Vlaanderen
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Historic-ecological position of beech in the area of the Sonian Forest and an overview of beech-forest-related biodiversity present in the forest.

Toelichting over de historisch-ecologische positie van beuk in het Zoniënwoud inclusief een overzicht van de aanwezige beuk-gerelateerde biodiversiteit.

Argumentatie in het kader van het UNESCO-erkenningsdossier.

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Bosreservaat Joseph Zwaenepoel, één van de voorgedragen components voor de uitbreiding van de UNESCO-Natural Heritage Site 'Primeval Beech Forests and Natural beech forests of Europe' (foto: Kris Vandekerkhove)

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Voorwoord

Dit rapport werd geschreven naar aanleiding van de opmerkingen geformuleerd bij het IUCN-assessment van het erkenningsdossier voor de tweede uitbreiding van de UNESCO-component site 'UNESCO World Heritage Site of Primeval Beech Forests and Natural beech forests of Europe.'

Bij dit assessment werden specifiek voor de voorgestelde components in het Zoniënwoud de vraag gesteld of het Zoniënwoud wel van nature een beukenbos is. Een vaak geciteerde stelling is immers dat het bos tot in de 18de eeuw een gemengd loofbos was, vooral op basis van eik, en dat pas tijdens de Oostenrijkse periode het bos werd omgevormd tot een beukenmonocultuur.

Op basis van historische bronnen, resultaten van palynologisch en anthracologisch onderzoek, en aanwezige indicatorsoorten van natuurlijke beukenbossen kon deze stelling worden weerlegd en aangegeven dat er zeer duidelijke indicaties zijn dat het Zoniënwoud wel degelijk van nature, en al eeuwenlang, een beuk-gedomineerd bos is.

Deze argumentatie werd mee ingebracht in het UNESCO-dossier en heeft mee bijgedragen aan de uiteindelijke erkenning van de tweede uitbreiding, met inbegrip van de voorgestelde onbeheerde reservaten in het Zoniënwoud.

Om begrijpelijke redenen werd de argumentatie, en dus ook dit rapport, in het Engels opgesteld. Een nederlandstalige samenvatting is hieronder opgenomen.

Samenvatting

De strikte bosreservaten in het Zoniënwoud zijn voorgedragen om te worden opgenomen in het tweede uitbreidingsdossier van de UNESCO World Natural Heritage Site 'Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe'. In het kader hiervan werden door de beoordelingscommissie van IUCN een aantal kritische bemerkingen gemaakt, onder andere betreffende de mogelijke opname van de voorgedragen zones in het Zoniënwoud. Zo werd de vraag gesteld in hoeverre het Zoniënwoud wel van nature een beukenbos is. Dit vertaalt zich in twee concrete onderzoeksvragen :

1. Wat is de ecologische positie van beuk in het Zoniënwoud ? Er zijn geschreven bronnen die duidelijk aangeven dat het bos in het verleden vrij intensief werd beheerd, maar was beuk actief ingebracht of bevoordeligd door dit beheer, of zou deze sort van nature het bos domineren ?
2. Ontbreekt de typische soortenrijkdom die geassocieerd is met beuk in het Zoniënwoud, of is deze integendeel goed ontwikkeld ?

Gebaseerd op onderzoek van pollen en houtskool uit de bodem en van historische bronnen kunnen we argumenteren dat beuk hier zowat 4500 jaar geleden is aangekomen en de vegetatie al zeker gedurende 2000 jaar heeft gedomineerd. Zeker tot in de 9de eeuw was een beuk-dominant bos aanwezig. Enkel tijdens de volle middeleeuwen (tussen 1000 en 1250) zijn er aanwijzingen dat een secundair bos aanwezig was, met dominantie van eik, berk, lijsterbes… Dit bos was ontstaan na zware overexploitatie van het beukenbos in de eeuw daarvoor, in functie van houtskoolproductie voor ijzerwinning (laagovens in het bos). Vanaf de 14de eeuw zijn kappingen in het bos strict gereguleerd. Er wordt een hooghoutsysteem toegepast (tire-et-aire) met kapcycli van 80-100 jaar, die de ontwikkeling van beuk sterk bevordert, weliswaar met bijmenging van andere boomsoorten (eik in de 'reserve' in de bovenetage, berk en andere pioniersoorten in de jongwasfase op de kapvlaktes vooraleer beuk hen overschaduwt). Vanaf de 15de-16de eeuw is beuk duidelijk weer de dominante boomsoort. In de 18de eeuw werd het tire-et-aire- systeem dan geleidelijk aan verlaten (laatste eindkap 1908), om over te schakelen op een klassiek hooghoutsysteem met femelslag, waarbij ook weer beuk als dominante boomsoort werd aangehouden.

De continue aanwezigheid en dominantie van beuk in dit bosgebied vertaalt zich ook in de soortenrijkdom die in het bos werd vastgesteld. Inventarisatiegegevens wijzen op een uitzonderlijk rijke beukgerelateerde biodiversiteit, in het bijzonder wat betreft vaatplanten, dood-hout-paddenstoelen, zweefvliegen en kevers. Deze vaststelling ondersteunt de stelling dat dit bos, niettegenstaande zijn historiek van intensieve menselijke interventies, nog steeds de erfenis meedraagt van een natuurlijk beukenbos met bijhorende biodiversiteit. De voorgedragen bosreservaten zijn ondertussen al goed ontwikkeld en dragen veel karakteristieken van natuurlijke beukenbossen (veel zwaar dood hout, monumentale oude bomen). Ze behoren tot de best ontwikkelde voorbeelden van 'toekomst-natuurlijke' beukenbossen in de Atlantische biogeografische regio van Europa, en zijn daarom met reden voorgedragen om te worden opgenomen in de UNESCO-werelderfgoed-component-site 'Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe'.

