

ADOPTING THE PRECAUTIONARY PRINCIPLE IN DESIGNING AND MANAGING NATURA 2000 AREAS (EXEMPLIFIED BY THE CONSERVATION OF THE BUTTERFLY *MACULINEA NAUSITHOUS* IN A RURAL LANDSCAPE NORTH OF DRESDEN (SAXONY))

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ABSTRACT

The precautionary principle is more and more incorporated into national law and decision-making on natural resource management and biodiversity conservation. In the coherent European network of protected areas Natura 2000, the precautionary principle finds expression in the obligation to provide favourable conditions for the long-term survival of species and habitats, especially of the priority ones listed in the annexes of the Habitats Directive and the Birds Directive. After describing principles, structure, implementation and procedures of this rather new instrument for nature conservation using the example of one of the various Natura 2000 areas in Saxony (Germany), opportunities and problems for biodiversity conservation are outlined with particular regard for the situation in an agricultural landscape. Special attention is given to the following questions: requirements of and actual threats to the target species (the butterfly *Maculinea nausithous*), legal means and economic incentives for suitable measures, the management plan, and the role of stakeholders. It turns out that Natura 2000 could be an effective tool to advance nature conservation, and with special regard to the precautionary principle. Every effort is necessary to gain more public acceptance of Natura 2000, as well as to improve scientific knowledge concerning species and habitats under protection.

Key words: acceptance, butterfly *Maculinea nausithous*, grassland, management plan, stakeholders

INTRODUCTION

Precaution – the “precautionary principle” or “precautionary approach” – is a response to uncertainty in the face of risks to health or the environment. In general, it involves acting to avoid serious or irreversible potential harm, despite there being a lack of scientific certainty as to the likelihood, magnitude, or causation of that harm. Applying precaution in natural resource management and biodiversity conservation is clearly essential for responding to uncertain environmental harm. The precautionary principle is relevant regarding the efforts to conserve and to use biodiversity sustainably, and in particular to reduce habitat loss, control alien invasive species, prevent over-exploitation of wild species and biological resources, and avert and mitigate the impacts of climate change. Notwithstanding the lack of a shared understanding of the meaning and application of the principle, the immediate and obvious importance of precaution in the context of nature conservation and

management, where impacts can clearly be both serious and irreversible, has been recognised through its endorsement by all major biodiversity-related multilateral environmental agreements, as well as myriad policy and legislative instruments at all levels (cp. Cooney, 2004).

The European Union (EU) accepted the precautionary principle as a general environmental policy principle. The Maastricht Treaty (signed in 1992) states that “community policy on the environment must aim at a high level of protection and be based on the precautionary principle, as well as on the principle that preventive action should be taken, that environmental damage should be rectified at source and that the polluter should pay.” In 2000, the European Commission published a communication on the precautionary principle, subsequently adapted by the European Parliament, which provides important guidelines for translation of the general principle into operational measures (European Commission, 2000). For example, the 1992 EC Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna (Directive 92/43/EEC, the Habitats Directive) states that “in the case of a project likely to have a significant effect on a protected site, competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned.”

The Habitats Directive aims at the establishment of a suitable network of protected areas for threatened habitats and species listed in several annexes. Together with the bird conservation areas (Special Protection Areas, SPAs) established by the 1979 Birds Directive (79/409/EEC), the Special Areas of Conservation (SACs = Fauna-Flora-Habitat areas, FFHs) established by the Habitats Directive form the European Natura 2000 network. This network shall be sufficiently comprehensive, and it should be distributed in such a manner, that the risks of extinction (in the framework of a region) of the habitats and species under protection are minimized. It cannot be ignored, however, that there is a lack of consensus on the meaning of precaution and guidance on how it should be operationalised.

This paper focuses on the European Natura 2000 network, exemplified by a rural area in Saxony (Germany) that is dedicated mainly to protection of the Dusky Large Blue butterfly (*Maculinea nausithous*). This area was chosen for the case study, because there are long traditions of (landscape) ecological research, conservation efforts, and contacts with relevant stakeholders.

