STATE OF THE ENVIRONMENT REPORT

2005

Sub-report 9:
Biodiversity

Malta Environment & Planning Authority

January 2006

Biodiversity

Key messages

- Many rare and indigenous species are threatened and continue to decline.
- The main threats to Malta's biodiversity are development in rural and marine areas, the introduction of alien (non-native) species that may compete with native biodiversity, and the exploitation of wildlife.
- An enhanced legal framework has been put in place to ensure the protection of ecologically important sites in the Maltese Islands, including marine protected areas. Maltese candidate sites submitted for the EU Natura 2000 network of protected areas now cover approximately 12.5 percent of Malta's land area.
- Effective management of protected areas has begun, with four management plans approved, covering 1.3 percent of Malta's Special Areas of Conservation. However this process needs to be significantly accelerated in order for Malta to reach its target of halting loss of biodiversity by 2010. There is also need for regular monitoring and enforcement, as well as communication, education and public awareness programmes.

The Maltese people share their Islands and the surrounding seas with thousands of different species of animals, plants, bacteria and fungi. The number and variety of organisms and species and the complex ecosystems they form part of, in other words, biodiversity, safeguards the functioning of ecosystems and the benefits derived from them, such as the provision of food and water, recreational and cultural benefits, and nutrient recycling. Species interact with one another and with their environment in a dynamic equilibrium. The Maltese natural environment includes varied habitats such as cliffs (*rdum*), valleys (*widien*), garrigue (*xagħri*), sand dunes (*għaram tar-ramel*) and coastal waters. Malta's natural heritage is particularly rich; its isolated yet central position in the Mediterranean has given it a relatively large number of unique species that have affinities with those of the Northern, Southern Eastern and Western Mediterranean.

However, certain human activities, often arising out of prosperous lifestyles coupled with the high population density, threaten this delicate web of life, so that **many rare and indigenous species, including endemic species, are threatened and continue to decline**. These threats are mainly related to Malta's relatively large built-up land area, which has limited natural land cover to only 22 percent[242] and significantly reduced the extent of many habitats and species, and to the waste we generate, which natural ecosystems struggle to process. Polluting chemicals in the air, waters and soil are not only a threat to human health; plants and animals are also negatively affected by pollution, and

[242] See Sub-report 5 on land.

find it hard to adapt to changing environmental conditions. This has direct economic relevance for agricultural productivity, [243] fisheries and tourism; all sectors of strategic importance.

Malta's key target in the area of biodiversity, which originates in the 6th EU Environment Action Programme,[244] is simple and ambitious: to halt the loss of biodiversity by 2010. This EU target takes forward at a European scale the international Convention on Biological Diversity[245] target to significantly reduce the current rate of biodiversity loss by 2010.

9.1 Malta's Biodiversity

Malta has a rich biodiversity, consisting of a number of different communities of native plants and animals. Each community type has its own peculiar characteristics, which are the result of complex interactions between the various species that make it up, together with a variety of non-biological factors such as soil type, exposure to wind and water currents, insolation, slope, and type of bedrock.[246] Indeed, many species give a clear indication of the ecological conditions of where they occur.

From the point of view of vegetation, Malta's most characteristic community is the so-called sclerophyll series, which is a dynamic system consisting of four main vegetation types of which the highest expression is the evergreen wood (*bosk*) dominated by trees such as Evergreen Oak (*Quercus ilex; Balluţ*) and Aleppo Pine (*Pinus halepensis; Żnuber*).

This particular community has practically disappeared from Malta and is only represented by forest remnants such as at Wardija and Imġiebaħ where very old oaks still exist. The second stage of the series is the maquis (*makkja*) which is dominated by a variety of small trees and large shrubs such as the Olive (*Olea europaea; Żebbuġ*), the Carob (*Ceratonia siliqua; Ħarrub*), the Lentisk (*Pistacia lentiscus; Deru*) and several others. A particularly interesting maquis is that dominated by the Arar Tree (*Tetraclinis articulata; Għargħar*) which is Malta's National tree, now very rare, but which probably covered considerable tracts of land some hundreds of years ago. The maquis also includes a rich undergrowth of large herbs and lianas.[247] Most of the maquis includes trees that were introduced in antiquity because of their usefulness. The third stage of the sclerophyll series is

243 See Sub-report 2 on air pollution.
244 COM(2001) 31 final
245 This Convention has been incorporated into Maltese law under LN 160 of 2002, under the Environment Protection Act (Act XX of 2001). See also EU Council Decision 93/626/EEC.
246 This review is based on Lanfranco 2005.
247 Lianas are woody climbing vines.

the garrigue (or garigue) which is the most characteristic of the Maltese natural communities. This typically thrives on coralline limestone plateaux and slopes and is dominated by a variety of low small-leaved shrubs such as the Mediterranean Thyme (*Thymbra capitata; Sagħtar*), Mediterranean Heath (*Erica multiflora; Erika*) and the endemic Maltese Spurge (*Tengħud tax-Xagħri*). There are various types of garrigue that may be dominated by one or other species. Particularly noteworthy is the garrigue dominated by Tree Spurge (*Euphorbia dendroides; Tengħud tas-Siġra*) which occurs on sloping rocks such as valley sides. The garrigue also harbours a very rich diversity of herbaceous plants of which the numerous orchids and irises are noteworthy. The garrigues are home to about 500 species of flowering plants which is over half the total number of indigenous species in the Maltese Islands. The fourth stage is represented by the steppes which typically lack woody species but which nevertheless support a very high species diversity. It should be noted that these four stages of the sclerophyll series community form a dynamic system and each stage can change into another depending on the factors affecting the habitat. Thus, much abandoned agricultural land has become transformed into maquis.

In addition to the sclerophyll series, there are several other vegetational communities of which the most noteworthy are the coastal cliffs. Cliff communities are particularly important because they support most of the Maltese endemic and sub-endemic species including such important species as the Maltese Cliff Orache (*Cremnophyton lanfrancoi; Bjanka tal-Irdum*), the Maltese Centaury (*Cheirolophus crassifolius; Widnet il-Baħar*), which is Malta's National plant, the Maltese Salt-tree (*Darniella melitensis; Xebb*), the Maltese Everlasting (*Helichrysum melitense; Sempreviva ta' Għawdex*) and various others, most of which are protected. Other habitats include a variety of freshwater and saline wetlands, all of which are highly vulnerable, as well as a variety of coastal habitats of which coastal dunes are particularly endangered and from which several species have already been lost in the last quarter of a century. There are also a variety of important marine habitats such as seagrass meadows, which are further discussed below, and habitats based on coralline red algae, which often form substantial bioconstructions that support a variety of other biota.

Within the Maltese natural communities, endemic species are of great cultural and scientific importance, not only because of their unique nature, but also because they are a valuable part of the national heritage and have the potential to shed light upon the evolutionary processes that led to their uniqueness and isolation. The number of endemic species known to exist in Malta has been increasing since the 1980s, following growing interest in the nature protection field. Since the 2002

State of the Environment Report, a few species have been added to the list, the most interesting being the Maltese Horned Pondweed (*Zannichellia melitensis; Ħarira ta' l-Ilma*),[248] which is a rare and vulnerable species confined to rock-pools in Maltese coralline limestone garrigue and rocky steppes, and which has been reported from Malta, Gozo and one single rock-pool on Comino. A few other species are promising and are currently being studied. All Maltese endemic species, with a few exceptions, were given legal protection in 2003.[249] Nevertheless, many species remained threatened; some are dramatically close to extinction, such as the Yellow Spider Orchid (*Ophrys lacaitae; Brimba Safra*), of which one single individual is left, whilst some other species are poorly known, such as the endemic Maltese Top-Shell (*Gibbula nivosa*; *Gibbula ta' Malta*), whose habitat and feeding grounds have not yet been clearly identified.

