acqua dolce indigeni in Italia*; Bulgarini F., Calvario E., Fraticelli F., Petretti F., Sarrocco S., (Editors), 1998, *Libro rosso degli Animali d'Italia*. Pinchera F., L. Boitani & F. Corsi, 1997, *Application to the Terrestrial Vertebrates of Italy of a System Proposed by the IUCN for a New Classification of National Red List Categories*. Biodiversity and Conservation 6, 959-978



*Worth mentioning among the causes of impact are those tied to hunting, which can be practiced in more than 83% of the national territory, though hunting pressure differs from one region to the next.*

*Fishing is an important factor of impact in marine environments. Italy accounts for approximately 5% of the total European catch, but, as do the other countries of the Union, it takes part in efforts pursued by the EU for some time now to limit fishing.*

Moving on to a more detailed analysis of the causes of impact, mention can be made of those tied to hunting, an activity that, it should be noted, can be practiced in more than 83% of the national territory (ISTAT, 2006 and the Ministry of the Environment, Land and Sea, 2003). Pressure from hunting is not uniformly distributed throughout the country: in certain regions, such as Umbria and Tuscany, the level is definitely higher than in others. The greatest levels of pressure are to be found both in large-size regions (Tuscany, Lazio, Lombardy, Campania) and in those of limited extension (Umbria, Liguria and Marche). Assuming that the number of hunters constitutes the primary factor of hunting pressure within a given territory, a decrease in this pressure was observed between 2000 and 2006, due to a drop of 4.5 percent in the number of hunters on the national level. This outcome was the combined result of a widespread reduction on the regional level (no fewer than fifteen regions out of twenty registered a decrease in the number of hunters), combined with increases in the five remaining regions, and at times by considerable amounts, as in the cases of Calabria (+28.2%) and Trentino Alto Adige (+22.3%).

As far as fishing is concerned, it has a major impact on the marine environment. Italy accounts for approximately 5% of the total European catch, though, together with the other countries of the Union, it takes part in the efforts to limit the impact of fishing pursued for some time now by the EU and forcefully confirmed in the new Common Fisheries Policy (CFP), which went into effect on 1 January 2003. The year 2007 registered a continuation of the trend begun in 2000, with the size of the fishing fleet falling in terms of both ships and overall engine power, while, in contrast, the figure for the total tonnage of the national fleet reversed its downward curve during the last year, growing by 20% over the figure for 2006 (MIPAAF-IREPA, 2007). As a rule, the Italian fishing fleet consists of modest and medium-size vessels, with non-industrial-scale fishing in many regions accounting for 80% of the entire fleet (Ministry of Agricultural, Food and Forestry Policies - IREPA, 2007). Naturally, the situation varies throughout the national territory: in 2007 more than 50% of the vessels of the national fishing fleet were registered in Sicily, Apulia, Sardinia and Campania, while the highest figures for average days of fishing were recorded in Lazio, Marche, Campania and Apulia. The most frequently used



fishing systems are bottom and mid-water trawling, together with small-scale coastal fishing, confirming the general tendency of the Mediterranean to favour non-industrial modes of fishing. In the case of small-scale coastal fishing, it is common for different systems to be used in different periods of the year. Even though the vessels are generally small in size, and fishing activities have been successfully limited in recent years, more than 50% of the vessels operate exclusively along the coast (MIPAAF, 2008), subjecting this zone, in which a large part of the resources of the entire marine system are located, to greater pressure.

The procurement of supplies of wood and non-wood materials (cork, pine seeds with shells, strawberries, raspberries, blackberries, chestnuts, mushrooms and acorns) constitutes a factor of pressure specific to forest ecosystems. It should be noted, however, that the expansion of forest area mentioned earlier has corresponded, in recent years, to a reduction in the rate of procurement (the ratio between the supplies of wood materials taken and the forest area), with the trend reversing between the year 2000 (when a level of  $1.7 \text{ m}^3/\text{ha}$  was reached) and 2005 (when the amount of supplies procured was  $1.2 \text{ m}^3/\text{ha}$ ). This reduction was especially pronounced for roundwood (-40% compared to 2000 - ISTAT, 2006) and, though to a lesser extent, for wood used as fuel, which still accounts for more than 60% of overall wood production. Another noteworthy factor is the decrease of the average surface area of forest cuttings. In 2006, a number of non-wood forest products, with the noteworthy exception of mushrooms, showed a decrease compared to 2000 (ISTAT, 2007), probably on account of processes of urbanisation and the loss of local traditions. As a rule, these trends can be interpreted as a lessening of pressure on forest ecosystems, though consideration should also be given to the fact that a renewal of production activities, if properly managed, can end the state of abandonment of forests and improve the manner in which they are managed, with positive fallout in terms of conservation as well.