NATURA 2000 – THE PROCEDURE

The selection of Natura 2000 areas

The objective of this network is to protect and sustain biological diversity in the territory of the European Union. The Natura 2000 network implies both maintaining and restoring a favourable conservation status for natural habitats and species of wild fauna and flora of Community interest. The selection of areas (and species) is realized according to uniform criteria.

The criteria for selecting SAC sites are the following:

- Representativity (especially characteristic examples of the special habitat type),
- Area size (the larger the better), and
- State of conservation and chances of restoration (well-developed examples of the habitat type, or the natural site conditions are suitable for development of the former more favourable state).

- Overall assessment: Those criteria will be selected which best fulfil the subcriteria representativity, size and state.

Criteria for the selection of populations or occurrences of SAC-relevant species:

- Population size and density,
- State of conservation and chances for restoring the habitat of the relevant species, and
- Isolation of the population in the area.
- Overall assessment: For the preservation of a certain species, large or connected populations living in well-developed habitat sites are especially important.

These criteria correspond with the precautionary principle more or less. Consider, for example, the “area size” criterion: Large habitats and big populations rich in individuals are more stable than small habitat patches and sparse populations. Additionally, large habitats have a core zone relatively free of impacts from outside, whereas small habitats are more exposed to external disturbances.

The coherence of the Natura 2000 network is an especially important aspect, i.e., the biological diversity shall be maintained in all biogeographical regions of the European Union. Thus, the EU prescribed protecting a defined percentage of the total area of a special habitat type or of plant and animal populations in a region. For example, 100% of all dry sandy heaths on inland dunes shall be protected, 40% of lowland meadows poor in nutrients, as well as 100% of the lynx, wolf and salmon populations, 50% of the beaver territories, and 50% of Dusky Large Blue (*Maculinea nausithous*) butterfly populations.

By prescribing the protection of a defined percentage of a special habitat or of a plant or animal population in all biogeographical regions of the EU, Natura 2000 coincides with the precautionary principle: The rarest and especially vulnerable species and habitats are given protection in higher percentages of their areas or to numbers of their populations. The coherence of habitats (e.g. along river valleys) facilitates the movement of animals, their distribution and exchange between subpopulations. If a certain subpopulation would become extinct (e.g. due to human impacts or natural catastrophes), its habitat has better chances to become resettled by this species. Moreover, if a habitat or a species is protected at various places and in different regions, the risk of extinction is lowered. Habitats belonging to the same type are not necessarily uniform. Their locations in different regions mean corresponding peculiarities in (abiotic) site conditions and variations in the spectrum of flora and fauna in these habitats. Also, the widespread populations of plant and animal species are not homogeneous; they can show genetic nuances and special habitat requirements. For biodiversity conservation, the whole genetic variability of a species is necessary, i.e., populations from the total area settled by the species must be protected.

The role of stakeholders

The selection of Natura 2000 areas shall be based on scientific grounds only. Case law of the European Court of Justice has established that political expediency, economic interests, and infrastructure interests must not play any role in selecting and delimiting sites. Only in this way is it guaranteed that economic interests and concessions to land users and other stakeholders cannot water down the Natura 2000 system from the outset. Excluding economic interests is in line with the precautionary principle. Otherwise, thresholds or so-called “safe minimum standards” for numbers and sizes of populations and habitats to be protected would not be kept. Only if a lower percentage of habitats or populations is needed for the Natura 2000 network can those areas be chosen that cause no, or at most small, conflicts with economic interests.

In practice, the selection of Natura 2000 areas varies from country to country. For example, in Greece the authorities have proposed a comprehensive list of Natura 2000 sites with respect to their scientific values. Many landowners and other stakeholders are aware of the importance of protecting these areas in favour of so-called “green” tourism. Other EU Member States are tending more towards involving landowners (in Finland) or communities (in France) very early (already in the “scientific stage”) in the decision-making process. The too-strong consideration of economic interests has led to an incomplete selection of Natura 2000 sites by some countries (GDENV, 2000).

