

# Researches on the ecological role of dead wood in the Natural Reserve “Izvoarele Nerei”

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**Abstract** One of the defining characteristics of the (quasi) virgin forests is the presence of dead wood (standing dead trees, fallen logs) in different stages of decomposition. The importance of dead wood consists in the fact that it generates a multitude of specific habitats for a large series of organisms, giving a specific note to forest biodiversity. The main objective of this paper is the determination of quantitative and qualitative indexes of dead wood (diameter classes and decomposition –decay– classes, frequency of microhabitats) from „Izvoarele Nerei” Natural Reserve and the determination of the ecological role of dead wood regarding the optimal functionality of forest ecosystems.

## Key words

dead wood, decay classes, diameter classes, microhabitats, virgin forests

Up to a third of European species depend on veteran trees and dead wood for their survival. Deadwood is providing habitat, shelter and food for birds, bats and other mammals and is particularly important for the less visible majority of forest dwelling species: insects, especially beetles, fungi and lichens. Deadwood and its biodiversity also play a key role for sustaining forest productivity and environmental services such as stabilising and storing carbon [5].

Despite its enormous importance, deadwood is now at a critically low level in many European countries, mainly due to inappropriate management practices in commercial forest and even in protected areas. Average forests in Europe have less than 5% of the deadwood expected in natural condition. The removal of decaying timber from the forest is one of the main threats to the survival of nearly a third of forest dwelling species and is directly connected to the long red list of endangered species [5].

The absence of ageing and decay phases, rich in deadwood, is therefore one of the main ecological deficiencies of managed forests. As of the 1960s, the benefits of deadwood were highlighted by scientists. However, it would have to wait until the 1980s for the publication of the first monographs devoted to this particular habitat and its inhabitants, as well as a real inclusion of this forest component in the thinking of conservationist and managers. [6].

Increasing the amounts of deadwood in managed forest and allowing natural dynamics in forest protected areas would be major contributions in sustaining Europe's biodiversity. For generations, people have looked on deadwood as something to be removed from forests, either to use as fuel, or simply as a necessary part of “correct” forest management. Dead trees are supposed to harbour disease and even veteran trees are often regarded as a sign that a forest is being poorly managed [5].

In international and European political processes, deadwood is increasingly being accepted as a key indicator of naturalness in forest ecosystems [5].

Volume of deadwood depends on productivity, pattern of natural disturbance, successional stages, forest history and human intervention. Deadwood type and decay trajectory are influenced by the way in which it die (lightning strike, storm damage, drought, disease etc). Deadwood type and volume vary between different forest types and management systems. Some types of disturbance are particularly linked to the production of either standing deadwood (e.g. dry - out), or fallen deadwood (e.g. storm damage) [5].

Table 1

Average volume of deadwood in the forest in a few European countries [5]

Country	Volume of deadwood (m <sup>3</sup> /ha)	Nature of data
Austria	0.6	Productive forests (88% of total), over 35 cm diameter
Belgium	9.1	Regional average (Wallonia), standing and fallen deadwood
Finland	2 – 10	Average production forest
France	2.2	National average
	6.7	Departmental maximum (Savoie)
Germany	1-3	Regional average (Bavaria)
Luxemburg	11.6	National average
Sweden	6.1	National average
	11.6	Regional maximum (North)
Switzerland	12	National average
	4.9	Average in the “plateau” region
	11.6	Average in South of the Alps
	12.2	Average in the pre - Alps
	19.5	Average in the Alps

## Material and Method

The Natural Reserve “Izvoarele Nerei” is located in South-Western Romania, in Caras-Severin County, on the territory of Nera Forest District, and according to the local administration to the Prigor Commune. This Reserve covers the South and South-Eastern slope of the Semenic Mountain and it was established in 1975.

Geographically, the Reserve is located between 45°5' - 45°10' lat. N and between 22°2'30" - 22°6'40" long. E; according to forestry administration, the Reserve is located in the Nera Forest District and at a lower level in two Production Units: II Nergana and III Nerganita. The Reserve has a total surface of 5260.3 ha, represented by 4772.9 ha natural reserve and 487.4 ha as buffer zone.

Among the principal motives for choosing „Izvoarele Nerei” Reserve for this study are the following:

- The Reserve has been in the last 30 years under a strict protection regime, with integral protection as a Scientific Reserve, stated by the zonal functioning of the forests, according to the forest management plans; no forest harvesting or dead wood removal was present in this Reserve;
- The Reserve is included in the National Park “Semenic – Cheile Carasului”;
- The whole Reserve has a surface of 5253 ha (with 487 ha as buffer zone), which represents one of the largest beech virgin forest from Europe (Giurgiu, V., et al, 2001);

- The Reserve is distinguished by a large number of dead trees fallen on the ground and standing dead trees, broken mainly due to wind action; despite these dead trees, the forest from the Reserve presents very strong ecological stability.

The aim of this paper is to deepen the knowledge about the role and importance of dead wood in (quasi) virgin forests, this element being a definitory characteristic of sustainable management of the forests.

The fieldwork was undertaken in circular research plots of 500 m<sup>2</sup> which were located on altitudinal layers. The location on field of the research plots was made on the level of 800 m, 1000 m and 1300 m altitude (15 research plots per level line), in order to detect, in the most representative way, all decomposing categories of dead wood and all the specific microhabitats present in this forest, according to the development stages of this forest.

For the standing dead wood, the total height and the diameter at 1,30 m was measured. For the fallen dead wood, two diameters were measured –at both ends– and the total length; only pieces with at least 8 cm diameter at the thick end and at least 1 m in length were considered. Regarding the saprofitic flora and fauna, the observations were made on itinerary and the species of fungi and insects on or inside the dead wood were mentioned (enumerated). For each research plot, all present microhabitats were recorded. The statistical processing of the data was undertaken using the Microsoft – Excel software. The estimate of the (living) standing volume was made by the classical method of volume series and by using the specific software FOND. Six classes of dead wood decay were used (see photos 1-6), which are described in Tab. 2.

Description of decay classes [3]

table nr. 2

Decay class	Bark	Twigs and branches	Softness	Surface	Shape
1	Intact or missing only in small patches, >50%	Present	Hard or knife penetrate 1-2 mm	Covered by bark, outline intact	Circle
2	Missing or < 50%	Only branches > 3 cm present	Hard or knife penetrate less than 1cm	Smooth, outline intact	Circle
3	Missing	Missing	Begin to be soft, knife penetrate 1-5 cm	Smooth or crevices present outline intact	Circle
4	Missing	Missing	Soft, knife penetrate more than 5 cm	Large crevices, small pieces missing, outline intact	Circle or elliptic
5	Missing	Missing	Soft, knife penetrate more than 5 cm	Large pieces missing, outline partly deformed	Flat elliptic
6	Missing	Missing	Soft, partly reduced to mould, only core of wood	Outline hard to define	Flat elliptic-covered by soil



Class I (Photo 1)



Class II (Photo 2)



Class III (Photo 3)



Class IV (Photo 4)



Class V (Photo 5)



Class VI (Photo 6)

Photos 1-6 – Beech logs – examples for each decaying class

## Results

## 1. The quantity of dead wood

After the location on field of the 45 research plots (each plot of 500 m<sup>2</sup>) on 3 altitudinal levels (800 m, 1000 m and la 1350 m) and the processing of the collected data, it resulted an average quantity of dead wood of 115 m<sup>3</sup> / ha. The whole quantity of dead wood is represented by beech.

