

“Dead wood: a key to biodiversity”
Proceedings of the International Symposium
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This symposium focused on the role of dead wood conservation in maintenance and enhancement of forest biodiversity. Dead wood is an important part of the forest ecosystem, when a tree dies it only has fulfilled one part of its ecological role. Innumerable species (from lichens to vertebrates) depend on the microhabitats provided by hollow or senescent living trees or by dead trees (standing and fallen). During the meeting several approaches on the conservation, protection of these habitats and on forest applications used in different countries were highlighted.

The largest part of this meeting was however dedicated to the **Bosco della Fontana Life project**. The nature reserve (239ha) is one of the last oak-hornbeam relicts on the Veneto Plain. During the 1950s alien tree species were introduced after heavy post-war logging, especially *Quercus rubra* is threatening the floral harmony of the site. The Life project involves the elimination of alien species and their transformation into dead wood by reproducing the effects of natural perturbations. To complete the restructuring of the dead wood components, the London plane (*Platanus spp.*) trees are converted into “habitat trees” through pre-senescence. All methods used for inventory projects (invertebrates, birds, etc.) were explained next to the forest management techniques. R. Cavalli and F. Donini explained the possible **management actions to increase the amount of dead wood**. Analysis of inventories for the elimination of red oak, obtained by simulating the effects of meteoric events, and interventions to produce habitat trees (nesting holes and basal slits) has demonstrated the validity of the tested techniques in terms of both work productivity and costs. In the Bosco della Fontana projected explosives were used to produce standing snags, whilst other trees were uprooted or partially debarked. Most of these techniques can be used in other environments that differ by their morphological characteristics and infrastructure (slopes etc.). L. Longo and J.P. Rukalski & M. Faccoli respectively presented the effect of the creation of holes in alien trees on the population of **birds and ambrosia beetles**. The first study revealed an increase of birds breeding in these habitat trees not only because of the better protection of their nest but also of the higher amount of nourishment available. The latter shows an augmentation of ambrosia beetles attracted especially by dead and uprooted pedunculate oaks. The **insect assemblages** in Bosco della Fontana were studied by D. Birtele since 2002 (study till 2005). The author

used a new method of trapping; wooden boxes filled with *Quercus robur* L. shavings. The aims of the study are twofold; on one hand to provide information on the insect succession that occurs during the early stages of decomposition and on the other hand to establish whether such method can be applied as an instrument for testing the efficiency of forest management actions aimed at maintaining and enhancing biodiversity in forests. The preliminary results are promising, after one year many (saproxylic) syrphidae and tabanidae were reared from the boxes. Besides insect communities **vertebrates of lowland forests**, particularly those species with a clear preference of dead wood, were studied in Bosco della Fontana (P. Paolucci). Small mammals and birds are the main vertebrates that take advantage of this important ecological niche (as feeding, nesting or hibernation site). This work is a resume of the vertebrate species that can be found in a lowland forest.

Next to the conservation and the increase of dead wood, the project aims to give a sufficient information support dedicated to the **popularisation** of this Life-project and the research activities. This need was due to the fact that most forest management activities undertaken at Bosco della Fontana may seem destructive and illogical to everyday visitors. Public awareness was achieved with projects for visitors, schools, university students and the participants of fairs and specialised meetings. Through the use of multimedia networks a progressively larger level of popularisation was obtained.

Other studies on different topics of dead wood communities were also presented, mainly about conservation of dead wood, saproxylic insects and bird nesting.

D. Vallauri presented a **review of the literature on dead wood** in temperate old-growth forests. After a brief comparison of managed forests in French regions and Europe some suggestions are made by the author for a better management. According to D. Vallauri a reasonable goal for managed forests in France would be to restore a minimum of 15 m³/ha of dead wood, with at least 2 fallen trees and 2 standing (broken by wind, lightning) dead trees with a diameter larger than 40cm.