English abstract

The strict forest reserves of Sonian forest (near Brussels) have been proposed to be included as components in the extension of the UNESCO World Heritage Site ' Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe'.

The evaluation by the IUCN-assessment team for the site raised the issue of the strong human influence on the forest, questioning whether this site is indeed a locality where beech would naturally dominate (or its current presence is man-made), and assuming that the related species richness is missing or weakly developed. This brings the assessors to the conclusion that the site might not be suitable for inclusion.

In this report, we provide the necessary arguments, based on scientific evidence, that indicate that these assumptions are incorrect. They are formulated as answers to two basic questions :

1. What is the ecological position of beech in the Sonian Forest ? There is written evidence that these forests have been quite intensively managed in the past, but was beech actively introduced or favoured by this management, or would it naturally dominate these forests ?

2. Is the typical species richness associated with natural and semi-natural beech forests missing in the Sonian Forest, or on the contrary, well developed ?

Based on palynological and anthracological research and historical sources, we argue that the forest indeed was dominated by beech at least over the last two millennia. Only during the high middle ages (1000-1250 A£D), a secondary forest developed after overexploitation of the forest for iron industry. By the 14th-15th century, when tree harvesting was already strictly regulated in this forest, beech became the dominant tree species again, although other tree species (like oak, birch, rowan) occurred intermixed, and at the early stages of stand development after final fellings in the 'tire et aire' management system.

This high forest management system combines larger scale final fellings with rotation cycles of 80-100 years with double and triple rotation 'reserve' trees (of oak and beech). After the younger phases of regrowth (with birch, rowan and aspen), beech became dominant and remained so up to the next felling. Written sources confirm that at least from the 16th-17th century onwards, beech was clearly dominant. From the end of the 18th century, the tire-et-aire system was replaced by group felling regimes, also perpetuing the dominance of beech.

This continued presence and dominance of beech is also reflected in the species richness that was recorded in the forest. Inventory results on vascular plants, beech-related wood-decaying fungi, beetles and hoverflies indicate that the beech-related biological diversity is very well developed at this site. This supports the statement that this forest, notwithstanding its history of intensive human intervention, still contains the legacy of a natural beech forest, and its related biodiversity. The proposed strict reserves have already developed the characteristics of old-growth, with high densities of large trees and large amounts of dead wood. They can indeed be considered as some of the best exemples of future-natural beech forests in the Atlantic region of Europe, and are therefore eligible to be included in the UNESCO-world-heritage-component-site 'Ancient and Primeval Beech Forests of the Carpathians and Other Regions of Europe'.

Inhoudstafel

1. Historic presence of beech in the Sonian Forest.

Palynological and anthracological evidence

Several palynological studies show that beech (*Fagus sylvatica*) reached central Belgium c. 4500 years ago and became the dominant tree in the natural vegetation in this region since c. 2000 years (Bastin 1964, Munaut 1967; Verbruggen et al. 1996; Magri 2008; Storme et al. 2017). This evolution is believed to be the natural post-glacial re-colonization of beech from its refugia in southern Europe and was mainly controlled by climatic conditions and competition though human activities might have played an minor role as well (Giesecke et al. 2007; Magri 2008). Analysis of fossil pollen from peat and soil profiles at the sites of Rood Klooster, Rosières, Bierbeek, Braine-le-Château and Ottignies, situated in or near the Sonian forest and on similar soil and climatic conditions give a similar image of Holocene history of beech (Munaut 1967; Ntaganda and Munaut 1987).

For the Roman age, there are no data available from anthracological analyses from sites situated in or near the Sonian Forest. From a review of charcoal data from Roman cremation graves from all over Northern and central Belgium, it is clear however that beech was much more important in the vegetation on loamy soil compared to sites on sandy soil (Deforce and Haneca 2012).

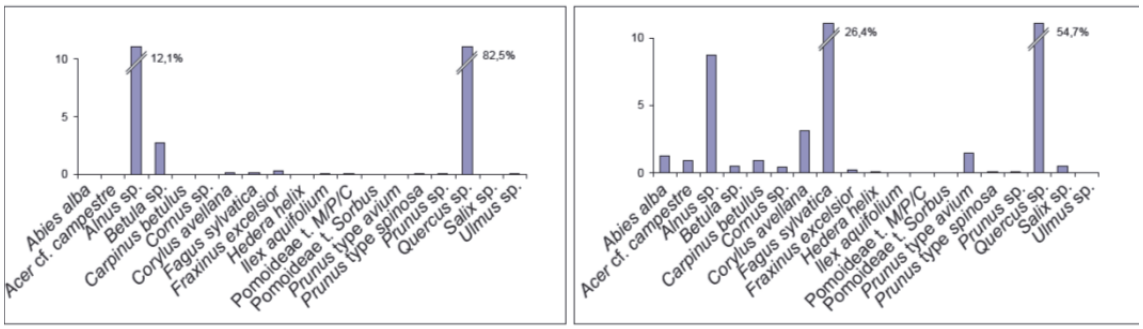

Fig. 1: Identifications of charcoal recovered from Roman Age cremation graves from Flanders (percentages of a selection of taxa only) on sandy (left) (n = 8770) and loamy soil (right) (n = 3267) (from Deforce & Haneca 2012).