This quantity is not uniformly distributed on the surface of the Reserve, it varies between 79 m<sup>3</sup> / ha on the 1350 m altitudinal level and 134 m<sup>3</sup> / ha on the altitudinal level of de 800 m (fig. 1). This fact is explained both by forest site quality (which is superior on low altitude forests and poor on high altitude sites) and by the situation that beech living at an altitude of 1350 m is close to the alpine grasslands (and the treeline) and close to the altitudinal limit of this species' vegetation condition.

As it can be observed on the graph above, the most significant quantity of dead wood is present on the altitudinal levels of 800 m and 1000 m, which represents the zone where very large exemplars of beech trees are uprooted or broken by wind or snow. In the same time, the number of dead wood pieces is larger on the mentioned altitudinal levels than the number of pieces recorded on the plots located at 1350 m.

In the graphs below (fig. 2-4) it can be seen that on the altitudinal levels of 800 m and 1000 m, and also at 1350 m, the standing dead wood volume is smaller compared to the fallen dead wood volume, due to the fact that the contribution to the quantity of standing dead wood is brought by a small number of trees dying on foot due to concurrence at initial stages in forest development, and also a small number of trees broken by windstorms or snow.

Thus, on the altitudinal level of 800 m, the standing dead wood volume 17% of the total quantity of dead wood recorded; on the altitudinal level of 1000 m the standing dead wood volume has a slight increment – 18% of the total quantity. Also on the altitudinal level of 1350 m, the situation is almost identical – standing dead wood volume 16% of the total dead wood volume recorded.

The mean quantity of standing dead wood recorded in the Natural Reserve “Izvoarele Nerei” (fig. 5) is similar with the quantity of standing dead wood found at the altitudinal level of 800 m, which is 17%, from the total quantity of dead wood recorded at the Reserve level.

## 2. The distribution of dead wood on diameter classes

As it can be observed from the graphs below, the distribution of dead wood volume on diameter classes varies from one altitudinal level to another. On the altitudinal level of 800 m (fig. 6), 20% of the recorded dead wood volume is represented by pieces (broken trunks, logs, uprooted trees) with a diameter between 51-60 cm, and 18% of the volume is represented by pieces with a diameter between 71-80 cm. The pieces with diameters between 101-110 cm and the pieces with diameters between 81-90 cm have also a relatively significant contribution in the dead wood volume (15% and 14%, respectively). The volume represented by the other categories of diameters has a lower contribution, individual values vary between 1% and 10%.

Regarding the altitudinal level of 1000 m (fig. 7), the main quantities of dead wood come from pieces with diameters between 71-80 cm (20%) and pieces with diameters between 81-90 cm (20%). Significant volumes of dead wood come also from pieces with diameters of 51-60 cm (13%) and pices with diameters between 111-120 cm (12%). The volume coming from other diameter categories has individual values below 10%.

The distribution of dead wood on the altitudinal level of 1350 m (fig. 8) is a little bit different from the situations incoutered at 800 m and 1000 m. Thus, the largest diameter category with dead wood pieces is 81-90 cm. the one category from which 32% of the dead wood volume comes is 51-60 cm. This category is succeeded by the following categories: 61-70 cm (22%), 41-50 cm (17%) si 71-80 cm (13%). The volume coming from other diameter categories has individual values below 10%.

On large scale, in the Natural Reserve “Izvoarele Nerei” (fig. 9) the significant contribution of dead wood is brought by the pieces with diameters between 51-60 cm (22%), the next important categories being 71-80 cm (17 %) and 81-90 cm (12%). The other diameter categories have a smaller contribution to the dead wood quantity, with individual values below 10%.

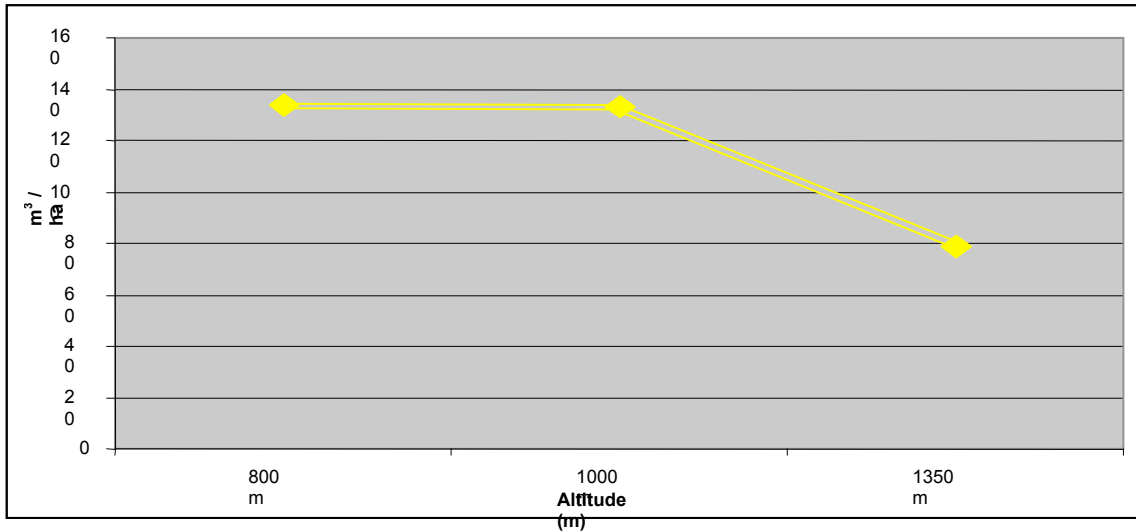


Fig. 1 – Distribution of dead wood volume per ha on altitudinal levels in the Natural Reserve “Izvoarele Nerei”

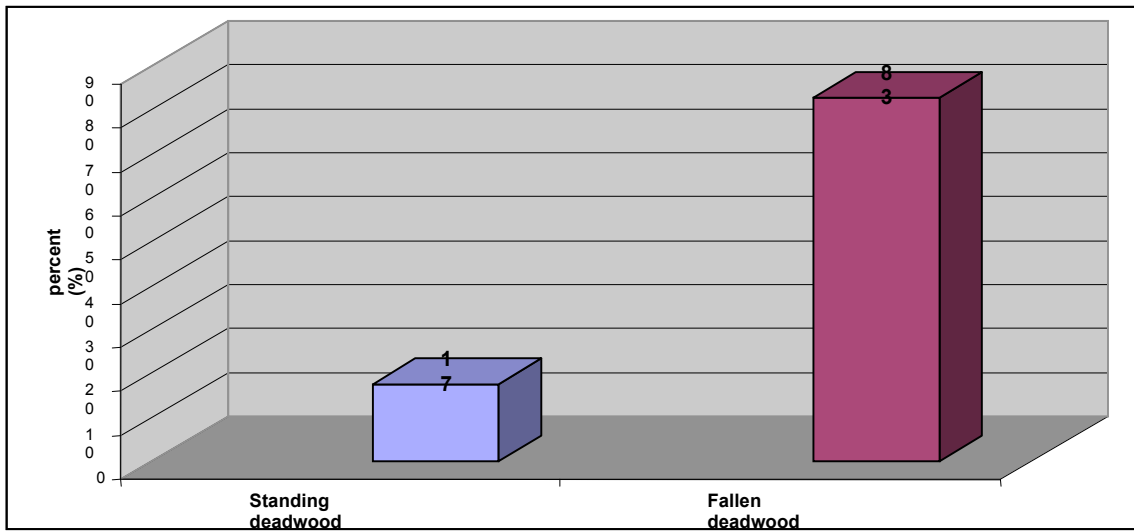


Fig. 2 - Percentage distribution of standing and fallen dead wood at the altitudinal level of 800 m