The introduction of potentially invasive alien species constitutes another threat to biodiversity. The presence of exotic species in nature can essentially be traced to three modes of introduction: intentional or voluntary (through raising, cultivation, as a hobby etc.),

*There has been a reduction in recent years in the rate of procurement of wood supplies, which registered  $1.2 \text{ m}^3/\text{ha}$  in 2005, while, at the same time, the average surface area of cuttings decreased.*



*The introduction of potentially invasive alien species constitutes another threat to biodiversity. Italy ranks fourth in Europe for the number of alien species reported.*

*As regards terrestrial fauna, it has been estimated that there are at least 450 alien or non-indigenous species in Italy, introduced intentionally or accidentally, with the largest portion belonging to the Insect class.*

secondary (*taxa* originally introduced in areas outside Italy's borders, only to enter our country, at a later point in time, on their own) and accidental (through the transport of cargo, the ballast water in ships, fouling etc.). Preliminary results from the DAISIE Project<sup>16</sup> indicate that there are 2,071 alien species in Italy, 302 of which are found in Sardinia alone, while there are 253 in Sicily. Within this group, marine species number 120, fresh water species 97 and terrestrial species 902. Italy ranks fourth among the European countries for the number of the alien species reported.

Based on the data currently available on terrestrial fauna, and especially Nematodes, Gastropod Molluscs, Arthropods and Vertebrates, it is estimated that there are currently 450 alien or non-indigenous species present in Italy, having been introduced intentionally or accidentally, with the majority belonging to the Insect class. Of the phytophagous Insects of interest to agrarian and forestry activities, at least 115 species have been introduced through trade, and roughly 80% have become acclimated. There are fewer alien terrestrial species among the Vertebrates (36 species), but they have an equally significant impact on the autochthonous biocenosis, often with noteworthy economic consequences as well, as in the case of the nutria. In inland Italian waters, at least 29 species of fish have been introduced, with no fewer than 12 becoming acclimated<sup>17</sup>. As far as the marine environment is concerned, at least 79 alien species of Invertebrates and 18 alien species of Fishes have been reported in Italian territorial waters, favoured in part by climate changes which, with the warming of the waters, can facilitate the naturalisation of outside Fish species with an elevated affinity for the warm waters of the Mediterranean Basin. At least 20 species of Molluscs living along Italian coasts are allochthonous, with some being cultivated in lagoon environments on account of their excellent commercial value (the Philippine clam, or *Tapes philippinarum*).

<sup>16</sup> [www.europe-aliens.org](http://www.europe-aliens.org)

<sup>17</sup> *Condannati all'estinzione? Biodiversità, biologia, minacce e strategie di conservazione dei Pesci d'acqua dolce indigeni in Italia*, Zerunian, 2002.



As far as flora are concerned, the increasingly massive entry of exotic plant species from distant countries, often due to human activities, is causing “floristic pollution”. A recent census in Italy recorded 782 naturalised exotic species<sup>18</sup> that manage to survive and successfully reproduce, to the point where they currently account for 10.4% of our flora (Figure 2.5). This process, still studied and known only in part, is taking on sizeable proportions in Italy, considering that roughly 30 years ago 527 exotic species that had managed to become a stable part of Italian flora were registered<sup>19</sup>. At the same time, however, the Mediterranean plant communities have shown themselves to be more resistant to invasions of alien species than those of Central Europe or the New World, and especially the communities of Australia, New Zealand and the Oceania Islands. In our country, the great majority of exotic plant species remain confined in agricultural areas and in environments attuned to human activity (along transportation routes, in population centres, in industrial areas etc.), while it is rare that they pose serious threats to the diversity of natural habitats. Only a small number of alien species (such as *Robinia pseudoacacia*, *Prunus serotina*) manage to spread in natural environments, showing a preference for invading lowlands, wetlands and coastal habitats.

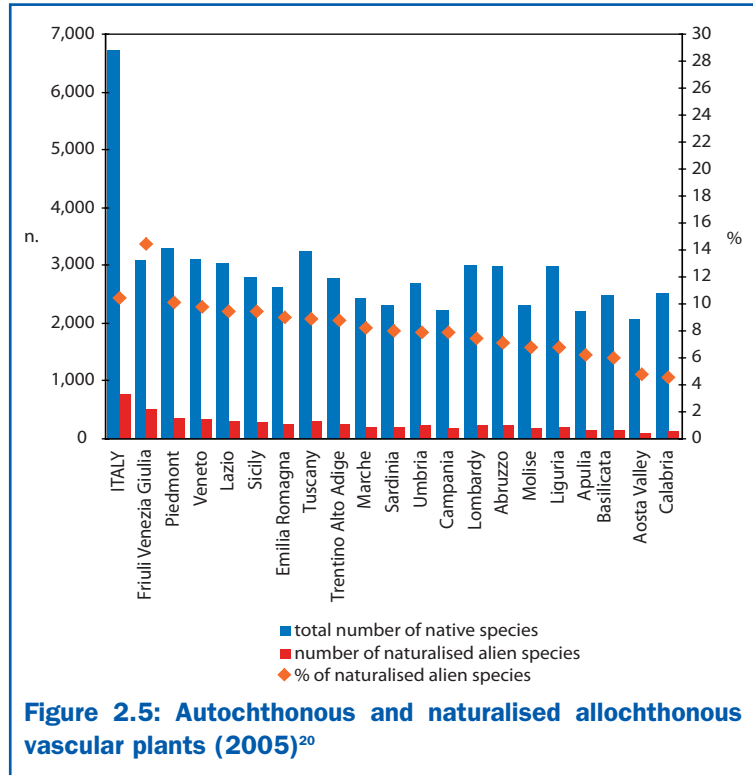
*A recent census in Italy recorded 782 naturalised exotic vegetal species that managed to survive and reproduce themselves with success; for the most part, however, these species remain confined to agricultural environments and those heavily influenced by man, only rarely posing serious threats to natural habitats.*

<sup>18</sup> *An Annotated Checklist of the Italian Vascular Flora*, Conti *et al.*, 2005.