The management and protection of Natura 2000 sites shall be achieved by legal means (establishment of nature reserves, special laws and regulations, management plans), economic incentives, and contracts (e.g. agro-environmental programmes). As Saxony aspires to close cooperation with the persons affected, legal means shall be limited as much as possible. Measures based on voluntary commitments to maintain or restore the Natura 2000 sites are preferred. Generally, the current land use (agriculture, forestry, fishery) can be continued if it does not conflict with the present favourable conservation state. Additional measures necessary for improving the present ecological situation can be agreed by negotiations with the owners and users. Such concrete measures to manage and develop the habitats and animal and plant species occurring in the Natura 2000 sites are generally determined together with the affected parties on site. Changes in land use forms are possible, if they do not impair the state of the habitat types and species under protection. Their living conditions must not be worsened, and of course their total destruction is not permitted. To assess such impacts, a so-called “Natura 2000 impact study” is necessary, and it must be elaborated by specialists (scientists and authorities) independent of the landowners and other beneficiaries.

Nature conservation measures carried out at Natura 2000 sites can be supported at the national level and by the European Union (e.g. through the ELER programme). Nevertheless, not all landowners and land users become enthusiastic if a Natura 2000 area is designated that includes their property. They fear they will suffer economic disadvantages or that their property rights will be compromised. To clear up misunderstandings and improve acceptance, broad communication campaigns are organized that include newspaper articles, leaflets, internet presentations, scientific conferences, exchanges of experiences, and training courses.

In practice, it is very difficult to implement effective measures to improve the situation of threatened species and habitats in Natura 2000 areas. The regulation that the present form and intensity of use can be maintained is not in correspondence with the precautionary principle. The mere fact that a certain species (still) occurs in an area does not prove the compatibility of the present land use (with regard to its form or intensity). It is possible that this species is (still) surviving only in spite of those impacts and that long-term survival is not certain.

Management, monitoring, impact studies

The EU Member States are obliged to establish the necessary conservation measures for Natura 2000 areas involving, if need be, management and development plans. Moreover, steps must be taken to avoid the deterioration of natural habitats and the habitats of species listed in the annexes of the Habitats Directive and the Birds Directive.

Measures to conserve natural habitat types and species must correspond to the ecological requirements of the natural habitat types and species. The determination of measures and conservation goals is initially oriented exclusively to the conservation goals of the Natura 2000 network. These activities must safeguard the status quo or continued viability or,

where appropriate, restore a favourable conservation status in relation to the features of interest (targets of conservation) on a given site. Moreover, there is an obligation to take “appropriate steps” to avoid deterioration of natural habitats and the habitats of species as well as disturbance of the species for which the areas have been designated, insofar as such disturbance could have significant effects (BFN, 2005).

A lack of (ecological) knowledge, however, is an essential obstacle on the way to the successful protection and management of Natura 2000 areas. Fundamental uncertainties derive from our fragmentary understanding of species biology and complex ecosystem dynamics, as well as from abundant stochastic variation in environmental parameters. Uncertainty is not just ecological, but it also surrounds human impacts that include such forces as globalisation and decentralisation, effects of changes in global markets and trade regimes (Cooney, 2004). Natura 2000 tries to cope with this problem of uncertainty in the following ways:

- Selecting habitat areas that are as large as possible to reduce actual and potential external disturbances and to minimize negative (genetic) population effects (shifts, accidental extinction of very small populations),
- Considering the connectedness and connectivity of the protected areas wherever it is useful and possible to enable population exchange, and
- Protecting not only one habitat of a type or one population of a species in a region but several habitats and populations in order to reduce risks of potential environmental damage.

A case study from Saxony

The SAC site “Promnitz und Kleinkuppenlandschaft bei Bärnsdorf” (Promnitz rivulet and small hilly area near the village of Bärnsdorf) covers 294 ha. It involves a varied agricultural landscape with a shallow river valley and distinct granodiorite hills partly covered by coppices (oak-hornbeam forests, partly in transition to beech forests). Along the Promnitz rivulet, various grassland communities are occurring as well as fallow land, perennial herb communities and small ponds. The otter (*Lutra lutra*) and especially the butterfly Dusky Large Blue (*Maculinea nausithous* Bergsträsser 1779, *syn. Glaucopteryx nausithous*) are animals of Community interest. For the last-named, this is one of its most important sites in Germany and Europe.