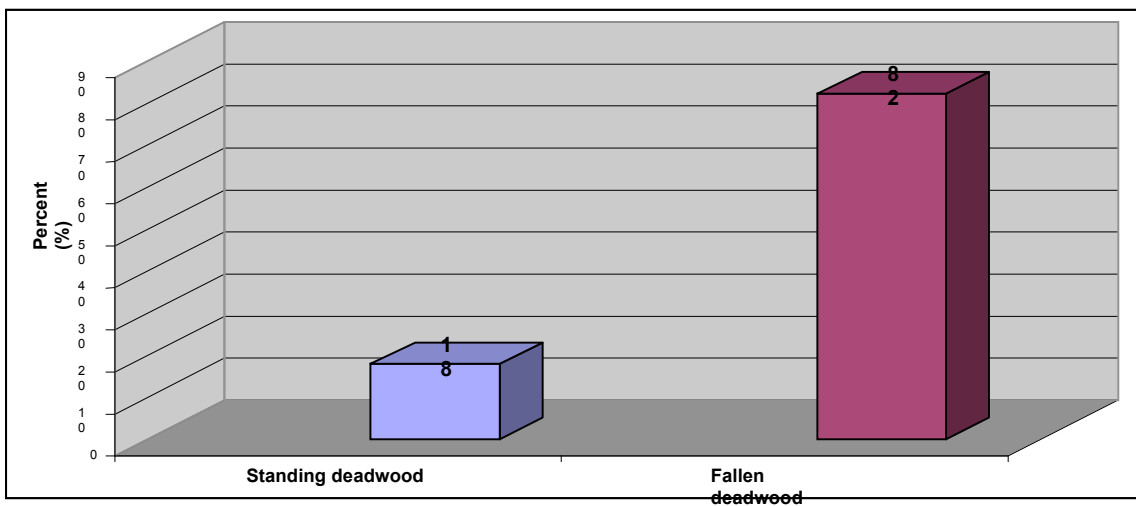


Fig. 3 – Percentage distribution of standing and fallen dead wood at the altitudinal level of 1000 m

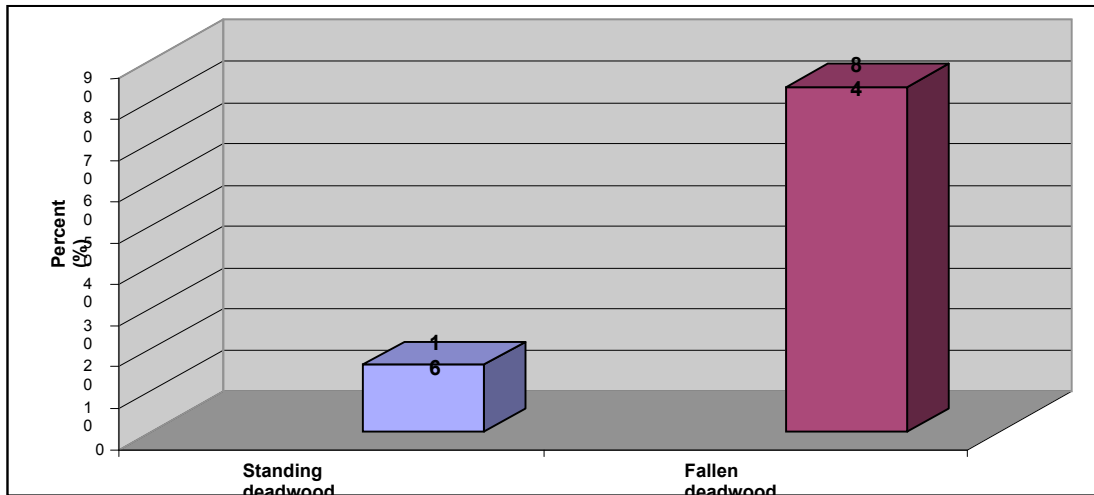


Fig. 4 - Percentage distribution of standing and fallen dead wood at the altitudinal level of 1350 m

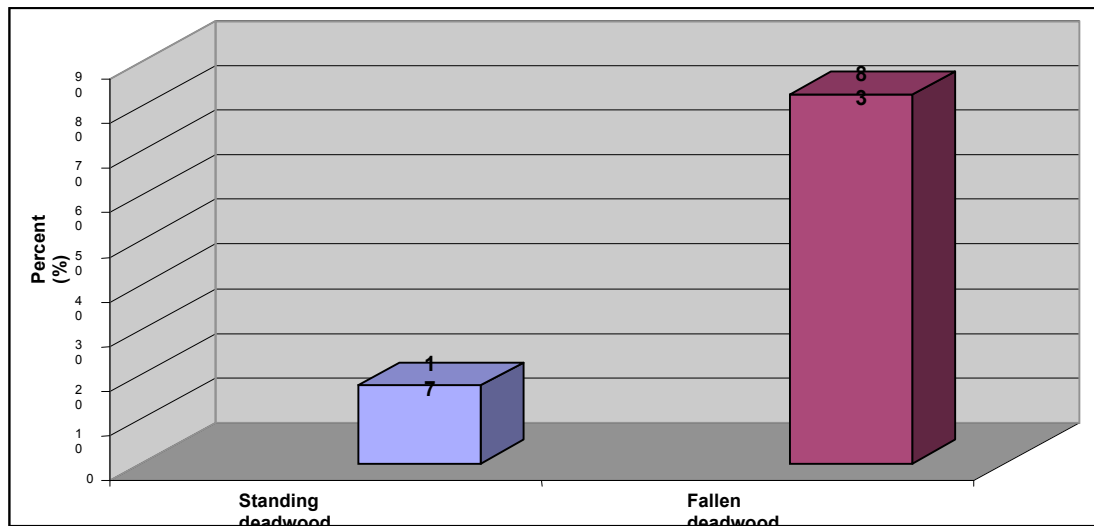


Fig. 5 - Percentage distribution of standing and fallen dead wood for the entire Natural Reserve "Izvoarele Nerei"

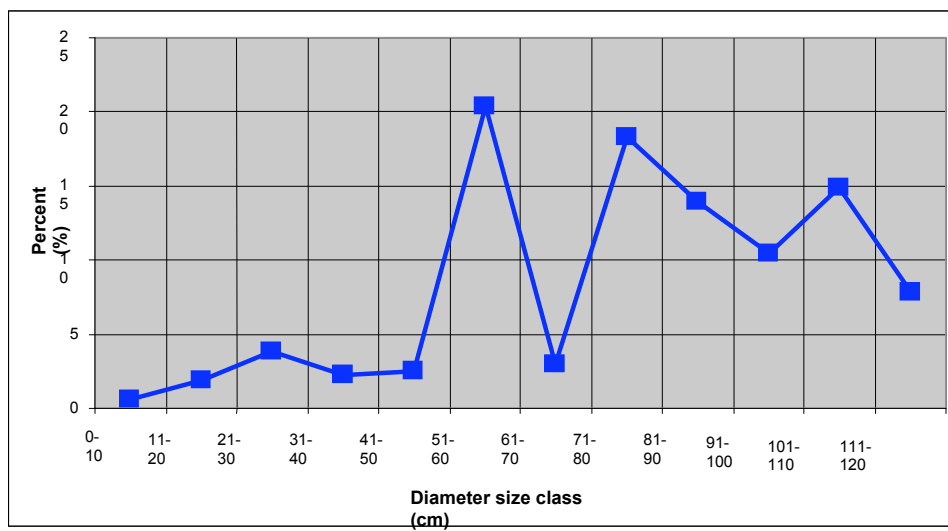


Fig. 6 - Percentage distribution of dead wood on diameter classes at the altitudinal level of 800 m