A recent and ongoing study of former charcoal production sites in the Sonian forest shows that beech was the dominant tree in the Sonian forest vegetation in the early medieval period (c. 600 AD and 900 AD) though there probably was a strong decline of beech by the end of the early medieval period because of charcoal production for metallurgy (Deforce 2015; Deforce et al. in prep.). Preliminary results of analyses of more recent kiln sites (1200 AD – 1900 AD) in the Sonian Forest further show that human activities resulted in more fluctuations in the percentage of beech in the forest composition but also that beech however did remain an important element in the vegetation (Deforce et al. in prep.; Schalbroeck 2017). It is true that late Holocene distribution and abundance of beech in Europe is influenced by human activities (Tinner and Lotter 2006; Magri 2008). However, seen that most of the Sonian forest area has never been used for agriculture (including forest pastures), as shown by intact natural soils and microtopography (Langohr & Sanders 1985) and that the use of coppice (which is not well supported by beech) was restricted in this forest (one specific area of 200 ha out of 10.000 ha; cfr. E.g. Goblet-d'Alviella, 1927), it is therefore very likely that beech played a more important role in the vegetation compared to adjacent regions since its (natural) establishment in the region.

Written sources

The results of the anthracological and palynological research on the position of beech are corroborated by written sources. For Sonian forest, the first written source on the presence of beech is the 'Donatio Angelae', a bull dating back to the year 819 AD. In this document the forest is explicitly mentioned for the first time (est ibi silva… que

vocatur Sonia). It consisted of a 'silva communis' and a 'silva domini' that belonged to the Landlord ('que singularis est'). It is however allowed for locals to enter and take out all the wood they like, except oak and beech (preter quercum et fagum), as they belonged to the landlord.

During the 9th -12th century, no written sources are known. It is a period in which intensive harvest of wood took place in the Sonian forest, for iron production, using local low-furnace ovens in the forest, that were heated with charcoal that was produced at the site.

However, from the 14th century onward, detailed written sources are available again, that intrinsically indicate that beech was a very important, if not the dominant tree species. Many of these documents are still present in the state archives, some of them cited or transcribed in the reference works of Pierron (1936) and Goblet d'Alviella (1927).

The 'Keurboeck of Sonian' dating back to the 14th century already clearly regulates all forest management, firmly restricting and regulating forest grazing and introducing a sylvicultural system (the so-called tire-et-aire) using cutting cycles of 80-100 years. This management regime was exceptional, as it implied high forest and natural regeneration, while practically all other forests in Western Atlantic Europe at that time were managed as coppice and coppice-with-standards, or as wood pasture. This explains why Sonian forest was amongst the only forests in Western Europe where beech reached its natural dominance in managed stands. This is also clearly confirmed in written documents, e.g. documents from 1624, when there were plans to transform the forest to a coppice regime, and the local managers argued to the Habsburg monarchs that this was a bad idea as 'the forest is strongly dominated by beech, which does not support a coppice regime' (see Goblet d'Alviella 1927 and Pierron, 1936).

During the 17th and 18th century, the forest was impacted by war and pillage, leading to over-exploitation on certain parts of the forest. By the end of the 18th century, the Austrian Habsburg emperors, who inherited the forest, decided to restore the 'vagues', covering 15-20% of the forest, by active replanting (coordinated by mr. Zinner). For the restocking of these vagues, local provenance seedlings were used that were grown in temporary tree nurseries (Pierron, 1936; Goblet d'Alviella, 1927). In the rest of the forest, the traditional Tire-et-aire system was continued. By the second half of the 19th century, the tire-et-aire system was abandoned under pressure of the city population and replaced by a very extensive forest management, using low intensity thinnings and postponing final fellings. This resulted in the current situation that the forest indeed contains an exceptionally high share of overmature stands (about ¼ of the forest consists of stands >200 years old) (Vandekerkhove et al., 2011b, 2013).

In the strict reserve Joseph Zwaenepoel, this share of overmature stands is even higher: over 2/3 of the reserve are stands of >200 years old, many of which reach 250 years. They originate indeed partly from 18th century reafforestations, but probably mostly from naturally regenerated stands (dominated by beech, but also containing old oaks and hornbeam) after final fellings in the tire-et-aire system. Since 1983, no more interventions were performed in the core area of the reserve (ca 20 ha); since 1995, this area was extended to over 130 ha, and in 2010 again (adding more very old stands) to its current size of 230 ha (including the buffer zone included in the Component proposal).

Over the few decades that this forest reserve was installed, the reserve developed significantly through natural dynamics towards a natural state. By now, the core area (20 ha) already contains comparable growing stock and deadwood figures as primary natural beech forests (Vandekerkhove et al. 2005, 2009, 2011a), and the density of very large trees (over 80 cm DBH) is even much higher than in most primary forests (Vandekerkhove et al., in prep.). Some of these trees have reached exceptional sizes for non-open-grown beech trees of over 150 cm DBH and hights of 45-50 meters. Also the more recent extension areas are relatively quickly developing natural features, as these areas also consist of old stands, where the management was already extensified since the 19th century.

We can conclude that the Sonian Forest is amongst the only sites in the densely populated lowland plains of Western Atlantic Europe where the natural dominance of beech could develop and remain in a context of human intervention. The current dominance of beech in the forest is thus not an artifact of human activities, also without human intervention, this dominance would have occurred.

Most other forests in Western Europe were managed as coppice and coppice-with-standards, or were used as wood pastures, strongly altering the species composition and structure of the forest stands and soils. Very few sites remained where beech could continuously occur in its natural dominance for many centuries, and even fewer of these sites contain strictly unmanaged reserves of comparable contiguous size as the Joseph Zwaenepoel reserve, well embedded in a large forest context, also containing high densities of old beech stands and trees.

Conclusion

Beech has been present in the Western-European lowland plain for over 4500 years, and reached its natural dominance about 2000 years ago. Due to its particular ownership context (royal/emperial domain) and related restrictions to human interventions and management systems, this forest is one of the only sites in the densely populated Atlantic lowland area of Europe, where beech continuously retained its natural dominance. Within this forest, the forest reserve Joseph Zwaenepoel, although influenced by human activities, could develop over the last decades to become a future-natural beech forest (sensu Peterken, 1996). The oldest parts of the reserve have already reached oldgrowth-indicator values (dead wood amounts, density of overmature trees, microhabitats,…) comparable to the primeval and Ancient beech forests that make up the current UNESCO natural Heritage Site 'Primeval Beech Forests of the Carpathians and the Ancient Beech Forests of Germany'.