The SAC site is part of the “Moritzburg small-hill landscape” that is characterised by a small-scale pattern of small hills and low ridges with exposed rocks and flat hollows. The heterogeneous geomorphologic pattern causes a high diversity of soil, water and climatic conditions as well as of vegetation cover and land use. Effective agricultural production is hampered by the complicated natural site conditions. Forests and woods are concentrated on the crests of the rocky and stony hills, arable fields on slopes, and grassland in moist hollows. Land improvements (especially drainage) had tried to diminish this natural heterogeneity, but with little success. Drainage facilities fell into disrepair after a few years, and the thin soil cover on the hills is an insuperable obstacle for ploughing. The result is a rich-structured rural landscape with a notably high biodiversity and an interesting scenery. The area is particularly rich in species that are adapted to less intensive agriculture, e.g. rare arable weeds, plants of field margins, edges and small coppices, birds breeding in hedges, woods, grassland and arable fields, amphibians, reptiles and many insect species (Bastian & Schrack, 1995; Bastian, 2007).

The distinguishing marks of the Dusky Large Blue butterfly are the following: The wing length is about 17–18 mm. The upper side of the male is dark blue, frequently with lots of brown or black spots. The female is brown, with sometimes a little bluish glance at the base

of the wings. The under side is dark brown with one row of black spots. The flying time of this butterfly is short, approximately two weeks between mid-July and mid-August. It appears extremely locally in moist and marshy meadows (Stolzenburg, 2001; LFUG, 2004).

The development cycle of this butterfly is extremely connected with the grassland herb species Great Burnet (*Sanguisorba officinalis*). The female butterflies lay their eggs only into the spherical flowers of the Great Burnet, upon which the larvae feed. The older larvae are leaving the fodder plant (or they are removed by ants, esp. the species *Myrmica rubra* syn. *M. laevinoides*), and they are living then in the nests of these ants. The Dusky Large Blue is among the most endangered butterfly species in Europe. It is highly specialised and extremely sensitive to unfavourable conditions (light withdrawal by woods, eutrophication), but also to soil compaction, because the ants prefer loose substrates and sparse vegetation. Great Burnet needs sandy to clay soils close to the groundwater table. That means an interconnected mosaic of loose and clay or loamy substrates to enable the occurrence of the fodder plants and the hosting ants in close spatial vicinity is the basic ecological precondition for the Dusky Large Blue. The vulnerability of this butterfly species results from the following facts: Until the 3rd stage, the larvae are not able to reach another inflorescence of the Great Burnet. If the meadow would be mown within this time period, the Dusky Large Blue larvae would be exterminated completely. Moreover, the Great Burnet is threatened by frequent mowing (more than two cuts per year), by nutrient inputs and lowering of the groundwater table. The Dusky Large Blue butterfly is not able to bridge long distances: the farthest range has been established as 5,100 m (LIBAQ, 2001). Thus, colonization of new sites is almost impossible. Therefore, the destruction of a site and the following extinction of a population cannot be regenerated, because the neighbouring subpopulation is not able to bridge this distance. Thus, it cannot function as a source for a possible reestablishment.

In order to protect the endangered butterfly species, and to avoid negative development (future population decline or extinction, habitat degradation), special habitat management measures following the precautionary principle are indispensable. Habitat management (see the special measures outlined below) improves the living conditions of this butterfly (food, reproduction, spread, reduction in disturbances and threats). Thus, the fitness of the population is strengthened, and the butterflies can better cope with possible negative influences from outside. These measures are outlined in the management plan. For each meadow in the SAC site where the butterfly occurs a special treatment procedure is fixed. In general, the following measures are necessary:

- Permanent and extensive use as grassland, predominantly mowing (two times per year in mid-June and in mid-September), no pasturing;
- Mowing with highly adjusted cutting (above 5 cm) to avoid soil wounding and threats to the ants;
- Fertilization only occasionally with muck, not with liquid manure;
- No rolling and dragging, so that soils are spared compaction;
- No grassland drainage;
- No sowing of grasses, no biocides and no ploughing;
- Sectionalised leaving of un-mown grassland stripes at the edges;
- Mosaic-wise, staggered mowing; and
- Maintenance of the coherence (a suitable rather close pattern of habitats) to link the Dusky Large Blue subpopulations.