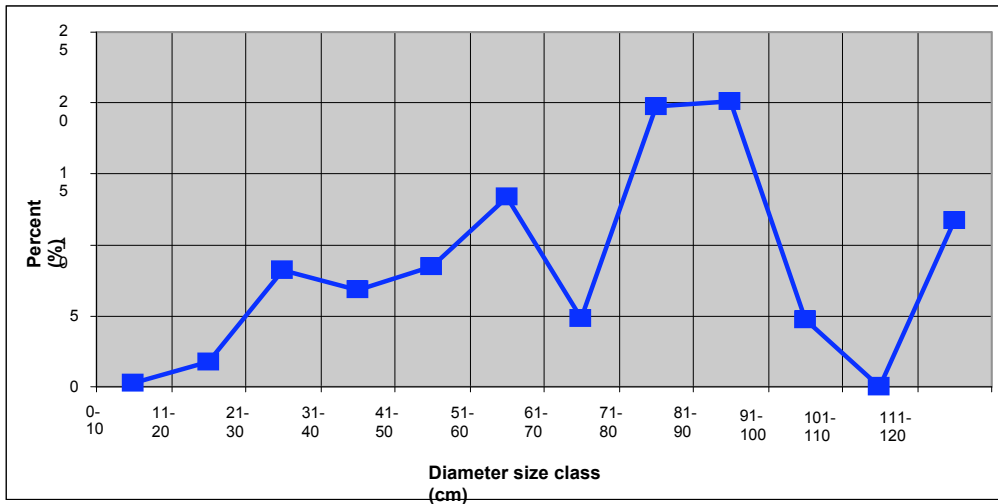


Fig. 7 - Percentage distribution of dead wood on diameter classes at the altitudinal level of 1000 m



Fig. 8 - Percentage distribution of dead wood on diameter classes at the altitudinal level of 1350 m

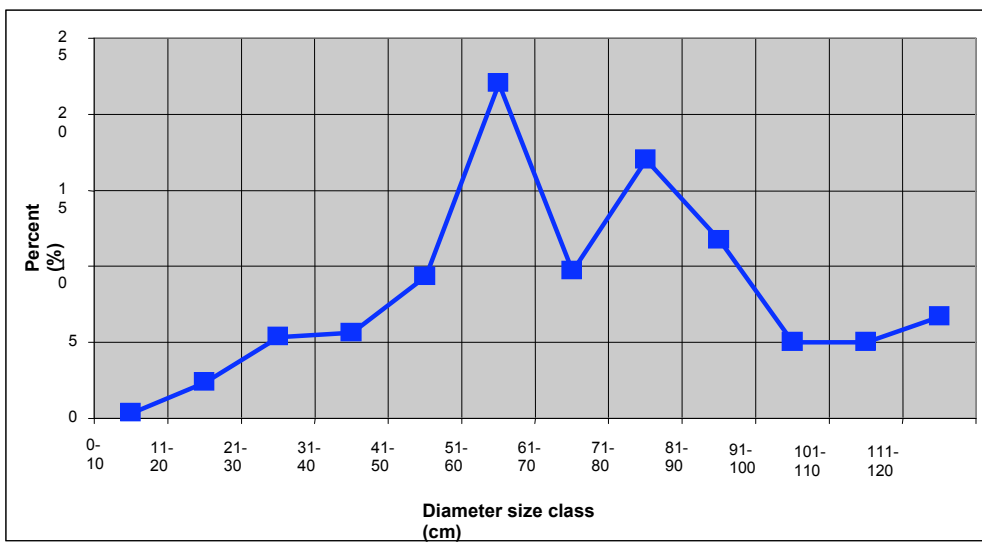


Fig. 9 - Percentage distribution of dead wood on diameter classes for the entire Natural Reserve "Izvoarele Nerei"

### 3. Distribution of dead wood on decay classes

From the graphs below it can be observed that it is a relatively uneven distribution of the dead wood volumes on decay classes. Due to the fact that the Natural Reserve “Izvoarele Nerei” was established approx. 30 years ago, but mostly because of the inaccessibility of the area, the presence of large quantities of dead wood is possible also in the final decomposition stages, even in Class VI, unlike in other reserves, for example Natural Reserve “Runcu-Grosi”, where, due to silvicultural practices from the recent past (cuttings and dead wood removal), the quantity of dead wood in final decay stages (Classes V and VI) represents only less than 10% of the total amount.

In the case of Natural Reserve “Izvoarele Nerei”, these volumes represent 21% (6% in Class VI) on the altitudinal level of 800 m, 34% (3% in Class VI) on the altitudinal level of 1000 m and 20% (5% in Class VI) on the altitudinal level of 1350 m (fig. 10-12).

At a larger scale, for the entire Reserve, it can be observed an increased volume of dead wood in Class II of decomposition (27% from the total amount of dead wood), compared to the dead wood volume from Class I (7% from the total volume). For the Classes III, IV and V the distribution is almost equal; these three Classes summarize 61% from the total volume of dead wood. The Class VI of decay is represented by 6% of the total dead wood volume (fig. 13).

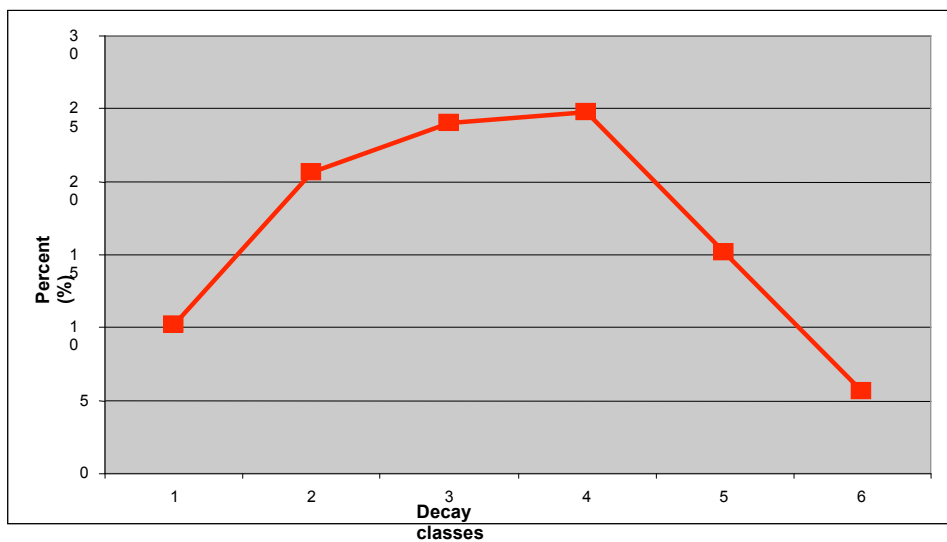


Fig. 10 - Percentage distribution of dead wood volume on decay classes for the altitudinal level of 800 m