E. Sandström presented the objectives and results of **dead wood conservation in Swedish forestry** and their experiences with Life-projects. In 1994 the forest policy gave equal importance to the environmental and production goals; dead wood became important for conservation. The aim in Sweden is to increase the amount of dead wood by 40% (in 2010). Nine Life-projects with the support of the EU tries to improve the methods to promote the environment as used in Sweden.

J. Schlaghamersky talked about the **saproxylic invertebrates of floodplains**. Most primeval forests (only) exist in mountainous areas and higher altitudes while very few lowland forests have an unbroken history of existence and a close to natural state. In some floodplains of large rivers however forests did prevail throughout the ages but they are nowadays among the most endangered habitats in Europe. The author studied since 1996 the poorly known saproxylic arthropod floodplain community of South Moravia (Czech republic). The results showed a large difference between de flooded

and not flooded site (almost 50% more species in the not flooded site).

In 1970 two natural forest reserves were established in the "Reichswald" Nordrhein-Westfalia (Germany). To **evaluate the conservation value** of these beech-oak forests, in relation to forested sections, birds and saproxylic beetles were surveyed. The author (S. Hardersen) found in the natural forest reserves a more complete community of birds typical for beech forests, the total number of threatened bird species was also higher. The overall number of saproxylic beetles showed no clear difference between the sections; however more xylo-detriticolous beetles with higher numbers of threatened species were found in the natural forest reserves.

Another type of forest management is natural disturbance. After the severe **windthrows** caused by the storm "Vivian" in 1990 the **arthropod fauna** was assessed for upon 10 years in three regions in the Eastern Swiss Alps. This study conducted by B. Wermelinger et al. reared a total of 1683 arthropod species. Windthrows areas yielded 35-69% more species than the intact forest plot, but only species composition and not species numbers differed between cleared and uncleared windthrows areas and saproxylic beetles were more abundant on uncleared areas.

Most information on saproxylic invertebrates comes from the Fennoscandian boreal forests (J. Siitonen and P. Martikainen presented respectively their research). The principal threat to fauna and flora in these forests is large-scale reduction of dead wood as a result of intensive forest management. J. Siitonen talked about the **saproxylic species in boreal forests and the effects of forestry methods**. Restoration of formerly managed stands in forest reserves has recently started on a large scale. Since 1990, new biodiversity-oriented management methods have been introduced into Fennoscandian forestry. The main methods include retention of important structures in regeneration, cutting and selecting important key habitats that are left outside forestry operations. This creates new habitats for saproxylic species and these are potentially powerful tools to revive saproxylic populations. The presentation of P. Martikainen dealt with the problems with **saproxylic insect inventories**. The results demonstrated that samples containing less than 200 beetles (2000 individuals), threatened species only accidentally occur in the samples; from 400 sampled species the probability of finding threatened species increased considerably.

The distributions of several saproxylic invertebrates were explained. For example *Osmoderma eremita* (by Audisio et al.). Present knowledge on the geographic distribution, ecology and conservation issues of *O. eremita s.l.* in southern Europe and especially Italy are dealt with. The results suggest a specific rank of genetic differentiation among sampled populations of *O. eremita* (Scopoli) (from central Italy and southern Sweden) and *O. lassallei* Baraud & Tausin (from Croatia). The definition of the actual taxonomical arrangement of the four presumed southern European "species" of *Osmoderma* is extremely important in order to establish a correct conservation plan for the whole European *Osmoderma* populations.

Eupotosia mirifica is another threatened saproxylic beetle species. In this contribution (by H. -P. Aberlenc et al.) the present state of knowledge and researches about this species are given and proposals for its conservation are made. According to the authors the species must be listed as local and European protected, with protection for its natural habitats, especially old oak.