Some of the meadows in the SAC site are in a good ecological situation, some need special management to become more appropriate as Dusky Large Blue habitat, but an essential number presently suffers from unfavourable conditions.

In September 2004, the results of the management plan were presented to the public during an informal get-together with planners, authorities (for agriculture and environment), members of nongovernment organizations and farmers in the restaurant of the village of Bärnsdorf. But only two representatives of the farmers attended the meeting, one private farmer and one member of a big cooperative farm. The management plan has shown that the current utilization of the protected valuable meadows is too intensive. Though it involves only a small number of meadows important for the Dusky Large Blue butterfly (a low percentage of the total area of the SAC reserve), the farmers fear the consequences (economic losses) of a reduction in the utilization intensity. The farmers want to mow the meadows earlier in the year (to harvest the young fodder rich in protein), and they also want to apply higher amounts of fertilizers than allowed (60–70 kg/ha annually instead of only 30 kg). They did not take into account that there is a reasonable nutrient input from the air and from adjacent arable fields as well as from the Promnitz rivulet during flooding. The farmers insist in compensation payments for economic losses. This demand is justified, and in the framework of Natura 2000 such payments are absolutely intended. The farmers' knowledge of this new nature conservation instrument is, however, poor. It can be expected that mental conflicts resulting from these knowledge gaps and resulting misunderstandings can be cleared up by the ongoing information campaign.

The age of the landowners is another problem from which the chances of a long-term survival of the butterfly and its habitats are suffering. Several elderly people own most of the valuable meadows in the Promnitz valley. It can be expected that within the foreseeable future they will not responsibly manage the meadows any longer, and neither will their children and grandchildren.

Presently, the agricultural policy of the EU is in a state of flux, and therefore the farmers are feeling uncertain. They need a sense of economic security to be able to plan their immediate and medium-term futures.

New risks for the biodiversity and especially for butterflies are arising from the cultivation of genetically modified maize. The biotech group Monsanto had entrusted geneticists to introduce parts of the genome of the bacterium *Bacillus thuringiensis* into the maize genome. The maize becomes poisonous, not only for the European Corn Borer (*Ostrinia nubilalis*), the larvae of which feed in the stems of maize plants, but the toxic substances originating from *Bacillus thuringiensis* can impair also other butterflies, beetles, green lacewings, birds and hares. They can contaminate the soil and the pollen that is spread by wind. Today, the real risks and the total long-term consequences for the organisms are not exactly known. In 2007, this maize MON 810 was cultivated on c. 36 ha around the SAC reserve where the Dusky Large Blue is living.

In general, the farmers are open-minded about nature conservation in this region. They are actively involved in landscape management and nature conservation, and they are carrying out specific measures, such as the following:

- an adapted management of some arable fields to support the rare bird species Grey Partridge (*Perdix perdix*), Lapwing (*Vanellus vanellus*), and Ortolan Bunting (*Emberiza hortulana*);
- a specialised utilization of meadows in favour of the threatened bird species Corncrake (*Crex crex*) and Yellow Wagtail (*Motacilla flava*);
- withdrawal of strips at arable fields to establish habitat elements for bird species living in arable fields and woods;