9.2 Biodiversity Status and Trends

It is not easy to assess the status of Malta's natural heritage, and to establish trends over time; while the threats to natural heritage are clear (see section 9.3), the richness of nature in itself makes it difficult to assess the health of each individual species. This problem is compounded by only partial information about the past status of important species and habitats, which would have allowed trends to be established. Nevertheless, in order to provide a picture of the status of Malta's biodiversity, it is possible to consider trends in the status of particular species, or selected groups of species, or else particular habitats. The reasoning here, which is advocated by the international Convention on Biological Diversity, is that if the whole is healthy, then the individual parts should be less threatened. This approach is taken below. In what follows, the status of selected groups of species, and an important threatened habitat, that of *Posidonia* sea grass meadows, is reviewed. Table 9.1 provides a qualitative review of the status of selected groups of species, while Boxes 9.1-9.3 provide examples of the status of a particular species of flowering plant, the Maltese Everlasting, and two groups of species: insects and bats.

Since particular species and groups of species live within ecosystems, which provide a physical setting in which animals, plants and other species live and have specific roles, it is also useful to assess the status of the various habitats. While extensive information on the current status of Malta's habitats is not available, to give some indication of this, the status of one typical but threatened habitat, *Posidonia* sea grass meadows, is considered in Box 9.4. This review of the status of selected groups of species, and a selected habitat, indicate a varied picture that

[248] Brullo *et al.* 2001.
[249] By means of LN 257 of 2003.

points to the need for stemming habitat loss, for better information to support policy and for more enforcement of existing legislation.

Plants: A significant reduction in species diversity has been observed since the early 1980s, particularly in sand dunes, freshwater wetlands and saline marshlands. Some species are possibly extinct while others vulnerable or endangered, mainly as a result of habitat loss or modification. On the other hand, an increase in species diversity is being observed in disturbed habitats due to the introduction of alien species, which may be causing a decline in the populations of native flora, some of which are endemic (see Box 9.1 for status of the endemic Maltese Everlasting).
Fungi: Many species are confined to a few areas, particularly forest remnants and selected garrigue sites, of which a good number are protected. Nevertheless, the increase in human disturbance in a number of areas has led to a possible decline in mycoflora (moulds). However limited population assessments have been carried out on these species.
Invertebrates: Detailed information is available on several groups, both from the terrestrial and aquatic aspect. Studies of a few well-known groups (such as butterflies) indicate a general decline (see Box 9.2). Molluscs are also declining in particular habitats, especially in the case of water-associated species. In addition some endemic species are threatened due to human-associated disturbance and development.
Fish: Mediterranean dolphin fish stocks appear unaffected by fishing pressures so far. Stocks of tuna and swordfish are however apparently diminishing. Large pelagic species account for over 60 percent of annual value of landings – these are heavily dependent on international management efforts. Fishing activities or effort distribution in the 25 mile Fisheries Management Zone should not be increased, in order to ensure their sustainability and safeguard fish "refugia".
Amphibians and Reptiles: Populations overall appear to be stable, although many species are still vulnerable and/or subject to illegal exploitation. Although no detailed assessments have been carried out, the endemic wall lizards populations are apparently stable, with the possible exception of that confined to Selmunett. Some snake populations appear to be increasing, although there are very limited scientific studies. The status of marine turtles needs assessment, although a number of turtles that have been accidentally captured or injured are now being rehabilitated and released.
Mammals: Variable trends and information are available. Bats are generally declining (see case study in Box 9.3). The Algerian hedgehog seems to be stable, although the impact of vehicles needs a more detailed assessment. Rats (*Rattus* spp.; *Firien*) are increasing, particularly in urban areas, disturbed habitats and smaller islands, to the detriment of the native flora and fauna of conservation value. Wild rabbit populations are increasing in some areas, particularly on Comino island, where its increase and the lack of prey species is negatively affecting the regeneration of native plants and animals. The status of marine mammals is not known, and limited information is available.
Birds: 33 bird species breed in Malta, of which some 20 retain constant numbers. Recent increases in breeding pairs for the Tree Sparrow are noted, while Corn Bunting numbers continue to decrease drastically. The Spectacled Warbler is still breeding in very low numbers but seems to be spreading slowly in Gozo. Most breeding is taking place in protected areas (such as Buskett and the Simar bird sanctuary), where Moorhens, Little Ringed Plovers and Reed Warblers increased recently. Reed Warbler breeding records increased from 1 (at Salina) in 1995 to 8 (at Simar) in 2004.

Sources: Bertrand et al*. 2000, Camilleri 2002, Camilleri 2005, Coleiro 2002, Coleiro 2003, MEPA Nature Protection Unit 2005a, MaLiRa Group 2004, Malta Centre for Fisheries Science, M. Gauci/ Birdlife Malta, Mosteiro and Camilleri 2005.*

Table 9.1 Status of selected groups of species

Box 9.1 Status of the endemic Maltese Everlasting

The Maltese Everlasting (*Helichrysum melitense; Sempreviva ta' Għawdex*) is endemic[250] to the Maltese Islands and is a very rare endangered species with a considerably restricted distribution of less than 25 km². This ornamental shrub with dense whitish succulent foliage and an aromatic curry-like smell, growing on seaside coralline limestone cliffs and screes is now found only on the island of Gozo (on Fungus Rock Nature Reserve and the western cliffs in the limits of Dwejra), where it is however very patchily distributed. It seems to have disappeared from the southwest of Malta and east Gozo, where it was previously recorded. Its present localised distribution, its eradication from other sites, and its occurrence in areas where urbanisation is increasing, renders this species endangered and on the decrease. Indeed it is considered amongst the rarest of the recognised Maltese endemic plant species. Furthermore, it does not seem to be reproducing at a fast rate. This species has been legally protected since 1993,[251] and its more recent protection under LN 257 of 2003 focuses on the need to conserve and manage its habitats, so that it is illegal to deliberately pick, collect, cut, uproot, destroy or damage, keep, transport, sell or exchange by any method, and import or export in any way any specimen of this species. MEPA is drafting an action plan for conserving this species and has co-financed a study on in-vitro propagation. Moreover, the western cliffs of Gozo, which are the most important location where the Maltese Everlasting grows, have also been protected,[252] and Malta has obtained EU funding for the formulation and implementation of a management plan for the area. The main threats to the Maltese Everlasting species are vandalism, habitat modification, unmanaged tourism, trampling and the introduction of alien species.