Also the later extensions of the reserve and the other component sites of the Belgian proposal are developing rapidly towards this state, as they are also mainly composed of old, overmature semi-natural beech stands.

In this context, the component cluster is very comparable to other component sites that are now already included in the Natural Heritage Site (like Serrahn, Kellerwald and Hainich).

2. Beech Forest ecosystem related biodiversity in the Sonian Forest : indicator species of ancient semi-natural beech forests are present.

Connected to the question of the naturalness of beech dominance in the Sonian forest, and its historic presence in the forest complex, it is hypothesized that if the beech dominance in this forest complex is a recent human artifact, the typical beech-forest-related biodiversity would also be incomplete or strongly degraded/eroded.

Existing studies and inventories however indicate very clearly that the floristic and faunistic richness of the forest is very high, and strongly connected to beech ecosystems. Allthough very specific species of virgin beech forests may have eroded (as in all the rest of Western and Central Europe), excluding emblematic species like White-backed woodpecker, Red-breasted flycatcher and many 'urwald relic species' (sensu Müller et al., 2005), we argue that the ecosystem integrity is still guaranteed, and the site figures amongst the most complete beech ecosystems of the Atlantic region in Western Europe. This is illustrated by the enumeration below.

Several species groups have been inventoried and studied in the Sonian Forest, and more particularly in the Joseph Zwaenepoel Strict Forest Reserve.

A full overview of compiled species for beetles (Coleoptera), hoverflies (Syrphidae), and wood decaying fungi are given in the annex to this document. These species groups are specifically selected as they contain usefull indicators for beech forest continuity over time, and for the evaluation of the status of naturalness in the forest, and the integrity of the faunal, floral and fungal communities (e.g. Maleque et al. 2006).

Below, the most important results are described and compared to international evaluation tools and other beech forest sites in Europe.

Vascular plants.

In total, 418 species of Vascular plants have been registered in the forest complex (Weyembergh et al., 2003), of which 144 species are forest species (according to Stieperaere & Fransen, 1982), 71 of which are considered ancient woodland indicators (out of 132 species in the whole of Europe, sensu Hermy et al., 1999), indicating that the forest is clearly an ancient woodland site. This species list also contains species that are very specifically related to beech and beech forests, and are often rare in Western Europe like *Neotta nidus-avis, Gymnocarpium dryopteris, Phyteuma spicata, …*

This rates the site amongst the most diverse beech forests of Western Europe, showing a very complete and typical ground vegetation. Typical for Atlantic beech forests are *Hyacinthoides non-scriptus, Gagea spatacea, Narcissus pseudonarcissus* and *Tamus communis*.

Beetles

Most data on saproxylic beetles come from detailed inventories of saproxylic beetles that were performed in 2010 and 2011 by Frank Köhler (Koleopterologisches Forschungsbüro, Bornheim, Germany) and Luc Crèvecoeur (LIKONA) in the strict reserve Joseph Zwaenepoel (Vandekerkhove et al., 2012a, 2012b). They were further completed with existing data from the whole forest complex. In total, over 570 species of beetles have been recorded for the forest, of which about 250 are saproxylic beetles. 70 of these are included on the German Red list, 17 of these are endangered and 4 of them are in the category 'critically endangered' (*Aeletes atomarius, Sepedophilus bipustulatus, Triplax rufipes* and *Mycetophagus ater*).

Evaluation systems for saproxylic beetle communities were developed in UK (Fowles et al. 1999, Alexander 2004), based on scores for individual species. Every species receives a Saproxylic Quality Score based on habitat quality requirements and rarity (Fowles et al. 1999). The list in Annex gives the SQS-score (Saproxylic Quality Score) of

every species. The derived Saproxylic Quality Index (SQI = sum of SQS/number of recorded species x 100) for Sonian forest reached a score of 819.

The Index of Ecological Continuity (IEC) (Alexander et al. 2004) focuses on species that indicate a continuity in the presence of dead wood habitat. The IEC score for Sonian forest reached 129.

In comparison : the forest of Serrahn (component of the existing natural heritage site) reached scores of 833 and 136 respectively. Sites in the UK on average have scores of 500-700 and 50-70 resp. Sites in UK with an IEC of over 80 are considered of international importance, deserving special conservation status and management (Alexander 2004).

Furthermore, Lachat et al. (2012) selected a list of 117 species (out of a total of over 800 species of saproxylic beetles) that are good indicators for natural beech forests, using IndVal-scores. The list is subdivided in 81 'common' and 36 'priority' species, the latter consisting of rare and red-listed species. In the Sonian forest, no less than 72 of these species have been recorded, of which 18 priority species. For many of these species it is the only known location in Belgium or Flanders, indicating the extraordinary richness of the site.

As Lachat states, Lucanidae are the best indicator group for natural beech forests : of the 4 selected species with strong indication for natural beech forests, 3 do occur in the forest (*Sinodendron cylindricum, Platycerus caraboides and Dorcus parallellepipedus*). The only species missing is *Platycerus caprea*, which is a continental species, not occurring in Atlantic Europe.

Other rare and remarkable beech-related indicator species occurring are the longhorn beetles Stictoleptura scutellata and Prionus coriarius. A very rare species, related to rotholes in sun-exposed trees, is *Gnorimus nobilis*. There are only 4 remaining localities of this species in Belgium, with only the site in Sonian forest being in its natural environment. All other sites are in parks and orchards.