The protection of **saproxylic syrphids** is discussed by M. Speight and J.A. Good. It is demonstrated that maintenance of quantities of coarse woody debris (including dead trees) in European forests is largely irrelevant for the maintenance of biodiversity in saproxylic syrphids. Most saproxylic syrphids depend upon microhabitats occurring almost exclusively in live (old or senescent) trees. It is concluded that unless problems dealing with dead wood conservation are overcome, "ecologically-friendly" forestry measures could as easily damage saproxylic biodiversity as maintain it. But not all forests need to be transformed to maintain the saproxylic insect diversity or to control the saproxylic pest species. Trees in healthy vegetative conditions are able to prevent attacks by **xylophagous insects**, therefore it is important to preserve the forest health (G. Curletti).

White-backed woodpecker, a species associated (in Italy) with mature beech woodlands and highly endangered in the westernmost parts of its large Palearctic range, is the study subject of M. Bernoni. Between 1987 and 2002 twenty-one nest holes of this species were found in the Apennines. The main study area considered was the Abruzzo National Park. The research aimed on one hand to identify the environmental characteristics of the species breeding areas and on the other hand to clarify the selection of the breeding site, also with the aim of providing suggestions for beech woodland management. The results show how the species purposely selects mature, old or rotting trees with large dead zones with all holes found in high trunk trees.

G. Allegro studied the **great spotted woodpecker** in the Po area by looking at nest sites. This species has to be considered a valuable help in the natural control of poplar borers, moreover the species shows a functional response to the pest species density and can prevent outbreaks. Nests and roost-holes are mostly excavated in dead trees and snags of more than 15cm in diameter. The author strongly recommends the preservation of those trees that can harbour the great spotted woodpecker. Other authors also emphasise the importance of woodpeckers in a forest ecosystem. R. Groppali talked about the **importance of woodpeckers in the reintegration of forest soil fertility**. They cause a continuous fragmentation of wood during their food search and the excavation of holes and nests in trees. Such fragments are more easily attacked by micro-decompositors, so accelerating the process of complete mineralization.

F. Mezzavilla and S. Lombardo began a study on **Tengmalm's owl** in 1987 and had as major aim to define the breeding biology and habitat choice of this species. By mean of nesting boxes installed in different wood typology, the authors studied the habitat preferences in three different areas and came to the conclusions that mostly spruce and mixed forests were hosting this species.

Not only birds and saproxylic invertebrates are important indicators for forest value; also fungi play an important role in the forest ecosystem. P.

Renvall gives in his presentation a brief summary on some major principals of the **dynamics of wood-decaying Basidiomycetes** on decomposing tree trunks in boreal old-growth forests. Species of wood-inhabiting fungi succeed each other during the decomposition of a trunk. Details of the species compositions and successional pathways vary strongly from tree to tree. Many species depend on old-growth forest and are now very threatened.

At the end of the meeting, a round table discussion was conducted to summarise the presentations, remarks and suggestions made during the sessions. This resulted in the formulation of a three point "Recommendation" on the dead wood issue, for transmission to institutional and European Union bodies. The text summarises priorities identified by the symposium participants and gives guidelines for further research possibilities.

Recommendation:

The Mantova Symposium participants recommend that:

1. a workshop at international level be arranged between specialists in the study of saproxylic flora (including fungi, lichens and mosses) and fauna (vertebrate and invertebrate) and those responsible for managing and monitoring forests selected for inclusion in the Natura 2000 series of sites, with a view of reviewing maintenance of these organisms and how they might be used in monitoring forest conditions, in different types of forest and different parts of Europe, taking (at least) one forest in each EU member State as a case study and with the particular objective of identifying any procedures that might be open to standardisation;
2. the saproxylic species mentioned as characteristic/typical of forest types within the Interpretation Manual of Habitats Directive be augmented, to cover a greater diversity of the threatened forest habitats listed in the Directive
3. urgent consideration be given to how a computerised database can be provided, of the biological information available for the saproxylics listed as characteristic/typical in the Interpretation Manual, for use as an interpretative tool in all member States.

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