Photo: S. Brullo, University of Catania

Source: Stevens and Lanfranco 2005

Box 9.2 Status of Insects

There has been an increase in the number of threatened insects, including a substantial increase in the number of extinct and endangered species from 1989 to date. It is estimated that about 20,000 different insect species inhabit our islands, however currently available data covers less than 20 percent of these. On the basis of existing data it is expected that over 10 percent of the insect species recorded to date are threatened, doubling the estimate of the 1989 Red Data Book (RDB).[253] Mifsud (forthcoming) indicates that a significant number of new records for Malta and some even new to science have been made during recent years. Insect species that are protected in the Habitats Directive and found in the Islands include the beetle, *Pseudoseriscius cameroni*, and the sand cricket, *Brachytrupes megacephalus*. The former is an endangered endemic species known to be exclusively found in coastal sand dunes, and is now confined to the sand dunes at Ramla in Gozo. The sand cricket, *Brachytrupes megacephalus,* is critically endangered, locally restricted to sandy chiefly because it is Conservation measures coastal localities. aid in decreasing, or are required in order to even eliminating, the rate at which insect species are being threatened locally. This study stresses that many insect species are threatened because the habitat in which they live is threatened, highlighting the need for practical solutions to conservation challenges. For example, protection regimes are required for particular habitat types such as the beds of dead sea grass, *Posidonia oceanica,* on beaches, dead wood, water habitats and sand dunes.

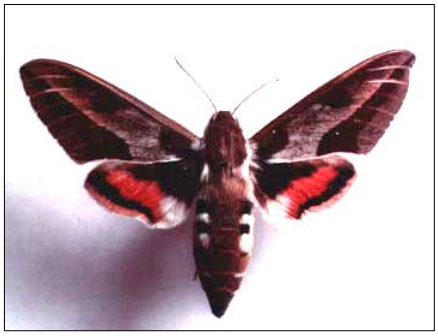


Photo: *Hyles sammuti*, a recently described endemic hawk-moth that is locally frequent (photo by D. Mifsud).

Source: Mifsud (forthcoming)

250 Found only in the Maltese Islands.
251 LN 49 of 1993.
252 LN 257 of 2003.
253 Schembri and Sultana 1989.

Box 9.3 Status of Bats

Bats are the only group of mammals capable of flight, with wings formed from skin stretched over the elongated bones of the hand. Most Maltese bats feed on flying insects, usually foraging for food at dawn and/or dusk. Data collected so far has allowed the monitoring of bat populations in the Maltese Islands, and the comparison of the present status of the species with that noted in the RDB taking into account changes to IUCN classifications. Bat populations in the Maltese Islands have dwindled in some cases and most appear to be rare or vulnerable. Unfortunately, at least one species is possibly extinct as a resident bat. Except for the Mediterranean Pipistrelle (*Pipistrellus pygmaeus; Pipistrell*), which is still relatively common and also found in inhabited areas, the status of all other bat species is alarming.

The main threats faced by bat populations are habitat fragmentation and destruction (mostly through development), loss of good feeding grounds, and misuse of pesticides and insecticides. Bats are also sometimes used in target practice by bird-shooters, and bats found in private homes may be killed or excluded from their roosts by home-owners. In addition, bat breeding areas and wintering roosting grounds in rural areas are being subjected to repeated disturbance, leading to abandonment of roosts. This has been the case for Għar il-Friefet, in the Birżebbuġa area. Many bats have deserted the area, and thus many invertebrate species that are directly and indirectly dependent on the bats' guano for their sustenance, including endemic species and species restricted to this cave only, are decreasing in number, and may eventually be lost.

In 2002 MEPA began to identify the important bat sites of the Maltese Islands, with the aim of further increasing the level of protection afforded to bats. Known bat sites and roosts are currently being assessed in order to determine the appropriate way forward for management and protection, and a number of important bat sites have already been protected, such as Buskett, Għar Ħasan, Għar ta' l-Inkiżitur at Girgenti, Iċ-Ċittadella and Wied ix-Xaqqa. Moreover, all bats recorded in the Maltese Islands are legally protected. Negative attitudes towards bats are gradually being dispelled by education campaigns and awareness-raising efforts.

Source: MEPA, Borg (forthcoming)

Box 9.4 Status of Posidonia Meadows

Sea-grasses, a group of marine flowering plants that live and reproduce in coastal marine waters all over the world, constitute a very important habitat type for a variety of species and are vital to numerous organisms, both as a breeding ground and as a source of indirect and direct food. Sea grass meadows also act as a barrier against coastal erosion and play an important role in the oxygenation of the seas. Moreover meadows based on *Posidonia oceanica* have reef-like properties and help protect the shore from the force of wave action. In fact very rapid erosion of the shore has taken place when *Posidonia* meadows died as a result of turbidity. These meadows are also important ecosystems in their own right and are home to a wide variety of other flora and fauna, while also providing shelter for young fish and squid. Five species of sea-grasses are reported from the Maltese Islands, of which two are presumably extinct, whilst another is quite rare locally. The most important species in terms of abundance and ecology are neptune grasses, popularly known in Maltese as *Alka* (although they are not algae), *Posidonia oceanica* and *Cymodocea nodosa*.

The neptune grass (*Posidonia oceanica; Alka*), is relatively abundant in the territorial waters of the Maltese Islands. However, despite such abundance, the distribution of this meadow- and reef-forming species had not been fully mapped until 2002, when a survey was commissioned[254] by MEPA to map the important habitats formed by this species and determine its extent and character (health status) in Maltese waters. The survey results indicate that Maltese *Posidonia* meadows were in a good state of health, with the channels between Gozo-Comino and Comino-Malta being very densely covered. It was found that *Posidonia* occupies 3.6 percent of Maltese territorial waters, with a total coverage of 142.56 km^2, which is considerable. *Posidonia oceanica* is a very sensitive species, known to be affected by various kinds of pollution and impacts ranging from turbidity, waste and chemical discharges to anchorage, certain types of fishing, dredging and agricultural run off and coastal development affecting the hydrodynamics and sedimentary regimes. Although some meadows have locally regressed, eroded or have experienced heavy epiphytic loads[255] and reduction in shoot density,[256] the status of this species and its meadows in the Maltese Islands is still overall relatively good and healthy. As a result of this survey, important *Posidonia* meadows have been identified, paving the way for the selection of potential marine protected areas, to be proposed by Malta for inclusion in the EU Natura 2000 Network in the framework of the Habitats Directive, since *Posidonia* beds (*Posidonion oceanicae*) is a priority habitat type listed in Annex I of this directive, which lists natural habitat types of community interest the conservation of which requires the designation of Special Areas of Conservation.

Sources: Lanfranco 2005, G.A.S. s.r.l. 2002, Borg et al *2005, Pergent-Martini* et al *2005*

254 G.A.S. s.r.l. 2002.

255 Epiphytic load is the coverage of epiphytes (organisms growing on submerged vegetation) on *Posidonia* leaves. Such coverage in certain conditions may become excessive, particularly if the meadows are subjected to excess nutrients in the waters, 'suffocating' the same *Posidonia* leaves and prohibiting photosynthesis from occurring.

256 Number of *Posidonia* shoots per unit area.

9.3 Threats to biodiversity

The principal threats to Malta's biodiversity are development in rural and marine areas, the introduction of alien (non-native) species that may compete with native biodiversity, and the exploitation of wildlife.

Land Development

Most land development has an effect on biodiversity, either directly through alteration, fragmentation and loss of natural ecosystems, habitats or species, or indirectly through increased interference with environmental media such as air, soil and water, including noise and light pollution. In terms of the direct development of land, where species exist in very restricted habitats such as sand dunes, wetlands or valley floors, the removal of these habitats directly or through blocking the ecological processes that form them (such as damming of valley beds or building roads through them) will have a direct negative effect on the habitats or species concerned. However species and habitats can also be affected by land development in indirect ways, related to the spillover effects of land development that affect the environmental conditions under which the natural habitats and species exist. For example, in the case of the Maltese Everlasting, the species did not stop growing everywhere except at Dwejra, Gozo, because the other cliff areas were built up, but because of wider and more subtle changes to their environmental conditions.