<sup>19</sup> *Flora esotica d'Italia*, Viegi *et al.*, 1974.



*In Italy the naturalised exotic plant species represent 10.4% of our flora. A recent census recorded no fewer than 782 species capable of surviving and successfully reproducing; however, these remain confined within agricultural areas and environments heavily influenced by man, rarely becoming serious threats to the diversity of natural habitats.*



**Figure 2.5: Autochthonous and naturalised allochthonous vascular plants (2005)<sup>20</sup>**

*Climate changes underway interfere with the physiology, phenology and distribution of species.*

Mention should be made of the indirect effects of actions of human origin, and especially those traceable to climate changes, already referred to and noted in numerous studies and reports. The climate changes underway interfere with the physiology of the species (for example, photosynthesis, respiration, the growth of plants, efficient use of water, composition of tissues, metabolism and decomposition), as well as their phenology (events in the life cycle that occur in advance or after a delay) and distribution (as in the case of shifting towards the poles and

<sup>20</sup> Source: ISPRA processing of data taken from Conti, Abbate, Alessandrini, Blasi, 2005 - *An Annotated Checklist of the Italian Vascular Flora*. Ministry of the Environment, Department of Nature Protection; Department of Vegetable Biology, University of Rome, "La Sapienza" Campus





higher altitudes), and thus their adaptation *in situ*. All these factors can result in modifications in the interactions between species (in terms of competition, predatory actions, infection from parasites, mutualism etc.), causing a further shifting in distribution and ultimately, in certain cases, arriving at extinction. In the final analysis, there can be modifications in the structures and compositions of communities, with a gradual impoverishment of certain communities and a related increase in opportunistic species.

Construction and infrastructure works are also a major cause of loss of biodiversity, when they result in the fragmentation, alteration and destruction of habitats, in addition to rendering terrain impermeable and causing acoustical disturbances and damage to fauna and flora.

There is controversy over the role of activities tied to agriculture as causes of impact on the natural heritage. On the one hand, agricultural areas are subject to the negative impacts of other activities and other spheres of production, given that they frequently are affected by urbanisation, illicit dumping of waste and industrial pollution. At the same time, agricultural activities themselves are frequently identified as one of the main causes of water pollution, loss of stability of terrains and soil pollution, as well as of increases in the greenhouse effect, loss of biodiversity and simplification of the landscape.

In Italy, the available data and information show that the single largest environmental impacts directly traceable to agriculture are tied to the use of fertilisers and plant care products. The resulting pollution and deterioration of the soil, as well as surface and underground waters, can have repercussions on human health and on flora and fauna, plus the ecosystems to which they belong. On the subject of fertilisers, it should be noted that the quantity placed on the market in Italy, after a slow but continuous decrease that began in the 70's, returned to an upward trend in the period 1998-2007 (Figure 2.6), registering growth of 22.1% (ISTAT, 2007). The national figure for the year 2007 exceeded 5.4 million tons, with more than 3 million tons consisting of mineral fertiliser, of which the most widely used type are those based on nitrogen.

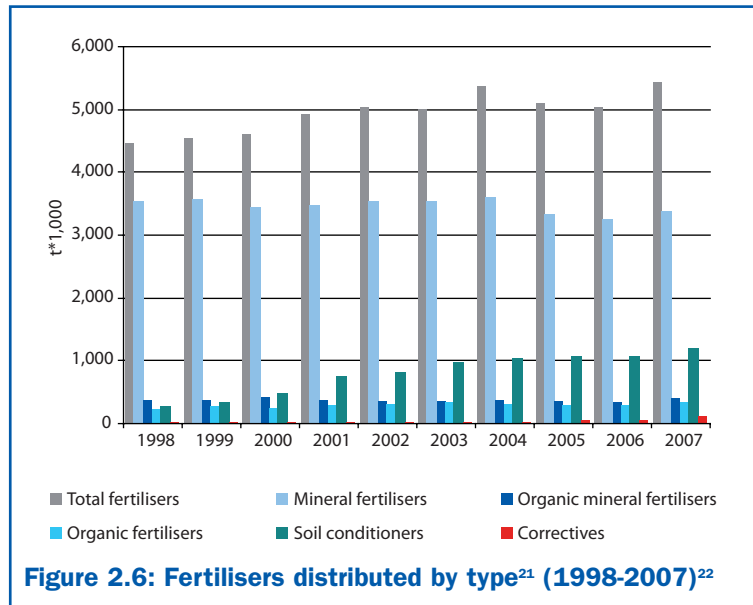
*Construction and infrastructure works are another cause of loss of biodiversity.*

*Agricultural areas are subject to the negative impact of other economic activities, while, at the same time, they can cause pollution and loss of biodiversity.*

*During the years 1998-2007, there was an increase of 22.1% in the quantity of fertilisers placed on the market.*



The most noteworthy environmental impacts traceable to agriculture are tied to the use of fertilisers. In Italy, following a slow but continuous decrease in the quantities of fertilisers placed on the market, a trend that began in the 70's, growth resumed in the period 1998-2007, with an increase of 22.1%.