- maintenance of careful management and establishment of hedges.
Many other important stakeholders in the region support nature conservation. For example:
- The municipal authority (of the city of Radeburg, to which the area belongs) is receptive to nature conservation and landscape management, and supports it actively.
- The local home village society is engaged in practical measures.
- The inhabitants of the neighbouring village of Marsdorf (administrative part of the Saxon capital Dresden) are attached to the beautiful environment of their village, and they are carrying out various measures (e.g. planting shrubs, trees and hedges) and monitoring threatened bird species. In 2003, they were the winners in a nationwide competition organized by the federal environmental foundation DBU (Deutsche Bundesstiftung Umwelt) and the Second German Television Channel.
- A voluntary section of nature conservationists, including a youth and a children's group, has been very active in the region for almost 30 years. They analyse the bird populations, care for nature reserves, collaborate with communities, landowners, and farmers (e.g. in special landscape management measures, care of White Storks, and public relations work).

This sensitivity of various stakeholder groups to nature conservation issues is an important precondition to realizing the conservation goals. It is also very important with regard to the precautionary principle: The chances for the protected species and habitats rise if various efforts and people support these goals, or if they only avoid disturbances or other unfavourable impacts.

CONCLUSIONS

Natura 2000 is a relatively new but effective tool to further nature conservation, and it gives special regard to the precautionary principle. This principle finds expression in coping with scientific uncertainty concerning the number and size of habitats and plant and animal populations necessary for their survival. To reduce the risks of extinction, not only one habitat or population of a type or a species is included into the network of protected areas. Rather, a certain percentage of areas (being as large as possible) believed to be sufficient is included. In Natura 2000, not only ecological issues are taken into account but also economic and social aspects, and the various stakeholders are involved in decision-making and management. The comprehensive network of protected areas covering large areas in all EU Member States is a precondition for the long-term survival of endangered species and their habitats. The success of Natura 2000, however, will also depend on how the protection and the necessary management measures can be guaranteed, including in times when money is short. To improve the acceptance of Natura 2000, more public relations work is needed as well as financial security for the landowners and land users to carry out the sometimes expensive management measures. However, the scientific investigation (e.g. about population biology and ecology) should also be deepened in order to find the most favourable solutions to manage these areas. The Natura 2000 approach is suitable not only on a national or a European scale but in a worldwide context to maintain global biodiversity in a sustainable manner while considering the precautionary principle.

REFERENCES

- Bastian, O. (2007). The Moritzburg cultural landscape - between traditions and new challenges. In: Pedroli, B., van Doorn, A., de Blust, G., Paracchini, M.L. Wascher, D., Bunce, B. (Eds.): *Europe's living landscapes. at a turning point*. pp 261–276. KNNV Publishing & Landscape Europe, Wageningen (NL).
- Bastian, O., Schrack, M. (1997). *Die Moritzburger Kleinkuppenlandschaft – einmalig in Mitteleuropa!* Veröff. Mus. Westlausitz Kamenz, pp 118.
- BfN (2005). *Natura 2000*. The Federal Agency for Nature Conservation. Retrieved 2007, February, from <http://www.bfn.de>.
- Cooney, R. (2004). *The Precautionary Principle in Biodiversity Conservation and Natural Resource Management: An Issues Paper for Policy-makers, Researchers and Practitioners*. IUCN, Gland, Switzerland and Cambridge, UK, pp 51.
- European Commission (2000). *Communication on the Precautionary Principle*. COM No.1/2000.
- GDENV (2000). *Natura 2000*. EU-General Direction Environment D2. Newsletter 11/2000.
- LfUG (2004). *Dunkler und Heller Wiesenknopf-Ameisenbläuling: Arten der Fauna-Flora-Habitat-Richtlinie (FFH)*. Sächsisches Landesamt für Umwelt und Geologie, Dresden.
- LIBAQ (2001). *Schwarzblauer Bläuling (Maculinea nausithous)*. Natura 2000 InfoPool für Brandenburg, Retrieved 2007, March, from <http://www.natura-2000.de/steckbr/nausi.html>
- Stolzenburg, U. (2001). Zum Vorkommen des Dunklen Wiesenknopf-Ameisenbläulings *Maculinea nausithous* (Bergstraesser, 1779) im Naturraum Westlausitzer Platte. *Veröff. Museum Westlausitz Kamenz* 23: 89–96.