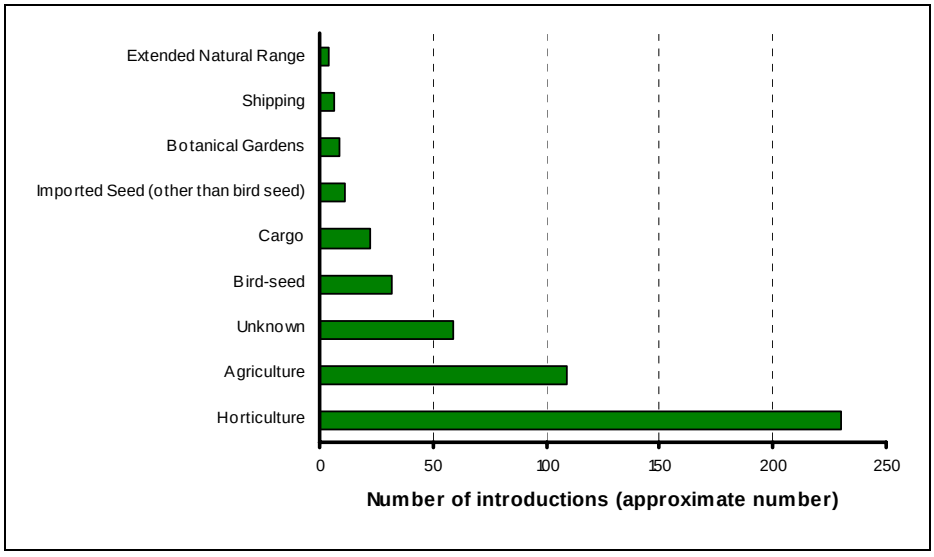
Development has a far greater effect on wildlife when it takes place in rural or marine areas, where natural habitats in which important species live may be removed, weakened or fragmented. Protected areas are designated to ensure the survival of particularly important natural habitats and species, and development in such areas is tightly controlled. Indeed, during 2004, with the exception of the redevelopment of a coastal hotel in the northwest of Malta, the development permitted in such areas related chiefly to agriculture (for example agricultural stores) and is likely to have had a minor effect on biodiversity. In Malta, as in most Mediterranean countries, many of the plants and animals have evolved alongside traditional agricultural practices. From the point of view of nature conservation, therefore, these traditional agricultural practices (such as rubble wall terracing) are important to the maintenance of rural biodiversity. Development related to this type of agriculture would therefore have a positive impact on biodiversity. In some cases development may also be related to conservation goals, such as when interpretation panels are installed or visitor centres established. In 2004, 71 development applications in protected areas were granted permission, with 18 percent of them in the Mellieha locality. Most of the applications (34 percent) were

for agricultural purposes, mainly agricultural stores, reservoirs and pump rooms, followed by additions and alterations to existing buildings (25 percent).

Alien Species and GMOs

The introduction of alien species[257] into the Maltese Islands is a matter of considerable potential concern, since once introduced into the environment they may escape and become established in natural habitats, where they may actively compete with indigenous species. This competition is threatening native species because in most cases alien species have no natural predators. They are also often opportunistic species that tend to outcompete native plants and animals; some alien plants use toxic substances in order to keep other flora away.

Due to the limited size of the Maltese Islands and the number of endemic species present, biological invasions by alien species could have significant negative impacts. Important, rare and vulnerable habitats, such as sand dunes, valleys, salt marshes, maquis, garrigue and cliff communities, as well as marine communities such as sea-grass meadows, could be affected. The threats posed by alien species may be irreversible and could also have economic consequences, for example in the agriculture, fisheries and tourism sectors. However not all introduced alien species cause ecological harm, and some are even beneficial, for example as agricultural crops.



Source: Lanfranco (forthcoming)

Chart 9.1: Mode of introduction of alien flora into the Maltese Islands

257 These are animals, plants or other living organisms that are non-native, i.e. not usually found living in the Maltese Islands, and which do not have an established place in the local ecosystem.

Alien species may be introduced into a country in a number of ways, which may be deliberate (legal or illegal) or accidental (see Chart 9.1 for an analysis of their mode of introduction). In the case of plants, this may take place for example through importation of ornamental plants, agricultural products, or food, as well as via international shipping movements, mainly through discharge of ballast water and organisms on ship hulls. Introduction can also be due to natural causes, although this is rare in Malta, probably due to its isolation. The entry and spread of alien species into the Maltese Islands, as in other countries, has increased recently, principally due to increased trade and travel and higher standards of living. Changes in climate and in land use may also contribute to biological invasions.

In the Maltese Islands 18 percent of the plant species so far identified may be classified as alien.[258] Of these, approximately three percent are possibly native, one percent was introduced more than 500 years ago, while approximately three percent are known to be invasive. Examples of alien flora in the Maltese Islands include: the Cape Sorrel (*Oxalis Pescaprae; Ħaxixa Ngliża*); the Tree of Heaven (*Ailanthus altissima; Xumakk falz|Xumakk*); the Castor Oil Tree (*Ricinus communis; Riċnu|Riċċinuwa*); the Narrow Leaved Aster (*Aster squamatus; Settembrina Selvaġġa|Żagħżigħa*); and the Grape Caulerpa (marine green alga) (*Caulerpa racemosa; Għeneb tal-Baħar*).

Malta is required to address the issue of alien species under a range of international and regional agreements, such as the Convention on Biological Diversity, the Bern Convention,[259] and the EU Wild Birds[260] and Habitats[261] Directives. It is obliged to take measures to ensure that any introduction of a non-native species does not prejudice the native fauna and flora, and therefore to regulate or prohibit importation as necessary. In order to implement measures to control the spread of alien species that are causing harm to ecosystems present within the Maltese Islands, public awareness and education on the threats posed by alien species are essential.

Genetically Modified Organisms (GMOs) are often treated similarly to alien invasive species because they are also introduced in areas where they do not occur naturally. However, there are also other environmental risks associated with GMOs, which are not necessarily exhibited by alien species. The principal concerns relating to GMOs are their potential adverse impacts on the environment and human health. GMOs can have a detrimental effect on local biodiversity by hybridising with

258 Lanfranco (forthcoming).
259 See Council Decision 82/72/EEC adopting the Council of Europe Convention of 1982.
260 79/409/EEC.
261 Directive 92/43/EEC transposed as LN 257 of 2003 under the Environment Protection Act (Act XX of 2001).

wild or cultivated relatives, that is, similar species. If GMOs find themselves in the wild, they may threaten ecosystems by outcompeting local biodiversity through potential invasive behavior that is introduced into the organisms by means of the inserted gene. Newly developed GMOs are therefore examined for a range of characteristics, including their survivability and invasiveness. Other environmental concerns relate to the stability of the inserted gene, which can be transferred to other organisms, giving them new traits, one of which can be increased agressiveness. Indeed there are concerns that GMOs might result in superweeds. GMOs can also have allergenic or toxic effects on humans. However, GMOs can also be advantageous. These organisms often have introduced genes that confer resistance to pesticides, resulting in less pesticides being used by farmers, with environmental, financial and productivity benefits.