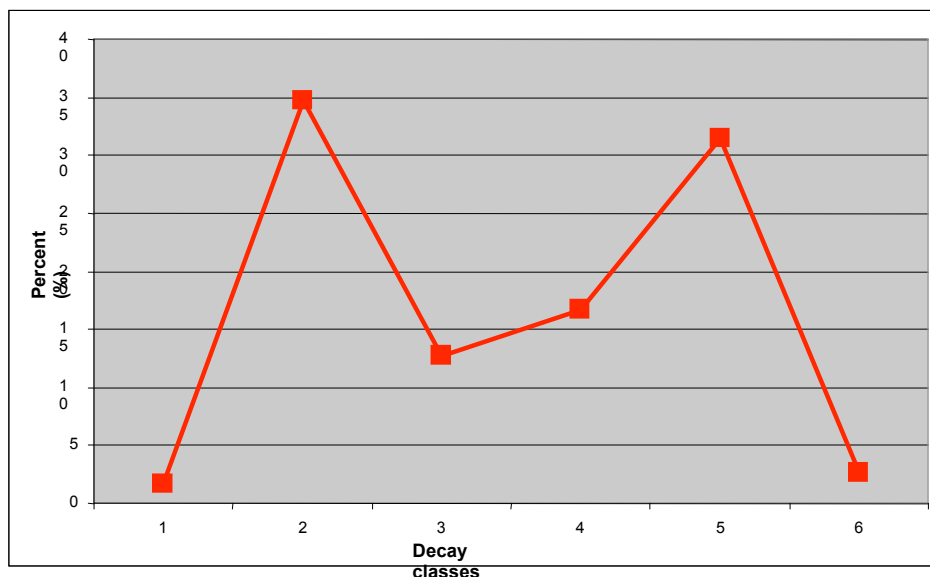


Fig. 11 - Percentage distribution of dead wood volume on decay classes for the altitudinal level of 1000 m

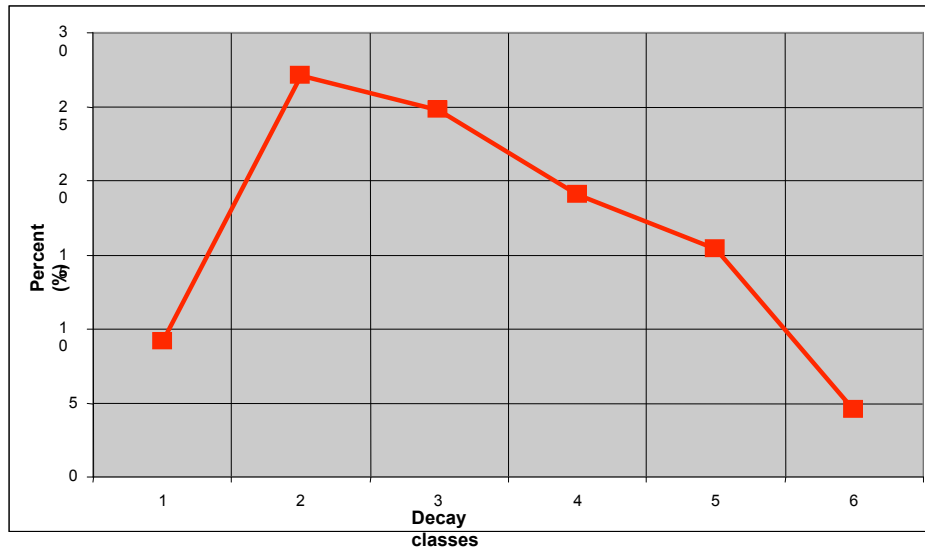


Fig. 12 - Percentage distribution of dead wood volume on decay classes for the altitudinal level of 1350 m

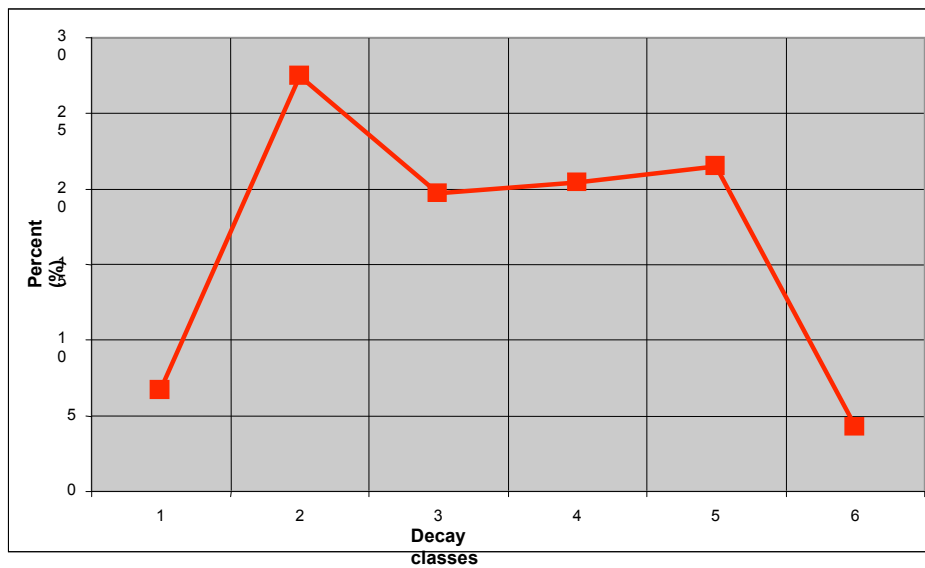


Fig. 13 - Percentage distribution of dead wood volume on decay classes for the entire Natural Reserve "Izvoarele Nerei"

#### 4. Microhabitats

As it is known, the forest biocoenosis, through the populations from its structure, realises a complete cycle of the organic matter from synthesis to decomposition. The quality of dead wood and its multiple uses which are offered to different species depend on the length of the decaying cycle and also on the tree species, the age of the tree at its death, cause of tree mortality, position (standing or fallen), tree size, climatic conditions, etc. (fig. 14).

The process of deadwood recycling can sometimes take hundreds of years to complete and includes three main phases:

- a short colonisation phases during which the wood is invaded by primary and vigorous saproxylic organism, often

longhorn beetles associated with fungi, which attack the wood when it is still hard [5];

- a long decomposition phase during which the primary saproxylic organisms are joined and replaced by secondary saproxylic organisms, which feed on material that has already been partially converted by colonisers, or are their predators [5];
- a long humification (formation of humus) phase through which the saproxylic organisms are progressively replaced by scavenging organisms like springtails or millipedes, who incorporate wood residues into the ground when it has been

sufficiently transformed during the decomposition phase [5].

During these phases, the tree components (branches, bark, roots, stem, etc.) offer microhabitats to different types of populations (consuming populations and decomposing populations) which form numerous food chains.

In descending order of the microhabitat presence in the Natural Reserve „Izvoarele Nerei”, it can be observed that the most frequent ones were “*bark of dead trees more or less detached*” and “*litter and fine woody debris*”, which were present in all

research plots. With a procent of 93% were present “*dead branches on the ground*”; “*dead tree on the ground*” were present in 87% of the plots. The similar case is for “*big dead tree broken by storm or the fall of another tree*” with a presence of 69%, the large number of these trees being explained by the actions of wind and snow. With a similar presence, 69%, appears another microhabitat, “*dead branches of living tree*”, presence that is explained by the inter-specific concurence between trees for light. “*Small cavities*” appear due to the action of insects in 56% of the cases. The other types of microhabitats have a presence below 50% (fig. 15 - 18).