Also for carabid beetles, the forest is particularly rich in ancient woodland indicator species (Desender et al. 1999) including *Carabus auronitens*, of which an endemic form *'C. auronitens var. Putzeysii'* occurs.

Hoverflies

With over 190 species recorded, of which 118 forest-related species, the Sonian forest is the site with the highest species richness of forest-related hoverflies in the Northwest-European Atlantic lowlands. Especially saproxylic syrphids are very well represented, including many species that are rare indicators of natural forests (Speight, 1989). In total 10 of these species occur here : *Brachyopa bicolor* and *panzeri*, *Caliprobola speciosa, Ceriana conopsoides, Chalcosyrphus piger, Chriorhina pachymera, Mallota fuciformis, Myolepta vara, Sphiximorpha subsessilis* and *Xylota meigeniana*. Some of them reach high densities and population sizes. Also other rare saproxylic species (like Ferdinandea cuprea) are present. An overview of all species is given in the Annex.

Fungi

The species list of Fungi for the whole of Sonian forest contains over 1000 species (Vanholen et al., 2001).. Specifically of relevance for this report are the wood-decaying fungi on beech.

A detailed standardized sampling of these species was performed in the SFR Joseph Zwaenepoel (Walleyn & Vandekerkhove, 2002), in the framework of the EU-5th framework NAT-MAN project comparing natural and semi-natural beech forests in Europe (see a.o. Odor et al., 2006; Halme et al. 2013; Heilman-Clausen et al. 2014). From the analysis, it appeared that the reserve was amongst the most species-diverse of all sites studied, also when considering rarer and more demanding species (SSI).

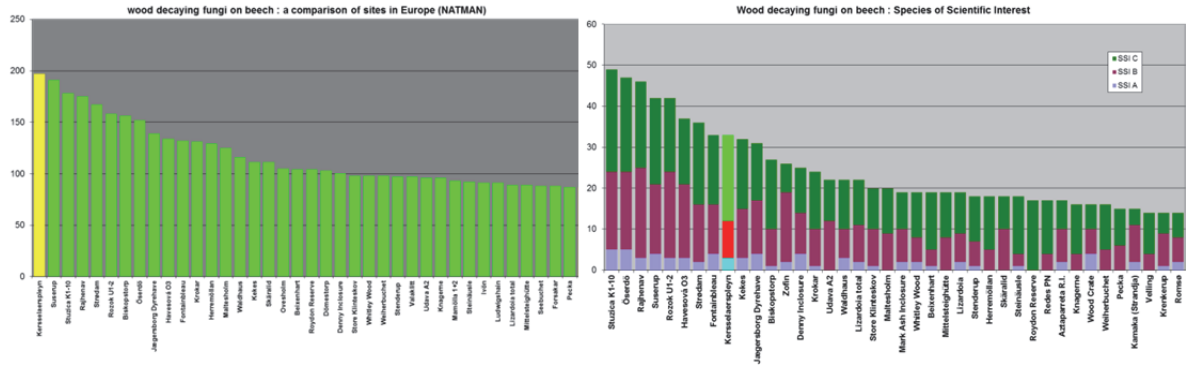

Fig 2 : figure on total species richness and Species of Scientific Interest (SSI) for the Nat-Man sites. Highlighted is the sampling site at Sonian forest.

From the analysis of the complete NAT-MAN-dataset, a European list of 22 top-indicator species for natural beech forests was developed (Christensen et al., 2005). Of these, 8 species have already been recorded in the reserve : *Ceriporiopsis gilvescens, Hohenbuehelia auriscalpium, Pluteus umbrosus, Flammulaster limulatus, Ganoderma pfeifferi, Hericium erinaceus, Lentinellus ursinus* and *Ceriporiopsis pannocinta*.

To compare : most Central and Western European sites that were included in this analysis counted only 1-4 of these indicator species. Only some localities in European primeval beech forests (e.g. in Czech republic) harbour 10-15 species. The strict forest reserve in the Sonian forest contains the highest species richness of these indicator species of all investigated sites in the Atlantic region. In the framework of this study, several of the components of the existing Unesco Natural Heritage site were included : primeval beech forests like Rozok, Stuzika and Havesova had resp. 16, 16 and 13 indicator species. The component 'Jasmund' however, counted only 4 of these indicator species.

3. Overall conclusion

The the strict forest reserves in the Sonian forest (in particular the Joseph Zwaenepoel strict reserve) appear amongst the most species-rich and complete forests of the Atlantic biogeographical region, conceirning beech-related biodiversity, showing high ecosystem integrity. This richness is clearly related to the long history of beech presence and dominance in the forest. Although obviously managed in the past, important parts of the forest have already developed over the last decades, natural structures and related biodiversity that is comparable to other ancient beech forests in Central Europe that are already included in the UNESCO WH site. It can therefore been considered an important addition to this component site, as it figures amongst the most natural exemples of beech forests in the Atlantic biogeographic region, a region that is not yet represented in this component site.

4. References

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5. Annex 1: Data on beetles

Annex 1a: compiled species list of Coleoptera for the Sonian Forest. Saproxylic species were all recorded in the reserve.