Malta, as a new member state of the EU, is required to regulate the release of GMOs into the environment and their placing on the market.[262] In order to fulfill its obligations, MEPA has established a Biosafety Co-ordinating Committee (BCC), which has now been in operation for over a year and acts as an advisory committee on the environmental implications of GMOs to MEPA and the Ministry for Rural Affairs and the Environment. One of the principal functions of the BCC is to assess applications that are sent for consultation by the European Commission to Member States for the placing on the market of GMOs. All applications are assessed on a case-by-case basis, taking into consideration the detailed scientific dossier that is provided by the applicant. In the year following EU accession, 19 applications for placing on the EU market were reviewed by Malta. However no applications have yet been received for experimental release in Malta of GMOs that have not previously been scientifically tested elsewhere in the EU.

Exploitation of wildlife

Wildlife may be exploited for human consumption, recreational, economic or other purposes. Inappropriate and unregulated exploitation of wildlife has a significant impact on wild populations. The illegal collection of animal species such as tadpoles, or wild plant and flowers such as Mediterranean Thyme (*Thymus capitatus; Sagħtar*) and orchids can negatively affect their status and that of dependent species. Exploited species are under growing threat due to increasing accessibility and improved capture and collection techniques, but the species most vulnerable to overexploitation are those with a low reproductive rate, slow growth, late attainment of sexual maturity and long life spans. Several native and endemic

[262] See Directive 2001/18/EC for procedures and measures, transposed by LN 290 of 2002 under the Environment Protection Act (Act XX of 2001).

species are threatened by exploitation and now have strict legal protection. Table 9.2 lists some examples of these, while the case of the painted frog is examined in Box 9.5.

Species	RDB Status	Current Status	Reason for Exploitation
Painted Frog (*Discoglossus pictus pictus*; *Żring*)	Vulnerable; Restricted distribution (Mediterranean and Maltese Islands)	Frequent though persecuted	Illegally caught to play with or to be kept as a pet (see Box. 9.5).
Evergreen Oak Longhorn Beetle (*Cerambyx cerdo*; *Susa tal-Ballut*)	Vulnerable	Stable but very small population size	Due to its large size it is subjected to indiscriminate killing
Irises (*Iris* spp.*; Fjurdilis*)	Generally vulnerable with a restricted distribution	Threatened. Restricted to a few areas.	Illegally picked from their natural habitat.
Maltese Pyramidal Orchid (*Anacamptis urvilleana*; *Orkida Piramidali ta' Malta*) and other species of orchids	Rare; Restricted distribution (Maltese Islands)	Scarce though widespread in garrigue in the Maltese Islands	Illegally picked.
Date Mussel (*Lithophaga lithophaga*; *Tamra*)	Not Listed	Threatened	Illegally removed from its natural habitat and subjected to illegal exploitation and illegal commercial activity for food consumption.
Loggerhead Turtle (*Caretta caretta*; Fekruna tal-Baħar)	Vulnerable	Scarce. Threatened by commercial fishing as it falls victim to by-catch as a result of long lining targeting swordfish and dolphin fish (*Lampuki*)	Before they were legally protected, marine turtles were exploited for their meat and carapace.[263]
Conspicuous marine invertebrate species such as sponges, corals, molluscs and sea horses	These are mainly assigned a rare status with restricted distribution.	Largely Threatened	Exploitation of numerous marine invertebrate species for the purpose of food, display, collection and sale as souvenirs. Seashells from a wide variety of marine mollusc species namely Triton shells, Tun shells, Cowries, Pen shells and Top shells are valued for commercial and ornamental purposes and are illegally exhibited for sale. Seahorses (*Żwiemel tal-Baħar*) such as the Short-Snouted Sea Horse (*Hippocampus hippocampus*) and the Long-Snouted Sea Horse (*Hippochampus guttulatus*), which are both protected, are sometimes directly and illegally captured from their habitat or else fall prey as by-catch.

Source: MEPA Nature Protection Unit 2005b

Table 9.2: Examples of strictly protected species that are subject to illegal exploitation

[263] Shell-like covering.

Box 9.5: Illegal capture and killing of the Painted Frog

The painted frog (*Discoglossus pictus pictus; Żring*) is the only native amphibian in the Maltese Islands, and this subspecies is known only from Sicily and the Maltese Islands.[264] It is likely that this frog is successful under Malta's water- scarce conditions due to its ability to breed all year round in any available freshwater. During the summertime, when levels of water diminish, the frog frequents humid areas. Once common in all localities with some freshwater, it is now becoming more restricted due to reduction in the number and quality of suitable ponds in close proximity to each other. This is happening as a result of disturbance, alteration and destruction of its natural habitat, lowered water tables, and pollution by pesticides and fertilizers used in nearby fields.

These threats are exacerbated by persistent persecution and illegal capturing of the tadpoles and frogs. Legally protected in Malta since 1993,[265] Malta's Painted Frog is also protected under the Bern Convention, in which it is listed in Appendix II (strictly protected fauna) and by the Habitats Directive, in which it is included in Annex IV (strictly protected flora and fauna). In the RDB, the Painted Frog is listed as vulnerable, with a restricted distribution both in the Maltese Islands and in the Mediterranean.

Source: MEPA Nature Protection Unit 2005b

The exploitation of certain other species, on the basis of sustainable harvesting that does not threaten the survival of the species, is also provided for by legislation.[266] Table 9.3 list examples of this type species.

Species	RDB Status	Current Status	Reason for Exploitation
Rosemary (*Rosmarinus officinalis*; *Klin*)	Rare; restricted distribution (Maltese Islands)	Still rare and restricted to a few localities	Culinary Uses
French Daffodil *(Narcissus tazetta; Narċis*)	Not Listed	*N. tazetta* is localised, but usually frequent where found	*N. tazetta* is often gathered and sold in large bunches
Mediterranean Heath (*Erica multiflora*; *Issopu*)	Not Listed	Frequent but declining	Used in cribs and flower arrangements
Rock Urchin (*Paracentrotus lividus*; *Rizza*)	Not Listed	Very Common. Vulnerability to overexploitation is observed in species such as sea urchins, which have slow reproductive cycles.	Direct removal for scientific purposes (although *bona fide* studies should help in conservation efforts), culinary and commercial purposes.
European Lobster (*Homarus gammarus*; *Iljunfant tal-Baħar*) and other species of lobster	Not Listed	Scarce, but more information on its status is required	Commercially exploited for food consumption
Dusky Grouper (*Epinephelus marginatus*; *Ċerna*)	Not Listed	The intense exploitation of the Dusky Grouper by artisanal or harpoon fishing has severely depleted stocks of this fish.[267]	Commercially exploited fish for food consumption

Source: MEPA Nature Protection Unit 2005b

Table 9.3: Examples of species the taking in the wild and exploitation of which may be subject to management measures

264 Lanza *et al*. 1986.
265 LN 49 of 1993.
266 LN 257 of 2003.
267 Mifsud and Stevens 2003.

The practice of wild bird hunting and trapping, which focuses on migratory birds,[268] also has a significant effect on biodiversity. Information indicating the scale of these activities is lacking, particularly trend data, but a rough indication of the scale of the activity may be found in the catches registered in Carnet de Chasse[269] declarations, which are mandatory for persons wishing to obtain a licence.