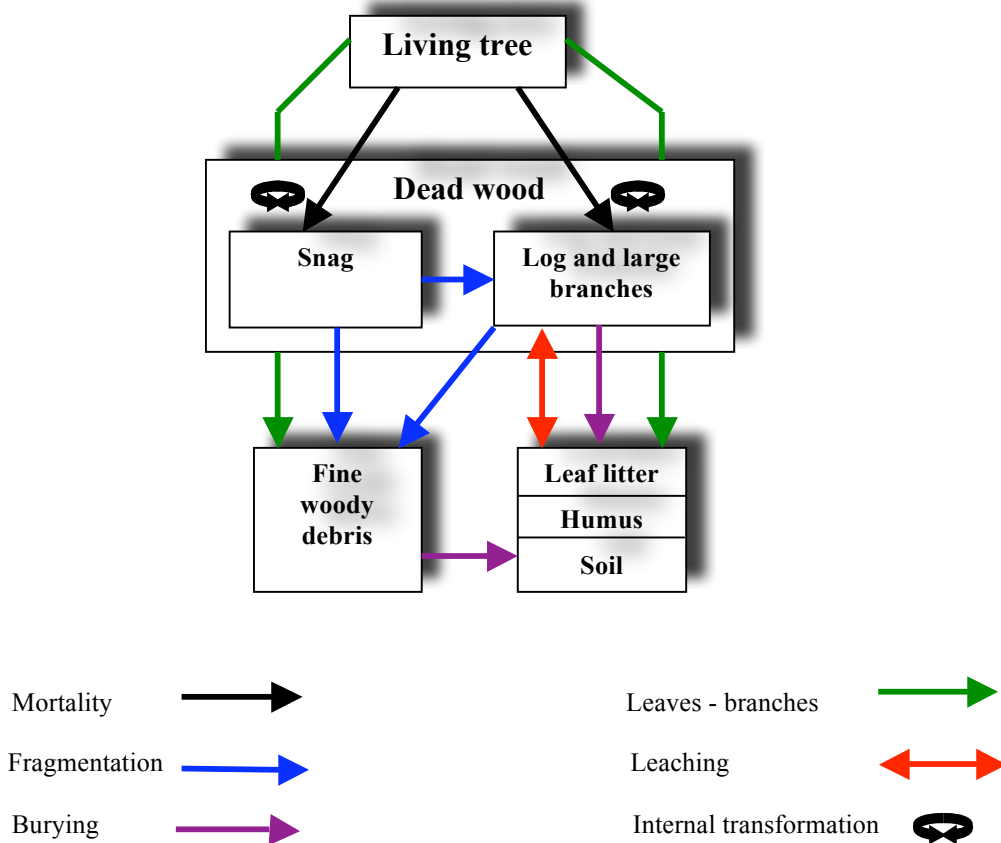


Fig. 14 – Simplified cycle of deadwood [6]