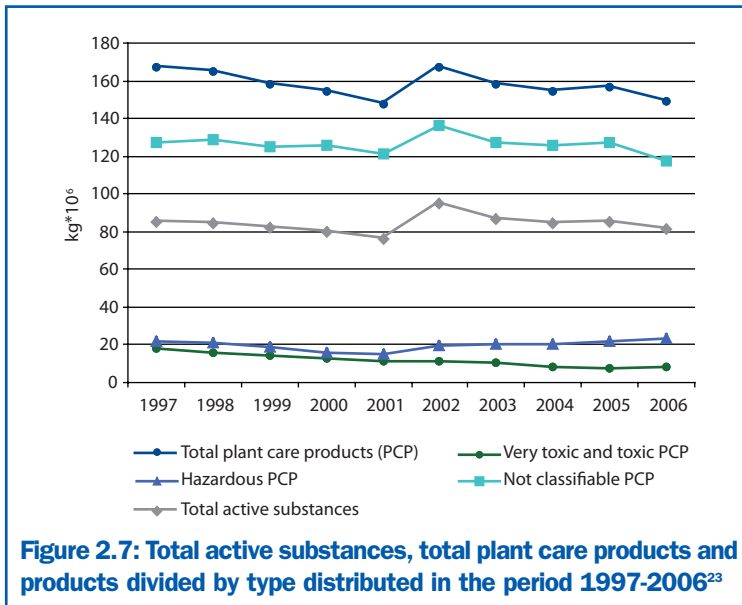
**Figure 2.6: Fertilisers distributed by type<sup>21</sup> (1998-2007)<sup>22</sup>**

The quantities of plant care products placed on the market during the period 1997-2006 shrank by 10.8%.

As far as plant care products are concerned, the quantities placed on the market in the period 1997-2006 shrank by 10.8% (Figure 2.7). In 2006 more than 149,000 tons were sold (for an increase of approximately 7,000 tons over 2005), with 78.8% of the total consisting of “unclassifiable” products, and the remaining 21.2% include those products classified high toxic, toxic and harmful, which, being the most dangerous from a toxicological, eco-toxicological and chemical-physical point of view, are subject to special restrictions in terms of their sale and preservation. Compared to 2005, there was a worrisome increase in the level of very toxic and toxic products (over 1,100 tons more) and an increase in harmful products (approximately 1,300 tons). For the first time since 1999 the quantity of biological products used as alternatives to products made through chemical synthesis fell from 425 tons in 2005 to 344 tons.

<sup>21</sup> Since 2006 these categories of fertilisers have also been recorded: a) crop substrates; b) products exercising specific action. They are not shown in figure 2.6, however, because of the small quantities involved.

<sup>22</sup> Source: ISTAT



**Figure 2.7: Total active substances, total plant care products and products divided by type distributed in the period 1997-2006<sup>23</sup>**

The main environmental impacts traceable to agriculture are tied to the use of plant care products. In the period 1997-2006, the distribution of plant care products registered a decrease of 10.8%. In 2006 more than 149,000 tons were sold, for a decrease of approximately 7,500 tons compared to 2005, though quantity of the most hazardous products (very toxic, toxic and harmful) rose by more than 2,400 tons.

The agricultural areas of noteworthy naturalistic value referred to earlier on can be threatened by two contrasting situations: either the intensification of farming or the abandonment of extensive cultivation. Intensification occurs when the natural and economic conditions make it possible to increase the productivity and efficiency of agricultural activities. The abandonment of agricultural zones, on the other hand, is most frequent in regions with large areas of extensive agriculture, where productivity is fairly low and income reduced, with the difficult working conditions and the shortage of services making agriculture relatively unattractive, especially for the new generations of farmers<sup>24</sup>.

Agricultural areas of noteworthy naturalistic value can be threatened by two contrasting scenarios: the intensification or the abandonment of extensive farming.

<sup>23</sup> Source: ISTAT

<sup>24</sup> *Stirbt der ländliche Raum? Zur Demographie ländlicher gebiete in Europa: Zahlen, Fakten, Schlussfolgerungen*, Heilig, 2002; *Demography of Europe - the extinction of the countryside?*, Heilig, 2002.



*Italy has endorsed numerous conventions and international agreements geared towards safeguarding biodiversity.*

*In Italy, the Nature Network 2000 currently consists of 594 SPAs, with a surface area of 4,374,568 hectares, equal to 14.5% of the national territory, plus 2,284 SCIs, with a surface area of 4,511,322 hectares, equal to 15% of the national territory.*

## **The main initiatives for protection**

As already noted, the preservation of biodiversity often conflicts with the needs of man. Efforts to reconcile its defence as best as possible with the demands of society frequently result in agreements and legislative instruments, key elements that prove indispensable when it comes to combining the need for conservation with economic, social and cultural concerns, as well as those of local populations. Italy has endorsed numerous conventions and international agreements designed to safeguard biodiversity. Especially worthy of note, given its strategic importance on a global scale, is the Convention on Biological Diversity<sup>25</sup>, signed in Rio de Janeiro on 5 June 1992 during the United Nations World Summit on the Environment and Development<sup>26</sup>. The CBD sets three specific objectives: 1) the preservation *in situ* and *ex situ* of biological diversity; 2) the sustainable use of the components of biological diversity; 3) an equitable distribution of the benefits produced by the use of genetic resources.