In 2002 and 2004 these declarations indicated that approximately 150,000 and 175,000 birds were declared to have been hunted or trapped respectively. The species most affected were the Turtle Dove (*Streptopelia turtur; Gamiema*) (28,519 and 36,637 birds shot respectively), the Song Thrush (*Turdus philomelos; Malvizz*) (24,152/39,235), the Linnet (*Carduelis cannabina; Ġojjin*) (18,946/14,357), the Skylark (*Alauda arvensis; Alwetta*) (17,240/24,007), the Quail (*Coturnix coturnix; Summiena*) (17,021/18,791) and the Starling (*Sturnus vulgaris; Sturnell*) (15,830/25,348). While these estimates cover only legal hunting and trapping, the indication is that catches are rising in terms of overall numbers and for particular species. In 2004, 15,216 licensed persons were recorded in the Carnet de Chasse database. Between 1995 and 2005,[270] approximately 8,000 individuals sat for (and passed) the Hunting and Trapping License Exams, which relate to new applications for licences. Data for licences granted by the Police is also available (see Table 9.4).[271]

Type of Licence	2001	2002	2003	2004
Hunting on Land	11,281	11,984	12,027	12,071
Trapping of Birds	3,751	4,402	4,747	4,691
Trapping of Rabbits	33	27	30	32
Total	**17,066**	**18,414**	**18,805**	**18,795**

Source: Malta Police

Table 9.4 Police hunting and trapping licences

9.4 Nature Protection

The principal tool currently used to protect biodiversity is to give legal protection to important species and their habitats, and to actively manage them. **An enhanced legal framework has been put in place to ensure the protection of ecologically important sites in the Maltese Islands, including marine protected areas**. A number of land areas have been protected under both national and international designations. National designations include bird sanctuaries, nature reserves, special areas of conservation and areas/sites of ecological, scientific and geological importance. International designations fall

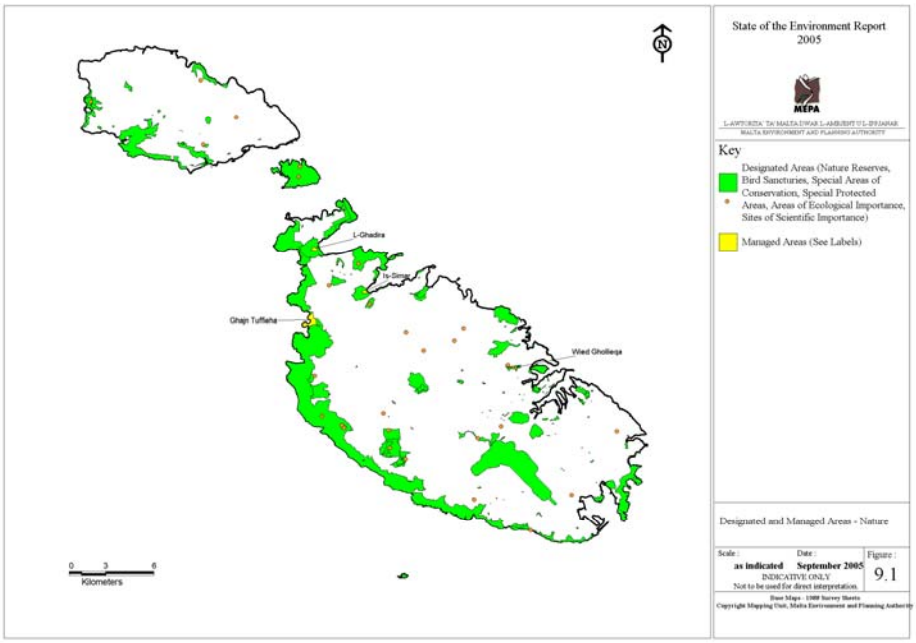
268 FKNK 2005.

269 The Carnet de Chasse is a register in which the hunter/trapper keeps a record of what was captured during the year.

270 2005 figures only include the period from January to 21st March 2005.

271 Note that individuals may hold more than one type of licence.

under the EU Habitats and Wild Birds Directives, the Ramsar[272] and Bern Conventions and the Barcelona Convention.[273] In all, the various designated areas (some of which fall under more than one designation, giving them multiple protection) represent 18 percent of the Maltese Islands (see Map 9.1).



Sources: MEPA, MEPA 2005a, MEPA 2005b, Gambin and Stevens 2005

Map 9.1 Designated and managed areas

In terms of national designations, there are 32 Nature Reserves (of these 29 are Nature Reserves aimed at protecting trees and the remainder, at Filfla, St. Paul's Islands and Fungus Rock, are Nature Reserves where access is controlled). There are also 24 Bird Sanctuaries (apart from cemeteries and public gardens) that occupy 5.24 percent of Malta's land area. Furthermore, 14 sites have been designated since 2002 under the Development Planning Act, 1992 (Cap 356)[274] as sites or areas of ecological or scientific importance. Currently these designations total 57 sites and areas extending over approximately 12.5 percent of land area.

Maltese natural areas are also protected through international legislation. The EU Habitats Directive[275] requires the designation of Special Areas of Conservation (SACs), and Malta has declared 38 such sites (with 31 sites of international and

272 Ramsar Convention on Wetlands (www.ramsar.org).

273 Protocol on Specially Protected Areas concerning Biological Diversity in the Mediterranean (SPA and Biodiversity Protocol).

274 See Malta Structure Plan policy RCO 1.

275 Directive 92/43/EEC transposed as LN 257 of 2003 under the Environment Protection Act (Act XX of 2001).

seven of national importance)[276] under the national legislation that transposes the Habitats Directive. As part of the latter, a network of protected areas called Natura 2000 is being set up to support habitats as well as species that are either important and/or threatened across Europe. This network already comprises more than 8,000 sites, covering over 17 percent of EU territory.[277] **Malta has submitted 23 sites[278] (drawn from its SACs of international importance) as candidate Natura 2000 sites, representing approximately 12.5 percent of land area**, and this number is expected to increase in the near future. This coverage compares well with the community average of 15 percent. The 23 candidate Natura 2000 sites have also been submitted to the Council of Europe as candidates for the Emerald Network of Areas of Special Conservation Interest that falls under the Bern Convention. The EU Birds Directive requires the designation of Specially Protected Areas (SPAs), of which Malta has declared six, covering 2.4 percent of the land area. As at March 2005, SPAs covered 8.25 percent of EU territory.[279]

In addition, L-Għadira and Is-Simar have been designated wetlands of international importance under the UN Ramsar Convention. Filfla and the surrounding islands, Fungus Rock, L-Għadira and St. Paul's Islands are designated as Specially Protected Areas under the Mediterranean level UN Barcelona Convention. Preparations are also being made for the designation of further terrestrial, as well as marine, protected areas; and 'Rdum Majjiesa to Ras ir-Raħeb' in the North West of Malta is one marine candidate site; studies are being carried out to identify others. A draft management plan for this one site and draft designation have recently been launched for public consultation. Marine protected areas have been created in all regional seas and on the coasts of many European countries.