Studies by Köhler & Crevecoeur, 2011; additional data from Versteirt *et al.*, 2000; Heirbout *et al.*, 2001; Dufrêne *et al.*, 2008.
German RL categories : 1=critically endangered, 2=endangered; 3=vulnerable

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Carabidae	Carabus	violaceus	2010			
Carabidae	Carabus	auronitens	2010			
Carabidae	Carabus	problematicus	2004			
Carabidae	Notiophilus	biguttatus	2003			
Carabidae	Clivina	fossor	2010			
Carabidae	Clivina	collaris	2010			
Carabidae	Dyschirius	aeneus	2010			
Carabidae	Tachyta	nana	2010			
Carabidae	Bembidion	deletum	2010			
Carabidae	Bembidion	quadrimaculatum	2010			
Carabidae	Bembidion	lunulatum	2010			
Carabidae	Asaphidion	curtum	2010			
Carabidae	Perigona	nigriceps	2010			
Carabidae	Bradycellus	verbasci	2010			
Carabidae	Bradycellus	harpalinus	2010			
Carabidae	Acupalpus	flavicollis	2010			
Carabidae	Acupalpus	dubius	2010			
Carabidae	Pterostichus	oblongopunctatus	2003			
Carabidae	Pterostichus	niger	2010			
Carabidae	Pterostichus	cristatus	2010			
Carabidae	Abax	ovalis	2010			
Carabidae	Limodromus	assimilis	2003			
Carabidae	Dromius	agilis	2004			
Carabidae	Dromius	quadrimaculatus	2010			
Carabidae	Calodromius	spilotus	2004			
Dytiscidae	Hydroporus	palustris	2010			
Gyrinidae	Gyrinus	substriatus	2010			
Hydraenidae	Hydraena	britteni	2010			
Hydrophilidae	Helophorus	obscurus	2010			
Hydrophilidae	Cercyon	ustulatus	2010			
Hydrophilidae	Cercyon	melanocephalus	2010			
Hydrophilidae	Cercyon	lateralis	2010			
Hydrophilidae	Cercyon	pygmaeus	2010			
Hydrophilidae	Cercyon	analis	2010			
Hydrophilidae	Megasternum	obscurum	2010			
Hydrophilidae	Cryptopleurum	minutum	2010			
Hydrophilidae	Hydrobius	fuscipes	2010			
Hydrophilidae	Anacaena	globulus	2010			
Hydrophilidae	Enochrus	melanocephalus	2010			
Histeridae	Plegaderus	dissectus	2010	3	2	8
Histeridae	Abraeus	granulum	2010	3	1	8
Histeridae	Abraeus	perpusillus	2010			
Histeridae	Aeletes	atomarius	2010	1	1	16
Histeridae	Gnathoncus	buyssoni	2002			
Histeridae	Dendrophilus	punctatus	2002			
Histeridae	Paromalus	flavicornis	2002			2
Histeridae	Paromalus	parallelepipedus	2002			32
Histeridae	Margarinotus	carbonarius	2002			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Histeridae	Atholus	duodecimstriatus	2002			
Silphidae	Nicrophorus	vespilloides	2010			
Silphidae	Phosphuga	atrata	2000			
Cholevidae	Nargus	velox	2010			
Cholevidae	Nargus	wilkinii	2000			
Cholevidae	Sciodrepoides	watsoni	2010			
Cholevidae	Sciodrepoides	fumatus	1999			
Cholevidae	Catops	subfuscus	2000			
Cholevidae	Catops	coracinus	1999			
Cholevidae	Catops	kirbyi	1999			
Cholevidae	Catops	neglectus	2010			
Cholevidae	Apocatops	nigrita	2000			
Cholevidae	Catops	fuliginosus	2010			
Cholevidae	Catops	nigricans	2000			
Cholevidae	Catops	picipes	2010			
Colonidae	Colon	brunneum	1999			
Colonidae	Colon	serripes	2010			
Leiodidae	Leiodes	calcaratus	2010			
Leiodidae	Colenis	immunda	2010			
Leiodidae	Anisotoma	humeralis	2000			2
Leiodidae	Anisotoma	orbicularis	2000			2
Leiodidae	Liodopria	serricornis	2010	3		
Leiodidae	Amphicyllis	globus	2010			
Leiodidae	Amphicyllus	globiformis	2010			
Leiodidae	Agathidium	varians	2000			2
Leiodidae	Agathidium	rotundatum	2010			2
Leiodidae	Agathidium	seminulum	2010			2
Leiodidae	Agathidium	laevigatum	2000			
Leiodidae	Agathidium	badium	2010			16
Scydmaenidae	Cephennium	gallicum	2010			
Scydmaenidae	Neuraphes	elongatulus	2010			
Scydmaenidae	Neuraphes	talparum	1947			
Scydmaenidae	Stenichnus	collaris	2010			
Scydmaenidae	Micoscydmus	minimus	2010	3	1	24
Scydmaenidae	Scydmaenus	tarsatus	2010			
Ptiliidae	Nossidium	pilosellum	2010	3		8
Ptiliidae	Ptenidium	gressneri	2010	3	2	8
Ptiliidae	Ptenidium	pusillum	2010			
Ptiliidae	Ptenidium	nitidum	2010			
Ptilidae	Ptilium	modestum	2010			
Ptiliidae	Ptinella	limbata	2010			16
Ptiliidae	Ptinella	aptera	2010			2
Ptiliidae	Ptinella	errabunda	2010			
Ptiliidae	Pteryx	suturalis	2010			2
Ptiliidae	Baeocrara	variolosa	2010	3		
Ptiliidae	Acrotrichis	montandoni	2010			
Ptiliidae	Acrotrichis	dispar	2010			
Ptiliidae	Acrotrichis	intermedia	2010			
Ptiliidae	Acrotrichis	sitkaensis	2010			
Staphylinidae	Scaphidium	quadrimaculatum	2010			2
Staphylinidae	Scaphisoma	agaricinum	2010			2
Staphylinidae	Scaphisoma	boleti	2010			8
Staphylinidae	Phloeocharis	subtilisssima	2010			2
Staphylinidae	Megarthrus	depressus	2010			
Staphylinidae	Megarthrus	sinuatocollis	2010			
Staphylinidae	Megarthrus	denticollis	2010			
Staphylinidae	Proteinus	ovalis	2010			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Staphylinidae	Proteinus	brachypterus	2010			
Staphylinidae	Proteinus	laevigatus	2010			
Staphylinidae	Micropeplus	tesserula	2010			
Staphylinidae	Micropeplus	staphylinoides	2010			
Staphylinidae	Phyllodrepa	floralis	2010			
Staphylinidae	Phyllodrepa	ioptera	2010			
Staphylinidae	Omalium	rivulare	2010			
Staphylinidae	Omalium	exiguum	2010			
Staphylinidae	Omalium	rugatum	2010			
Staphylinidae	Phloeonomus	pusillus	2010			2
Staphylinidae	Phloeonomus	punctipennis	2010			2
Staphylinidae	Xylostiba	bosnicus	2010			
Staphylinidae	Phloeostiba	planus	2010			2
Staphylinidae	Anthobium	atrocephalum	2010			
Staphylinidae	Anthobium	unicolor	2010			
Staphylinidae	Lesteva	longelytrata	2010			
Staphylinidae	Syntomium	aeneum	2010			
Staphylinidae	Coprophilus	striatulus	2010			
Staphylinidae	Planeustomus	palpalis	2010			
Staphylinidae	Carpelimus	rivularis	2010			
Staphylinidae	Carpelimus	impressus	2010			
Staphylinidae	Carpelimus	zealandicus	2010			
Staphylinidae	Carpelimus	gracilis	2010			
Staphylinidae	Oxytelus	laqueatus	2010			
Staphylinidae	Anotylus	rugosus	2010			
Staphylinidae	Anotylus	sculpturatus	2010			
Staphylinidae	Anotylus	nitidulus	2010		0	
Staphylinidae	Anotylus	tetracarinatus	2010			
Staphylinidae	Platystethus	cornutus	2010			
Staphylinidae	Bledius	gallicus	2010			
Staphylinidae	Bledius	femoralis	2010			
Staphylinidae	Stenus	fossulatus	2010			
Staphylinidae	Stenus	impressus	2010			
Staphylinidae	Stenus	annulipes	2010		0	0
Staphylinidae	Rugilus	scutellatus	2010			
Staphylinidae	Rugilus	rufipes	2010			
Staphylinidae	Rugilus	erichsoni	2010			
Staphylinidae	Medon	brunneus	2010			
Staphylinidae	Medon	apicalis	2010			
Staphylinidae	Lithocharis	nigriceps	2010			
Staphylinidae	Scopaeus	laevigatus	2010			
Staphylinidae	Gyrohypnus	liebei	2010			
Staphylinidae	Xantholinus	rhenanus	2010			
Staphylinidae	Hypnogyra	glabra	2010	3		
Staphylinidae	Atrecus	affinis	2010			1
Staphylinidae	Othius	punctulatus	2010			
Staphylinidae	Othius	subuliformis	2010			
Staphylinidae	Neobisnius	villosulus	2010			
Staphylinidae	Philonthus	debilis	2010			
Staphylinidae	Philonthus	succicola	2010			
Staphylinidae	Philonthus	decorus	2010			
Staphylinidae	Philonthus	fimetarius	2010			
Staphylinidae	Philonthus	quisquiliarius	2010			
Staphylinidae	Gabrius	astutoides	2010			
Staphylinidae	Gabrius	splendidulus	2010			1
Staphylinidae	Gabrius	nigritulus	2010			
Staphylinidae	Quedius	truncicola	2010	3		