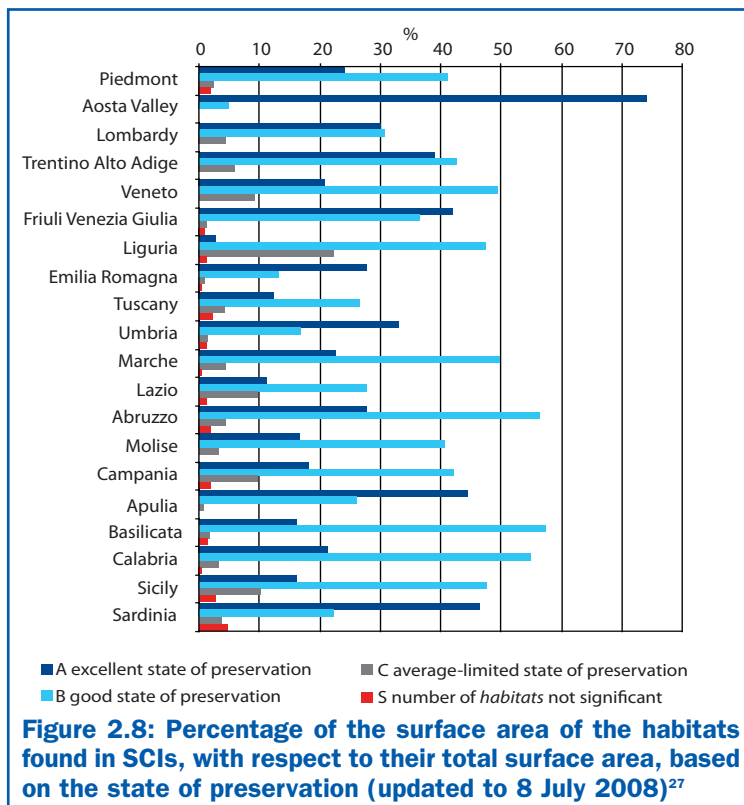
On the European level, the EU has issued two key Directives for the preservation of biodiversity: the Bird Directive (79/409/EEC) on the protection of wild birds and the Habitat Directive (92/43/EEC) on the preservation of the natural and semi-natural habitats of wild flora and fauna. The specific objectives of the Habitat Directive include the creation of a cohesive European ecological network entitled Nature 2000 and consisting of Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), with these last being determined in accordance with the provisions of the Bird Directive. The Bird Directive was transposed into national legislation with Law 157 of 11 February 1992, while the list of Italy's SPAs was published as part of a Ministerial Decree issued on 25 March 2005. The Habitat Directive was fully transposed into Italian law under Presidential Decree no. 120 of 12 March 2003. Later the lists of the Sites of Community Importance (SCIs) were published for the Alpine Bio-geographic region (Ministerial Decree of 25 March 2004), for the Continental region (Ministerial Decree of 25 March 2005) and for the Mediterranean region (Ministerial Decree of 5 July 2007). At present, Italy's Nature Network 2000 consists of 594 SPAs, with a surface area of 4,374,568 hectares, equal to 14.5% of the national territory, and of 2,284 SCIs, with a surface area of

<sup>25</sup> Convention on Biological Diversity - CBD.

<sup>26</sup> United Nations Conference on Environment and Development - UNCED.



4,511,322 hectares, equal to 15% of the national territory (*Database of the Nature Network 2000*, Ministry of the Environment, Land and Sea, 2008). All the habitats indicated in the Directive and exclusive to Italy - meaning that the country bears a particular responsibility for their wellbeing - are placed in at least one SCI, while the overall surface area of these habitats accounts for 71.3% of the total surface area of Italy's SCIs. The state of preservation, in terms of structure, functional performance and possibility for restoration, of all the habitats indicated in the Directive and placed inside the SCIs, is rated as good to excellent in approximately 64% of the cases (Ministry of the Environment, Land and Sea data 2008 processed by ISPRA) (Figure 2.8).



*At present Italy contains 2,284 Sites of Community Importance (SCIs), with a surface area equal to 15% of the national territory. The state of preservation, in terms of the structure, functional performance and possibility for reclamation, of all the habitats indicated in the Directive and found inside the SCIs is rated good or excellent in 64% of the cases.*

<sup>27</sup> Source: Ministry of the Environment, Land and Sea data processed by ISPRA



*In Italy the protected areas established cover almost 3 million hectares of terrestrial areas (9.7% of the national territory), plus a slightly smaller surface area of marine zones, equal to 30% of national coastal waters.*

*In Italy, a number of "Action Plans" for threatened species of fauna have been drawn up, together with "Guidelines" for limiting species that damage native fauna and natural habitats.*