In EU25 and the six other EEA countries[280] there has been a considerable increase in designations during the last decades, as most countries implemented national laws on nature protection more intensively, and in 2002 there were about 500,000 square kilometres of nationally designated areas in 30 European countries. However during the last decade the rate of designation levelled off due to land use conflicts, which have reduced the number of remaining semi-natural areas that are readily available for designation.[281]

---

276 See http://www.mepa.org.mt/environment/index.htm?natura2000/natura2000.htm&1.

277 http://europa.eu.int/comm/environment/nature_biodiversity/index_en.htm

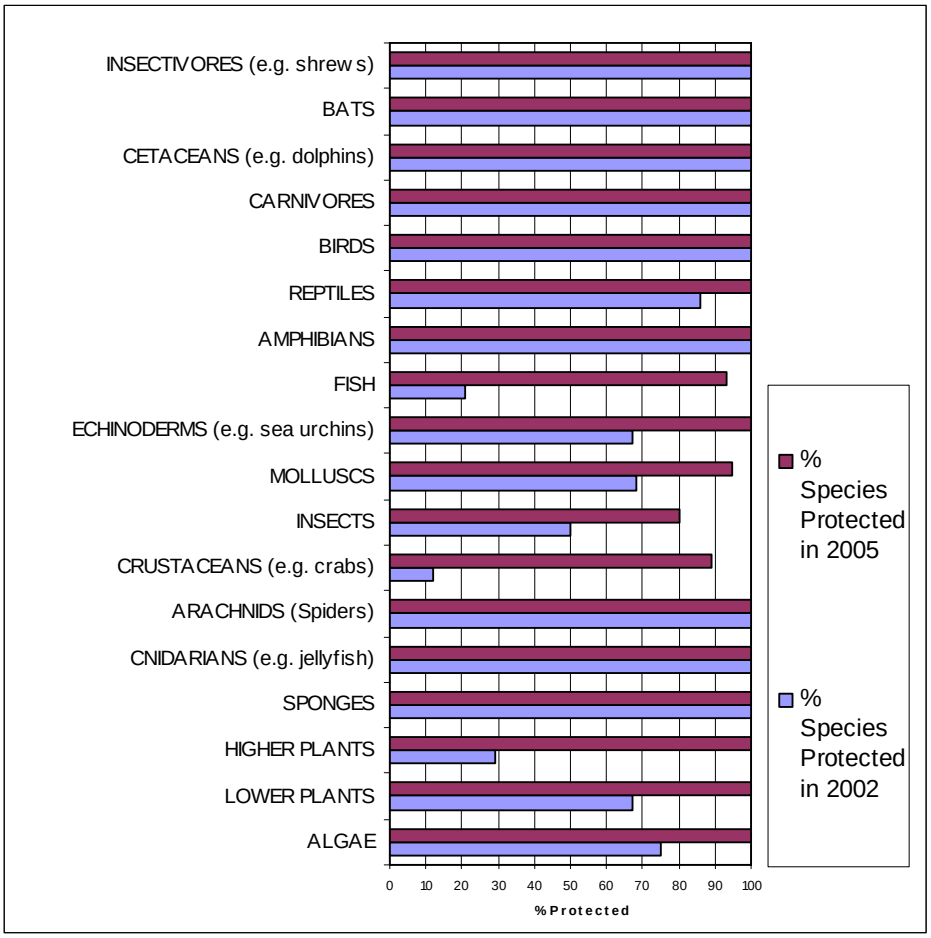
278 Nine sites along the coastal cliffs were combined into one, so the 31 SACs of international importance were submitted as 23 candidate Natura 2000 sites.

279 http://europa.eu.int/comm/environment/nature/nature_conservation/useful_info/barometer/barometer.htm

280 Norway, Slovenia, Croatia, Switzerland, Bulgaria and Romania.

281 http://www.eea.eu.int

International treaties and other instruments protecting wildlife generally include lists of threatened species in their appendices or annexes, indicating the species to which the protection provisions should apply. These listings serve as a good indicator of the international importance of local species. An analysis of 189 Maltese species of international importance (see Chart 9.2) indicates that 183 (97 percent) of species of international importance are protected by Maltese legislation. These figures contrast sharply with the protection regime in 2002, when 61 percent of the species of international importance were protected. The most marked improvements are with respect to higher plants (29 percent protected in 2002 in comparison with 100 percent in 2005), fish (21 percent in comparison with 93 percent), and crustaceans (12 percent in comparison with 89 percent).

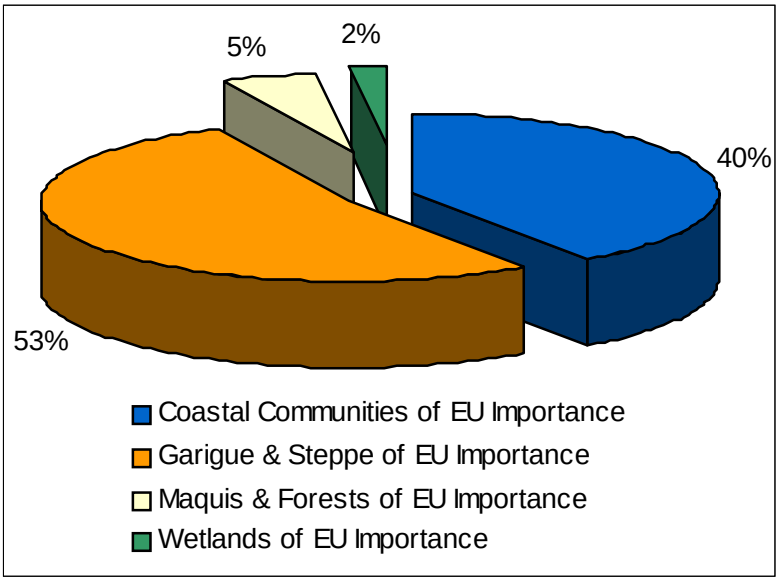


Source: MEPA Nature Protection Unit 2005c

Chart 9.2 Percentage of total species of international importance per group protected by national legislation

On the level of habitat protection, which is required to support the protection of species, Chart 9.3 indicates that over 90 percent of the land proposed as Natura 2000 sites is comprised of garrigue, steppe and coastal communities of EU importance. On the other hand, only a total of seven percent may be attributed to

maquis, woodlands and wetlands of EU importance. Although Natura 2000 sites cover approximately 12.5% of the land area of the Maltese Islands, this information points to the lack of certain habitat types within the Maltese Islands, and hence the importance of protecting the small areas covered by these rare habitat types.



Source: MEPA 2005d

Chart 9.3 Percentage cover of the main habitat groups of EU Importance in Maltese Natura 2000 candidate sites (as at September 2005)

However legal protection without management of the activities taking place in designated areas will not ensure that conservation goals are reached. To this end, a concerted effort is being made to put in place effective management regimes for protected areas. **To date there are four sites with management plans, however so far this only represents 1.3 percent of Malta's SACs** and 1.7 percent of its SPAs, and 0.16 percent of total land area (see Map 9.1). The Qawra/Dwejra Heritage Park is also covered by a draft Action Plan. One of the principal constraints related to the finalisation of the management plans is the determination of land ownership. **The area management process will need to be significantly accelerated if Malta is to reach its target to halt the loss of its biodiversity by 2010.** Besides protective and management frameworks, planning applications for development affecting ecologically sensitive areas are subject to compensation and mitigation conditions.

As a sound basis for policymaking, there is also need for more baseline and trend data about Malta's biological heritage. A start has been made; several studies in

relation to flora and fauna have recently been carried out. These include studies on a rare Maltese freshwater fish, the Maltese Killifish, on cartilaginous fish, on endemic species, on echinoderms (starfish and sea urchins) and on molluscs. There have also been studies on habitats, particularly on rock pools, as well as on specific protected areas, such as Wied il-Għasel, Wied Moqbol and Wied Żnuber. Two MEPA tenders, on *Posidonia oceanica,* the most important sea grass in Malta*,* and on threatened bats and important bat sites (see Box 9.3), have also been completed and the latter is currently under review. Tenders have also been issued for the collection of baseline data on locally threatened and/or endemic species, as well as on alien species. Through these studies, new species have been described, among which are a number of insects, as previously noted. Marine areas that are particularly important for biodiversity have been identified and studies are being carried out as a basis for designating marine protected areas. These include detailed benthic studies made in the proposed Rdum Majjiesa to Ras ir-Raheb Marine Protected Area, a study on the alignment of local marine habitat data with the EU's Palaearctic habitats classification, the RAC/SPAs's classification system for Mediterranean marine biocoenoses, and the studies related to an artificial reef project at St. Julian's, which is being carried out as part of MEPA's Environmental Initiatives in Partnership Programme.