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Staphylinidae	Quedius	lateralis	2010			
Staphylinidae	Quedius	cruentus	2010			
Staphylinidae	Quedius	mesomelinus	2010			
Staphylinidae	Quedius	scitus	2010		2	8
Staphylinidae	Quedius	cinctus	1966			
Staphylinidae	Quedius	fumatus	2010			
Staphylinidae	Quedius	auricomus	2010			
Staphylinidae	Quedius	lucidulus	2010			
Staphylinidae	Habrocerus	capillaricornis	2010			
Staphylinidae	Trichophya	pilicornis	2010			
Staphylinidae	Mycetoporus	lepidus	2010			
Staphylinidae	Bryophacis	crassicornis	2010			
Staphylinidae	Lordithon	trinotatus	2010			
Staphylinidae	Lordithon	lunulatus	2010			
Staphylinidae	Sepedophilus	littoreus	2010			2
Staphylinidae	Sepedophilus	testaceus	2010			8
Staphylinidae	Sepedophilus	bipunctatus	2010			8
Staphylinidae	Sepedophilus	bipustulatus	2010	1		
Staphylinidae	Tachyporus	nitidulus	2010			
Staphylinidae	Tachyporus	solutus	2010			
Staphylinidae	Tachinus	laticollis	2010			
Staphylinidae	Tachinus	marginellus	2010			
Staphylinidae	Oligota	pumilio	2010			
Staphylinidae	Holobus	apicatus	2010	3		
Staphylinidae	Cypha	longicornis	2010			
Staphylinidae	Gyrophaena	affinis	2010			
Staphylinidae	Gyrophaena	gentilis	2010			
Staphylinidae	Gyrophaena	minima	2010			2
Staphylinidae	Gyrophaena	joyioides	2010			
Staphylinidae	Gyrophaena	angustata	2010			8
Staphylinidae	Gyrophaena	polita	2010	3		
Staphylinidae	Cyphaea	curtula	2010	2		4
Staphylinidae	Placusa	tachyporoides	2010			8
Staphylinidae	Placusa	pumilio	2010			2
Staphylinidae	Homalota	plana	2010			2
Staphylinidae	Anomognathus	cuspidatus	2010			2
Staphylinidae	Leptusa	pulchella	2010			2
Staphylinidae	Leptusa	fumida	2010			1
Staphylinidae	Leptusa	ruficollis	2010			1
Staphylinidae	Euryusa	castanoptera	2010			
Staphylinidae	Euryusa	optabilis	2010			24
Staphylinidae	Bolitochara	obliqua	2010			
Staphylinidae	Bolitochara	bella	2010			
Staphylinidae	Bolitochara	lucida	2010			2
Staphylinidae	Autalia	rivularis	2010			
Staphylinidae	Cordalia	obscura	2010			
Staphylinidae	Myrmecocephalus	concinna	2010			
Staphylinidae	Gnypeta	ripicola	2010			
Staphylinidae	Aloconota	mihoki	1990			
Staphylinidae	Nehemitropa	lividipennis	2010			
Staphylinidae	Dinaraea	aequata	2010			1
Staphylinidae	Dinaraea	linearis	2010			2
Staphylinidae	Atheta	hygrobia	2010	2		
Staphylinidae	Atheta	sodalis	2010			
Staphylinidae	Atheta	pallidicornis	2010			
Staphylinidae	Atheta	picipes	2010			
Staphylinidae	Atheta	fungi	2010			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Staphylinidae	Atheta	dadopora	2010			
Staphylinidae	Atheta	coriaria	2010			
Staphylinidae	Atheta	crassicornis	2010			
Staphylinidae	Aleuonota	elegantula	2010			
Staphylinidae	Thamiaraea	cinnamomea	2010	3		2
Staphylinidae	Zyras	lugens	2010			
Staphylinidae	Calodera	nigrita	2010			
Staphylinidae	Parocyusa	longitarsis	2010			
Staphylinidae	Ocalea	picata	2010			
Staphylinidae	Oxypoda	elongatula	2010			
Staphylinidae	Oxypoda	opaca	2010			
Staphylinidae	Oxypoda	acuminata	2010			
Staphylinidae	Oxypoda	brevicornis	2010			
Staphylinidae	Oxypoda	alternans	2010			
Staphylinidae	Oxypoda	annularis	2010			
Staphylinidae	Ischnoglossa	prolixa	2010			2
Staphylinidae	Dexiogya	corticina	2010			8
Staphylinidae	Haploglossa	villosula	2010			
Staphylinidae	Aleochara	bipustulata	2010			
Pselaphidae	Bibloporus	bicolor	2010			2
Pselaphidae	Bibloporus	minutus	2010		2	8
Pselaphidae	Euplectus	nanus	2010		1	24
Pselaphidae	Euplectus	piceus	2010			2
Pselaphidae	Euplectus	infirmus	2010	2		2
Pselaphidae	Euplectus	karsteni	2010			2
Pselaphidae	Bythinus	macropalpus	2010			
Pselaphidae	Bythinus	burrelli	2002			
Pselaphidae	Bryaxis	curtisii	2010			
Pselaphidae	Bryaxis	puncticollis	2010			
Pselaphidae	Tychus	niger	2010			
Lycidae	Platycis	minutus	2002		3	8
Omalisidae	Omalisus	fontisbellaquei	2002			
Lampyridae	Lamprohiza	splendidula	1973			
Cantharidae	Cantharis	pellucida	2010			
Cantharidae	Cantharis	obscura	2010			
Cantharidae	Cantharis	decipiens	2010			
Cantharidae	Cantharis	livida	2004			
Cantharidae	Rhagonycha	fulva	2010			
Cantharidae	Rhagonycha	lignosa	2010			
Cantharidae	Rhagonycha	gallica	2010			
Cantharidae	Malthinus	balteatus	2004			8
Drilidae	Drilus	flavescens	2002			
Malachiidae	Charopus	flavipes	1969			
Malachiidae	Malachius	bipustulatus	2010			1
Malachiidae	Anthocomus	bipunctatus	2010			
Malachiidae	Axinotarsus	marginalis	1968			
Melyridae	Dasytes	caeruleus	2010			
Melyridae	Dasytes	aeratus	2010			2
Cleridae	Tillus	elongatus	2002	3	3	8
Cleridae	Opilo	mollis	2002		3	8
Cleridae	Oplio	domesticus	2004	2		
Cleridae	Thanasimus	formicarius	2010			4
Lymexylonidae	Hylecoetus	dermestoides	2010		3	4
Elateridae	Ampedus	balteatus	2002			2
Elateridae	Ampedus	sanguineus	2002			32
Elateridae	Ampedus	pomorum	2002		3	8
Elateridae	Ampedus	elongatulus	2002	3	3	8