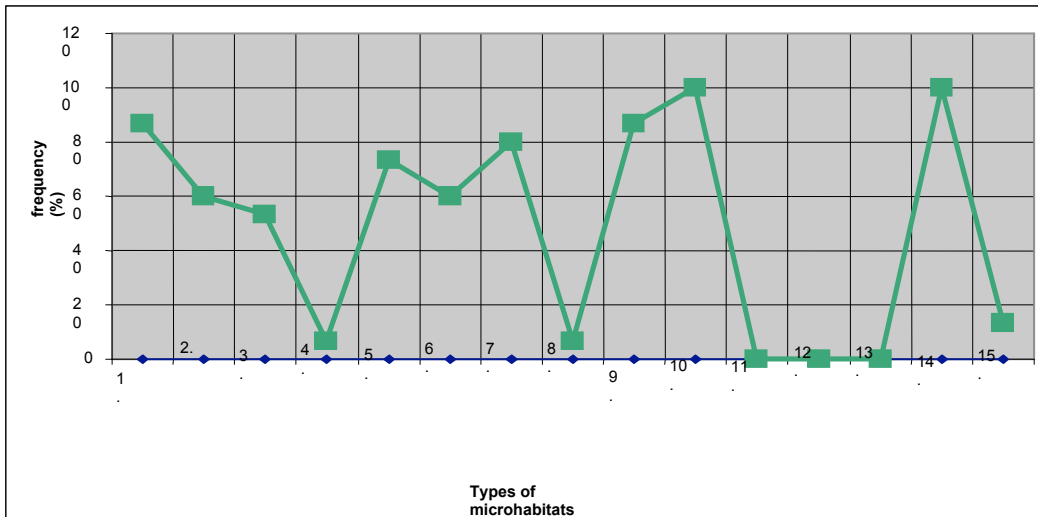


Fig. 15 - Frequency of microhabitats on the altitudinal level of 800 m

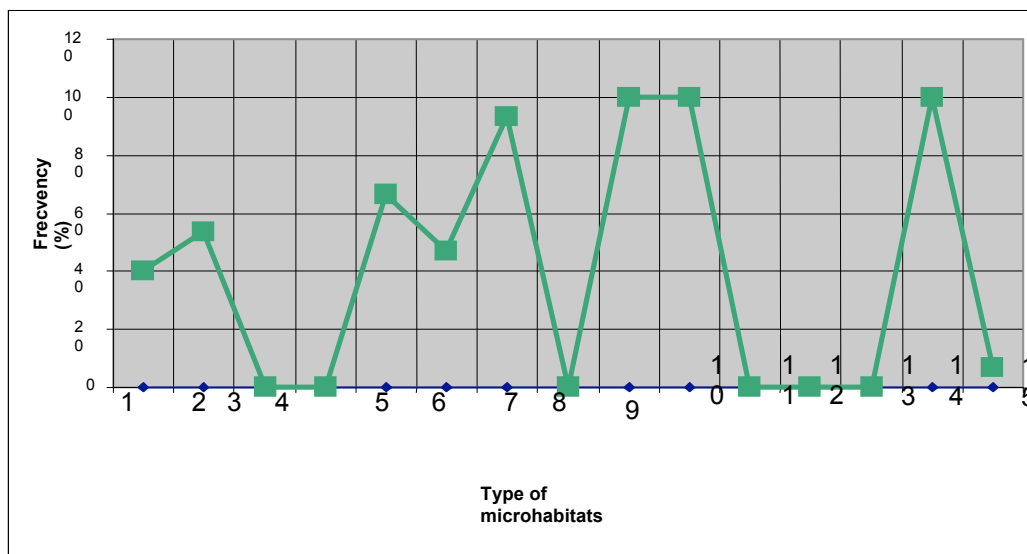


Fig. nr. 16 - Frequency of microhabitats on the altitudinal level of 1000 m

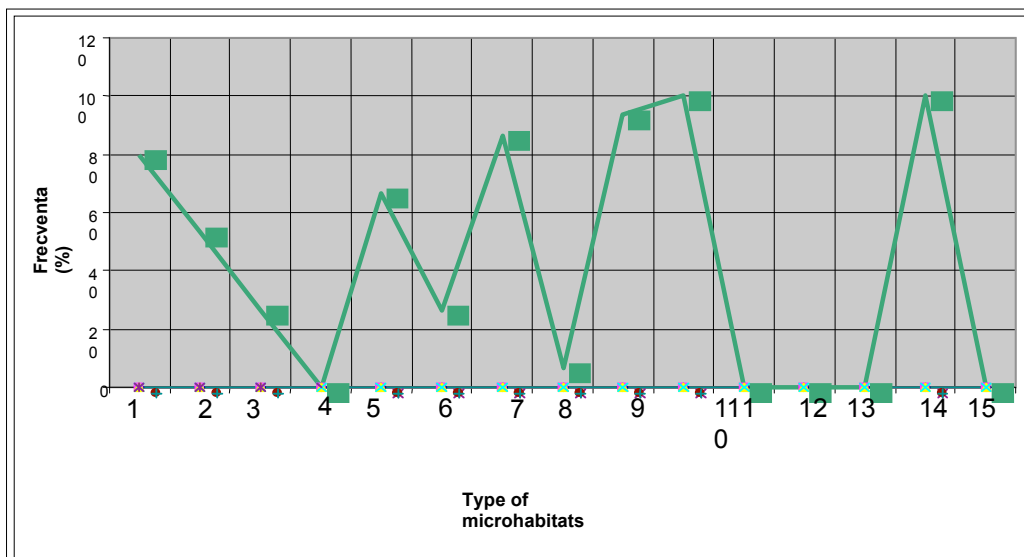


Fig. 17 - Frequency of microhabitats on the altitudinal level of 1350 m

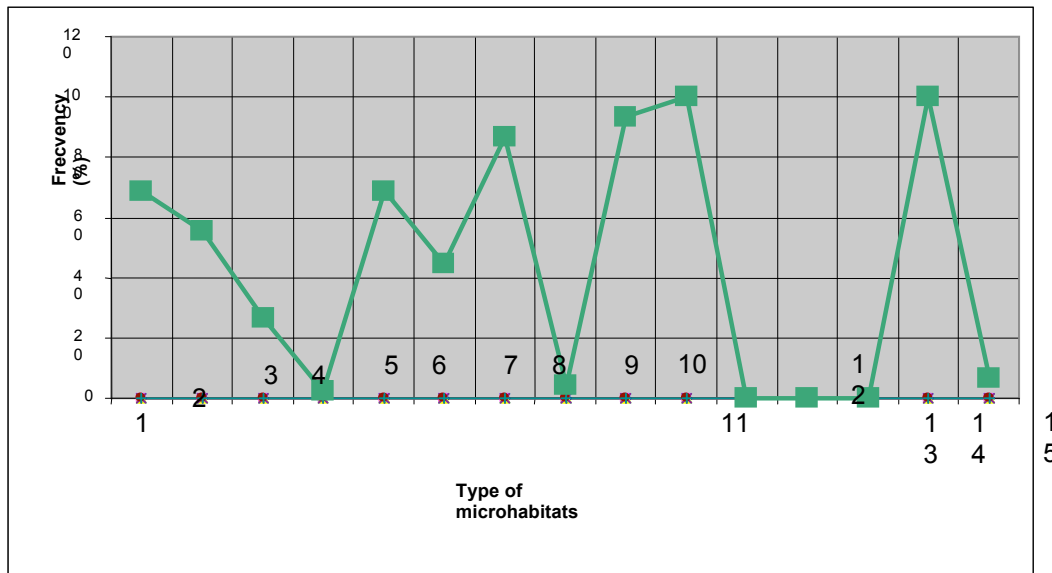


Fig. 18 - Frequency of microhabitats for the entire Natural Reserve “Izvoarele Nerei”

**Microhabitats:** 1-dead branches of living tree; 2-small cavities; 3-large cavities; 4-big standing dead tree; 5-big dead tree broken by storm or the fall of another tree; 6-small standing dead tree; 7-dead tree on the ground; 8-down dead tree with only one extremity touching the ground; 9-dead branches on the ground; 10-bark of dead trees more or less detached; 11-logging stump; 12-fine logging woody debris; 13-coarse logging woody debris; 14-litter and fine woody debris; 15-dead roots

## 5. Decomposing fungi and dead wood

The species of wood-rotting fungi are known to have specific preferences for certain stages of wood decomposition. Species replace one another in a characteristic sequence during the decomposition of wood, altering the physical structure, moisture, acidity and nutrient contents of the wood. This distinct successional order of species that develop on decaying trunks shows that lignicolous *Basidiomycetes* differ greatly from each other in their substratum requirements and in their competitive abilities at different stages of decomposition [9].

Properties of the host-tree species and the microclimate of the growth site govern the basic community development of wood-decaying fungi. However, the first stages in tree trunk decomposition strongly depend on the way the tree died. Pioneer decayers alter the structure and chemistry of wood, and in this way indirectly modify the fungal communities at later stages of succession [9].

Each stage of decomposition has a characteristic species' composition, which means that logs at each stage of decay harbour species which are not found at other stages of decay. The trunks at late and intermediate stages of decay maintain exceptionally diverse species' combinations and therefore are crucial for the conservation of lignicolous fungi. [9]

The history of fungal infections preceding the tree fall has a strong impact as do the base diameter and the type of stem breakage. Bark affects the microclimate inside wood by reducing evaporation, and thus is a factor that balances the moisture variability in fallen trunks [9].

The Natural Reserve “Izvoarele Nerei” is very interesting due to the saprophytic species decomposing beech. Lots of fructifications of *Fomes fomentarius*, *Ganoderma lipsiense*, *Fomitopsis pinicola* (well represented on beech), *Mycena haematopus*, *Mycena renatii*, *Pleurotus ostreatus* were observed. Among these, much rare species like *Polyporus squamosus*, *Hericium clathroides* and *Ossicaulis lignatilis* are present. The last two species are present on proposal lists for indicators of naturalness for the European beech forests (Christensen et al., 2004). Notable are in the same time *Artomyces pyxidatus*, *Pluteus luteovirens*, *Hypholoma epixanthum*, *Phyllotopsis nidulans*.

*Galerina paludosa* was observed on small hills colonized by species *Sphagnum*, and *Vibrissea truncorum* on a dead wood piece stucked in an acidophilous meadow. *Mycena galopus* was observed in the same amount in the meadow zones also. In the oligo-trophic rivers' zone from inside the forest there were found on dead wood debris the characteristic fungi: *Vibrissea truncorum* și *Cudoniella clavus* (Berducou, C., et al, 2006) .

List of fungi observed in the Natural Reserve "Izvoarele Nerei"  
 (after Berducou, C., Brustel, H., Corriol, G., Larrieu, L., Larrieu, S., Prud'homme, F.)  
 table nr. 3

Fungi	Izvoarele Nerei
Armillaria gallica	x
Artomyces pyxidatus	x
Calocera cornea	x
Collybia dryophila	x
Coprinus micaceus	x
Cudoniella clavus	x
Diatrype disciformis	x
Entoloma cetratum	x
Exidia truncata	x
Fomes fomentarius	x
Fomitopsis pinicola	x
Ganoderma lipsiense	x
Hericium clathroides	x
Hypholoma epixanthum	x
Hypholoma fasciculare	x
Kuehneromyces mutabilis	x
Marasmius alliaceus	x
Megacollybia platyphylla	x
Mycena crocata	x
Mycena galopus	x
Mycena leucogala	x
Mycena sanguinolenta	x
Ossicaulis lignatilis	x
Oudemansiella radicata	x
Pholiota lenta	x
Pleurotus ostreatus	x
Pluteus cervinus	x
Pluteus luteovirens	x
Polyporus leptcephalus	x
Psathyrella spadicea	x
Rusula risigallina	x
Stereum hirsutum	x
Trametes hirsuta	x
Trametes versicolor	x
Tremella mesenterica	x
Vibrisea truncorum	x

## 6. Coleoptera beetles and dead wood

The study of forest insects gives a large amount of information but is very difficult to be implemented: the specialists are rare and the demand is high, reference books are also rare, the ecology of forest insects is not well known yet, the method of capture (by killing the insect) is in contradiction with the forest rules, etc. Due to all these facts, the studies are focused on the best known Order : *Coleoptera*.