Despite this activity, there is need for wider and continuous monitoring of the condition of Malta's natural heritage. Additional Research is required in order to collect baseline data or trend data concerning habitats and species in view of the protection regimes and reporting requirements under the EU Habitats Directive, the EU Wilds Birds Directive and the EU Water Framework Directive. Such research would include vegetation surveys at specific localities, analysis of valuable faunal assemblages in selected ecosystems, distribution surveys of species listed in Annex II of the EU Habitats Directive, assessment of the impact of threats on populations of protected species, research surveys in connection with invasive alien species and assessment of the ecological quality of specific aquatic habitats using Water Framework Directive-compliant methods. Communication, awareness-raising and educational measures are also required to complement activities related to monitoring, designation and management of protected areas and species (see also Policy Responses Chapter).

For Malta to meet its overall target to halt loss of biodiversity by 2010, there is need for completion of management and action plans, regular monitoring and enforcement, as well as communication, education and public awareness actions. These measures now feature in Malta's National Reform Programme, which addresses Malta's competitiveness in the context of the

EU Lisbon Agenda. Work has also commenced on the preparation of a National Biodiversity Strategy and related action plans.

References

Bertrand, J., Gil de Sola, L., Papaconstantinou, C., Relini, G. and Souplet, A. 2000. 'An international bottom trawl survey in the Mediterranean: the MEDITS programme'. In Demersal resources in the Mediterranean. Co-ordinators J.A. Bertrand and G. Relini. IFREMER, Actes de Colloques 26: 76-93.

Borg J. forthcoming. Threatened Bats and Important Bat Sites. Study Commissioned by the Environment Protection Department.

Borg, J.A., Attrilla, M.J., Rowden, A.A., Schembri, P.J., and Jones, M.B. 2005. 'Architectural characteristics of two bed types of the seagrass Posidonia oceanica over different spatial scales'. Estuarine, Coastal and Shelf Science. 62: 667–678.

Brullo, S., Giusso del Galdo, G. and Lanfranco, E. 2001. 'A new species of Zannichellia L. (Zannichelliaceae) from Malta'. Flora Mediterranea. 11: 379-384.

Camilleri, M. 2002. 'The fishing effort distribution of Demersal gear in Maltese waters and the relative abundance of Demersal resources in the area'. International workshop on stock assessment and production of Demersal resources. (SAMED); Rome. March 2002.

Coleiro C. 2002. Breeding Birds Report. Is-Simar Nature Reserve 2002 Report :34

Coleiro C. 2003. Breeding Birds Report. Is-Simar Nature Reserve 2003 Report :29

Camilleri, M., 2005. Maltese fisheries and the sustainability of resources around the Maltese Islands. PhD thesis. University of Plymouth.

FKNK (Federazzjoni Kaccaturi, Nassaba u Konservazzjonisti) 2005. The Unique Hunting Situation prevailing over the Maltese Islands. Report for the State of the Environment Report 2005.

G.A.S. s.r.l. 2002. Baseline survey of the extent and character of *posidonia oceanica* (l.) delile meadows in the territorial waters of the Maltese Islands.

Lanfranco E. 2005. A Short Note on Malta's Ecological Communities. Contribution to the 2005 State of the Environment Report.

Lanfranco E. forthcoming. Alien Flora of the Maltese Islands. Commissioned MEPA tender carried out by E. Lanfranco on behalf of MUS Ltd.

Lanza, B; Nascetti, G.; Capula, M. and Bullini, L. 1986. '*Les Discoglosses de la Région Mediterranéenne Occidentale (Amphibia, Anura, Discoglossidae)*'. Bull. Soc. Herp. France, 40: 16-37.

MaLiRa Group, 2004. La campagna MEDITS 2004 nello Stretto di Sicilia (Mar Mediterraneo), Sub Area Geografica 15: rapporto finale. MaLiRA Group, IAMC-CNR, Sezione Territoriale di Mazara del Vallo (TP), Italia: 19pp.

MEPA (Malta Environment and Planning Authority). 2005a. Common Database on Designated Areas for Malta (http://cdr.eionet.eu.int/mt/eea/cdda1/).

MEPA (Malta Environment and Planning Authority). 2005b. Candidate Natura 2000 Sites in the Maltese Islands: Documentation, Maps and Information. (http://www.mepa.org.mt/environment/index.htm?natura2000/natura2000.htm&1)

MEPA Nature Protection Unit. 2005a. Background Note on the status of selected taxonomic groups.

MEPA Nature Protection Unit. 2005b. Background Note on the Exploitation of Wildlife.

MEPA Nature Protection Unit. 2005c. Background Note on Species of International Importance.

MEPA Nature Protection Unit. 2005d. Background Note on Habitat Protection.

Mifsud, D. forthcoming. Threatened and/or Endemic Insects. Advanced Industrial Systems Ltd., study and associated data cards commissioned by MEPA.

Mifsud, C.R. and Stevens, D.T. (eds). 2003. Strategic Action Plan for the Conservation of Maltese Marine and Coastal Biodiversity. Malta: Malta Environment and Planning Authority and the Regional Activity Centre for Specially Protected Areas.

Mosteiro, A. and Camilleri, M. 2005. Pilot Study on Dolphin fish 2004 – Malta. FAO-COPEMED.

Pergent-Martini, C.; Leoni V.; Pasqualini V.; Ardizzone, G.D.; Balestri, E.; Bedini, R.; Belluscio, A.; Belsher, T.; Borg J.A.; Boudouresque, C.F.; Boumaza, S.; Bouquegneau, J.M.; Buia, M.C.; Calvo, S.; Cebrian, J.; Charbonnel, E.; Cinelli, F.; Cossu, A.; Di Maida, G.; Dural, B.; Francour, P.; Gobert, S.; Lepoint, G.; Meinesz, A.; Molenaar, H.; Mansour, H.M.; Panayotidis, P.; Peirano, A.; Pergent, G.; Piazzi, L.; Pirrotta, M.; Relini, G.; Romero, J.; Sanchez-Lizaso, J.L.; Semroud, R.; Schembri, P.J.; Shili, A.; Tomasello, A. and Velimirov, B. (2005): 'Descriptors of *Posidonia oceanica* Meadows: Use and Application'. Ecological Indicators, 5: 213–230.

Schembri, P.J. and Sultana, J. (eds.). 1989. Red Data Book for the Maltese Islands. Department of Information, Malta, viii + 142pp. + 8 plates.

Stevens, D.T. and Lanfranco, E. 2005. 'Helichrysum melitense*, Malta'.* In de Montmollin, B. and Strahm, W. (eds.) The Top 50 Mediterranean Island Plants. Wild Plants at the brink of Extinction, and what is needed to save them. UK: IUCN, The World Conservation Union, pp. 74-75.

http://europa.eu.int/comm/environment/nature/nature_conservation/useful_info/barometer/barometer.htm

http://europa.eu.int/comm/environment/nature_biodiversity/index_en.htm

http://www.eea.eu.int

http://www.mepa.org.mt/environment/index.htm?natura2000/natura2000.htm&1.