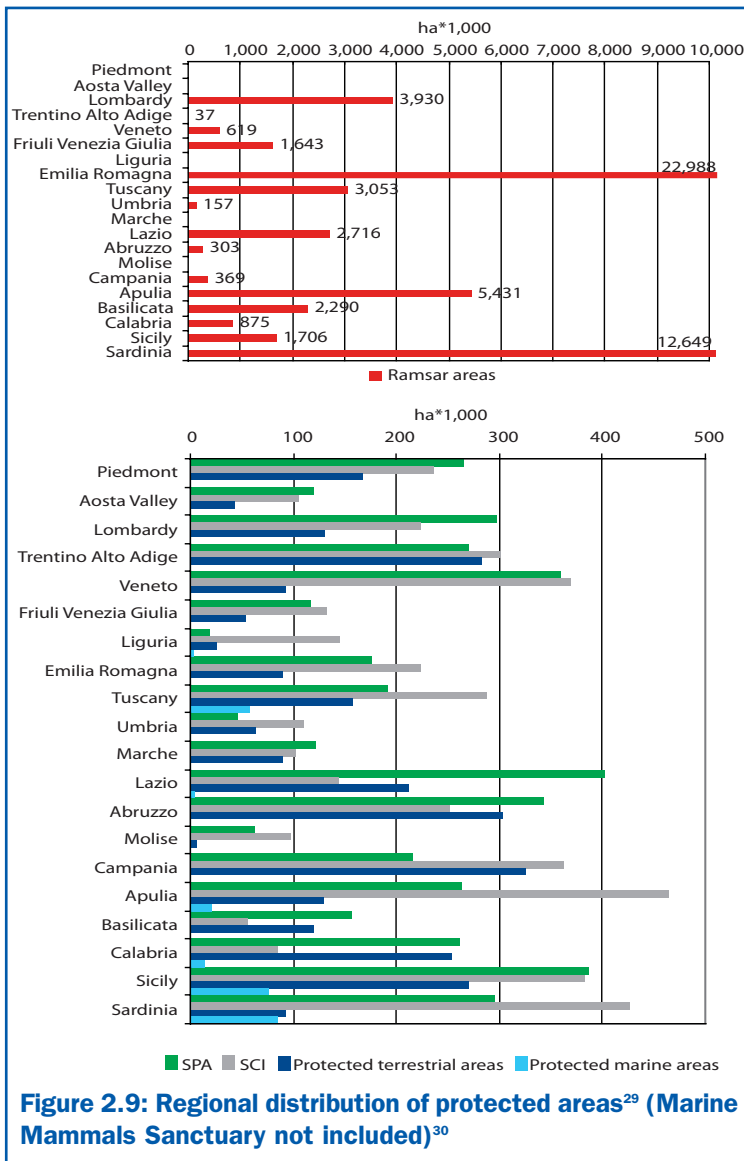
Another fundamental reference for the conservation of biodiversity in Italy is Framework Law no. 394 of 6 December 1991 on protected areas, an act that "lays down the underlying principles for the establishment and management of natural protected areas, in order to guarantee and promote, in a coordinated manner, the preservation and optimal use of the country's natural heritage". Accompanying the law are a series of measures meant to protect fauna and flora, regulate hunting, establish natural marine reserves, protect marine species and regulate fishing, in addition to safeguarding forest resources. Taken as a whole, the legislation approved has made it possible to carry out a number of different initiatives that attempt to safeguard and improve the conditions of our natural heritage. First of all, mention should be made of the 772 protected areas established, equal to almost 3 million hectares of terrestrial areas (9.7% of the national territory), plus a slightly smaller surface area in terms of marine zones<sup>28</sup>. Furthermore, thanks to Italy's endorsement of the Ramsar (Iran) Convention of 1971 on wetlands of international importance, 51 sites of major ecological importance, covering a total surface area of approximately 58,800 hectares, are protected.

Figure 2.9 shows the regional distribution of the protected areas, according to the provisions of the legislative instruments illustrated earlier.

In compliance with the international conventions on the protection of biodiversity, as well as the European Community Directives on birds and habitats, plus national laws on protected areas and the preservation of fauna, a number of different "Action Plans" have been implemented for threatened species of fauna, while "Guidelines" have been drawn up to limit species that damage native fauna and natural habitats. The Action Plans and Guidelines were drafted by the former National Institute for Wild Fauna (currently the ISPRA), on assignment from the Ministry of the Environment, Land and Sea (Nature Protection Department). Leading experts on each species, recommended by the main research institutes, the Italian Zoological Union and non-governmental associations, took part in the project as well.

As regards fishing, it should be noted that the reform of the CFP,

<sup>28</sup> V EUAP, Ministry of the Environment, Land and Sea, 2003.



The natural heritage is currently protected as follows: 14.5% of the surface area of Italian territory holds SPAs, 15% holds SCIs (all approved by the European Commission) and 9.7% contains protected terrestrial areas, plus a slightly smaller surface area consisting of marine zones, equal to 30% of the national coastal waters. In addition, 51 Ramsar sites are protected.

<sup>29</sup> Source: for protected land and sea areas: the Ministry of the Environment, Land and Sea, see the Official List of Protected Nature Areas 2003; for the Ramsar Areas: the Ministry of the Environment, Land and Sea, 2008; for the SCIs and the SPAs: ISPRA processing of data from the Ministry of the Environment, Land and Sea (updated to 8 July 2008)

<sup>30</sup> The surface area of the SCI and SPA found in the Gran Paradiso National Park, a portion of which lies inside the Aosta Valley Region and a portion in Piedmont, was distributed under a criterion that attributed the majority of the areas to Aosta Valley. The SPA surface area of the Gran Sasso-Monti della Laga National Park, which falls within the territories of Abruzzo, Lazio and Marche, was assigned primarily to Abruzzo. The SPA surface area of the Abruzzo National Park, portions of which are found in Abruzzo, Lazio and Molise, was attributed primarily to Abruzzo