In completion of the fact that is relatively well known, *Coleoptera* has the advantage of being a numerous order (both at species and individual levels) and well represented in forests (for example, half of the

10000 species from France are forest species) (Gilg, O., 2005).

Some species are very well spread and they can be found in almost all forests: other species need large stumps and therefore are more easy to locate. The most remarkable and typical for old forests are the saprofitic beetles which contribute to the decomposition of the wood.

Their high diversity is combined with a high level of specialisation. Each ecological niche (rotten burrows, humified wood, mushrooms, dead wood, decomposed wood, trees with diverse wounds, etc.) has its own community of saprofitic beetles located in different points of the trophic chain.

The state of decomposition of deadwood is particularly important for the study of saproxylic species. Every stage of decomposition harbours a specific community, and as numerous studies have shown it is possible to observe true successions of species throughout this decomposition [6].

Four main stages of decomposition can thus be distinguished (with certain variations depending on whether it is standing or downed dead tree, conifer, broad – leaved tree, etc) [6] :

1. onset of *Coleoptera* (*Scolitydae*, *Curculionidae* and *Cerambycidae*). Begin at death of the tree and last 1-2 years. By colonizing dying wood, scolytids bring other saproxylic species with them. The cambial zone is rapidly colonized owing to the galleries excavated by these *Coleoptera*.
2. begin during the second year following the death of the tree and can last 5 to 10 years. This concern species that will feed on

phloem remanins and species associated with the development of fungi under the bark and in the surface wood. First fructification of polypores.

3. phloem has been consumed and the subcortical habit disappears as the bark falls off. Stage characterized by mycophagous species, their parasites and their predators. Every species of polypore harbours a specific community and sometimes even specific species.
4. begin when the majority of sapwood is consumed and the duramen start to decompose. Saproxylic species becoming rare and are replaced by litter invertebrates that use the trunk for shelter (molluscs), to estivate (ground beetles), hunt or nest (ants).

List of Coleoptera beetles observed in the Natural “Izvoarele Nerei”  
(after Brustel, Chassain si Roge)

table nr. 4

<b>Coleoptera</b>	<b>Izvoarele Nerei</b>
<b><i>Carabidae</i></b>	
<i>Chrysocarabus auronitens</i>	x
<i>Carabus violaceus</i>	x
<i>Carabus variolosus</i>	x
<b><i>Cerambycidae</i></b>	
<i>Pidonia lurida</i>	x
<i>Rhagium mordax</i>	x
<i>Cerylon cf. ferrugineum</i>	x
<i>Endomychus coccineus</i>	x
<b><i>Erotylidae</i></b>	
<i>Dacne rufifrons</i>	x
<i>Triplax aenea</i>	x
<i>Sinodendron cylindricum</i>	x
<b><i>Monotomidae</i></b>	
<i>Rhizophagus sp.</i>	x
<b><i>Mycetophagidae</i></b>	
<i>Mycetophagus quadripustulatus</i>	x
<i>Mycetophagus ater</i>	
<i>Cyllodes ater</i>	x
<i>Omosita depressa</i>	x
<i>Bolitophagus reticulatus</i>	x

## Conclusions

Regarding the quantity of dead wood, it is a combination between the management system applied to the forest, the development stage of the forest, the productivity of the forest and the natural disturbances regime. In the Natural Reserve “Izvoarele Nerei”, the average dead wood volume per hectare is 115 m<sup>3</sup>. This quantity is not uniformly distributed in space, being dependent on the factors enumerated above. Therefore,

on the altitudinal line 1350 m (on the upper part of the Reserve) a quantity of 79 m<sup>3</sup>/ha is recorded, while on the altitudinal level of 800 m the dead wood quantity reaches 134 m<sup>3</sup>/ha.

In the initial stage of the forest an average quantity of dead wood is recorded, which can be considered as a “residual” from the terminal stage of the forest. The volume of dead wood depends also on the disturbances regime and intensity. When the forest grows to maturity, the quantity of dead wood continues

to increase due to the trunks and large branches fallen in the meanwhile. The maximum quantity of dead wood is recorded immediately after the degradation phase of the forest. The dead wood volume tends to a minimum in young forests, where dead wood is represented only by small dead trees which have as cause of mortality the concurrence.

The principal elements which influenced the diameter classes distribution were the age of the forest, the productivity and the local disturbances regime. Large logs were found at the lower part of the Reserve and in the middle part, zones with fertile soils and in mature forest. In parts of the reserve with the forest in the young stage, as well as in the upper part of the Reserve, the dimensions of the dead wood pieces were smaller.

Regarding the dead wood quantity, the main factors that influence this quantity are abiotic, like wind and snow action (as a principal factor) and with a smaller influence the lack of light as a result of concurrence (secondary factor).

It is possible that the differences in decomposing speed are influenced by the dimensions of the dead wood piece (the diameter class). It was observed that the distribution of the number of trees on decomposing classes is not uniform, still, the Classes V and VI have sufficiently large quantities of dead wood compared with the situation from other Reserves, e.g. "Runcu-Grosi". This fact can be explained by a longer status of protection for the "Izvoarele Nerei" Reserve, but mainly by a much higher degree of inaccessibility.

Microhabitats represent potential places for living for different populations from the ecosystem's structure. Their number depends on the combined effect of the age of the forest, types and regime of the disturbances, the forest management system. In this particular case, the high frequency of some microhabitats indicates that dead wood can offer space and resources for many populations, these microhabitats developing possible ecological niches, or even real ecological niches when they are colonized by the appropriate specific populations (Donita, N., 1998).

This research outcomes with a few general conclusions :

- old trees, standing dead trees and trees which are about to die, logs and fallen branches are one of the most important habitats for biodiversity;
- dead wood stabilizes forests, maintains their productivity, stocks the carbon and provides food and habitats for a large number of specialized species;
- many endangered species are associated with dead wood, from the most simple to the most complex organisms, mobile species like woodpeckers. Dead wood can be considered as one of the most endangered habitats of the forest;
- the final stages of the life cycles of the trees – from the very old trees and trees about to die to dead wood – attract specialized species which play a key role in the maintaining of the stability and health of the forest;
- protected areas were dedicated mainly to biodiversity conservation. Permitting the evolution of a natural dynamics, these areas guarantee a large diversity of habitats and species;
- a responsible forest management means keeping a sufficient quantity of dead wood in the forest. Dead wood does not threaten the health of trees and the preserving of dead wood does not cost very much if a wise management is applied;
- in deteriorated forest ecosystems of today, strategies for dead wood restauration are urgently needed.

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