*Of note among the priority objectives of Community Policy is the sustainable use of fishing resources, through strategies that include periods of biological rest, the use of selective systems and the reduction of the level of fishing operations.*

*Many other initiatives, including some undertaken on the regional and local levels, are focussed on the monitoring of the species and habitats, on environmental reclamation and restocking, on the creation of ecological networks, on the implementation of criteria of sustainability in the various production sectors, on the certification of products and on environmental education.*

referred to earlier, introduced a series of modifications meant to protect fish stocks and preserve the marine environment. Of the priority objectives, mention should be made of the sustainable use of fish resources through the implementation of strategies calling for, among other things, biological rest periods, the use of selective systems and the reduction of the level of fishing activities. The main changes in the CFP include a long-term approach that sets objectives for the achievement and/or maintenance of fishing stocks, together with a new policy for reducing the size of fishing fleets, uniform operating principles for systems of control and close involvement of the interested parties in the process of European-Community policy. Another step taken in support of the policy of involving the interested parties has been the formulation by the Ministry of Agricultural, Food and Forestry Policies of the Operational Program for Fishing FEP 2007/2013. The objective of reducing the level of fishing operations is reached both by reducing the size of the fishing fleet and by placing limits on catches (Total Admissible Catch - TAC). The year 2008 also saw the introduction of two new European Community regulations meant to address to very important issues: efforts of prevention and dissuasion against illegal, undeclared and unregulated fishing (INN fishing) (Reg. 1005/2008 EC), plus the regulation of fishing by Community boats outside of Community waters and of the entry of the boats of non-EU countries into Community waters (Reg. 1006/2008 EC), all for the purpose of pursuing the objective of sustainable fishing while and extending its territorial scope.

Many other initiatives, some of them taken on the regional or local levels, focus on the study and monitoring of species and their habitats, as well as efforts of environmental restoration and restocking, plus the creation of ecological networks, the introduction of criteria of sustainability in the various production sectors, product certification and environmental education. Many of these efforts are directly or indirectly controlled by the series of programs carried out on the local or national levels by public or private bodies, as well as by universities and other organisations. Monitoring plays an important role in the preservation of biodiversity, and it is approached as monitoring not only of the components of biodiversity, but also of the categories of activities that can prove detrimental





to biodiversity. The Chart of Nature, the monitoring networks of the Agencies System and the reporting activities involving environmental data, such as the ISPRA Environmental Data Yearbook, are direct offshoots of, or are closely tied to, the objectives found under art. 7 of the CBD. Efforts of preservation *in situ* include not only the establishment of protected areas, as illustrated above, but also the identification of areas for the implementation of special measures of conservation. Falling under this objective are the measures of protection contemplated for areas adjoining the protected areas, as well as the various initiatives - noteworthy examples of which can be observed within the national territory - for the establishment of ecological networks, both terrestrial and marine. The Italian Network of Germoplasm Banks for the *ex situ* preservation of wild flora (RIBES) is another major initiative for the preservation of germoplasm, as well as an incentive for studies on the subject (art. 9 of the CBD). As for the objective of the long-term use of biological components (art. 10 of the CBD), it includes initiatives designed to encourage the habitual use of biological resources, in accordance with traditional cultural practices that prove compatible, with one option for their implementation being the involvement of the local populations in the planning of actions for the restoration of biodiversity, together with improved cooperation between government authorities and the private sector. Major steps in this direction are the enactment of the 21 Agendas, plus efforts focussed on participation and access to information, as well as environmental certification and seals of quality for local products, with various examples of the application of such efforts on the local level found throughout the national territory. The Environmental Impact Assessment (EIA), the Strategic Environmental Assessment (SEA) and the assessments of the incidence of plans and projects, as well as surveys meant to gauge environmental damage, are all actions contemplated under art. 14 of the CBD and designed to assess, and therefore minimise, impacts that can prove harmful to biodiversity. Last but not least are the activities of research and training in the environmental sector (art. 12 of the CBD), as well as those of instruction and dissemination to the public (art. 13 of the CBD). In the case of these last programs, the Ministry of the Environment, Land and Sea, together with the Ministry of Educa-



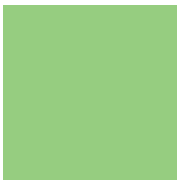
*At present, 745,991 hectares of the national forest area are certified (more than 8% of the total).*

*In the field of nature conservation, the State Forest Corps and the Environmental Defence Division of the Carabinieri Corps play an important role in terms of controls.*

tion, has carried out the program of the INFEA initiative on information, training and environmental education of 1995, a noteworthy effort of coordination meant to channel experiences and isolated initiatives on a local level in such a way that they can contribute to national programs and structures.

Finally, mention should also be made of initiatives involving the certification of forest activities and forest products. Forest certification is defined as a voluntary instrument issued by independent parties for the purpose of reconciling the requirements of sustainable forest management with the demands of the market. Internationally, two alternative systems of forest certification, both used in other European countries as well, can be identified: the PEFC (Programme for Endorsement of Forest Certification Schemes, 1999, promoted by owners of forests and the forest industry) and the FSC (Forest Stewardship Council, 1990, drawn up by environmentalist organisations and operative for a longer period of time). With the first forest certification having been awarded to the Magnificent Community of Fiemme (Province of Trento) in 1997, at present 745,991 hectares of the national forest area has obtained this recognition, meaning more than 8% of the total. In addition to the Alpine regions, which hold the majority of Italy's certified forest areas, numerous zones in the central and southern Apennines have also been certified. A further development of note was the first certification of an Italian cork forest (FSC), in Tempio Pausania (Province of Sassari), in 2005.

In terms of application of the measures described above, a number of different public bodies, on both the central government and the local government levels, carry out activities of oversight. Considering only the specific field of nature conservation, mention can be made of the activities of the State Forest Corps (which, as a result of its controls carried out in 2006, undertook more than 1,300 legal measures regarding violations and/or administrative sanctions, an increase over the 1,211 such measures of 2005, but a decrease of 44% compared to 2004) and the Environmental Defence Division of the Carabinieri Corps (which, based on the controls performed in 2006, enacted 727 legal measures regarding violations and/or administrative sanctions, a sharp decrease compared to both 2005 (-28%) and 2004 (-41%)). The various actions



listed up to this point to safeguard nature and biodiversity can be effectively applied only if they are supported with adequate funding. An examination of the available data, supplied by ISTAT<sup>31</sup>, shows that spending by different government bodies (grouped by COFOG)<sup>32</sup> on the defence of biodiversity and the countryside totalled 4.088 billion euro in 2006. In 2000, total spending on such efforts was 2.864 billion euro, making for growth of approximately 43% during the period and confirming the attention placed in the sector under public policies.

As for relations between agriculture and the environment, it should be noted that, while policies of rural development in the past, on both the national and extra-national levels, were primarily geared towards increasing the productivity of forestry and farming operations, for a number of decades now their priority objective has been efficiency and sustainability. Starting in the 90's, a thoroughgoing change in Community Agricultural Policy (CAP) has occurred, oriented towards supporting farmers in their efforts to take preventive action against risks of environmental deterioration and to play a positive role in the defence of the countryside. Specifically, the reform of the CAP over the middle term (2003) has established a system for the awarding of European-Community subsidies and bonuses that is no longer based on the types of crops grown and the quantities produced, but rather on the exercise of agricultural activities and on the awarding of a "single payment for each enterprise", on the condition that a number of obligatory operating criteria are met in the areas of environmental defence, food security and the wellbeing of animals. The EU also implements measures involving farming and food to support agricultural practices specifically geared towards defending the agricultural environment, biodiversity and the countryside. These modifications, referred as the "greening" of the CAP, are meant to supersede traditional methods of farming, in order to arrive at a production system based on the sustainable use of resources and protection of the environment.

In terms of maintaining or increasing the dimensions of the UAA

*During the period 2001-2006, the various government bodies spent an average of more than 4.0 billion euro on defending biodiversity and the countryside.*

*The reform of Community Agricultural Policy is meant to replace traditional methods of production with an agricultural system based on the sustainable use of resources and protection of the environment.*

<sup>31</sup> Spending of government bodies level-II in the years 2000-2006.

<sup>32</sup> Classification Of Function Of Government: a classification determined internationally by the main national accounting institutes.



*European Community policies on agriculture and the environment call for incentives promoting production activities of low environmental impact. National guidelines promote generational turnover, economic and social development and the reconstitution of farmlands and farming enterprises.*

*In Italy the surface areas involved in, or being converted to, biological agriculture in 2007 were equal to 1,150,253 hectares (+0.18% compared to 2006), representing 9% of the national UAA.*

nationwide, it should be noted that no specific objectives are set under either international or national legislation, though the last two European Action Programs in the field of the environment, as well as the 21 Agenda, set a number of general objectives, such as the sustainable use of the territory, the protection of Nature and biodiversity and the maintenance of the levels of production. These objectives are reiterated in the resulting thematic strategies, in the associated legislative proposals and in the numerous existing legislative measures. Community policies for agriculture and the environment call for incentives promoting production systems featuring low environmental impact, such as integrated and biological agriculture, as well as increased extensive production, safeguarding of habitats of elevated naturalistic value, maintenance of biodiversity and the low-intensity management of pasturelands. Equally important are the national guidelines, geared towards promoting a generational turnover, together with economic and social development of agriculture, in addition to providing incentives for the reconstitution of farmlands and farming enterprises.

Within this framework of measures and facilitations, particular attention is focussed on biological agriculture. This is a method of agricultural production, animal husbandry and industrial processing and transformation of foodstuffs whose purpose is to promote methods for the production of raw materials and foods that respect natural cycles, safeguard biodiversity, contribute to the wellbeing of animals and defend the countryside, the fertility of the soil and non-renewable resources. In Italy the surface areas involved in or being converted to biological agriculture in 2007 were equal to 1,150,253 hectares (+0.18% compared to 2006), representing 9% of the national UAA. The majority of the land used for biological farming produces green animal feed from seed crops and grains. The operators involved (producers, transformers and importers) number 50,276 (-1.55% compared 2006), with the largest concentration in Sicily, while Molise is the region showing the largest increase in operators compared to previous years. Sicily, followed by Calabria, is the region with the most producers, while Calabria, followed by Basilicata, has the highest ratio of producers to UAA. Within the EU-25, Italy retains an uncontested lead in terms of both the number of biological enterprises and the amount of land involved.