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Elateridae	Dalopius	marginatus	2002			
Elateridae	Agriotes	pallidulus	2002			
Elateridae	Agriotes	acuminatus	2010			
Elateridae	Agriotes	pilosellus	2002			
Elateridae	Ectinus	aterrimus	2000			
Elateridae	Melanotus	rufipes	2002			
Elateridae	Melanotus	castanipes	2002			
Elateridae	Ctenicera	pectinicornis	2002		0	
Elateridae	Anostirus	purpureus	2002			
Elateridae	Anostirus	castaneus	2002			
Elateridae	Calambus	bipustulatus	2004			8
Elateridae	Denticollis	linearis	2002			1
Elateridae	Stenagostus	rufus	2004	3		
Elateridae	Stenagostus	rhombeus	2002	3		4
Elateridae	Athous	haemorrhoidalis	2002			
Elateridae	Athous	vittatus	2002			
Elateridae	Athous	subfuscus	2002			
Eucnemidae	Melasis	buprestoides	2002		3	4
Eucnemidae	Eucnemis	capucina	2002	3		32
Eucnemidae	Dirhagus	pygmaeus	2002	3		8
Eucnemidae	Dirhagus	lepidus	2002	3		
Eucnemidae	Hylis	olexai	2002	3		24
Eucnemidae	Hylis	cariniceps	2002	3		32
Eucnemidae	Hylis	foveicollis	2002			
Throscidae	Trixagus	dermestoides	2002			
Throscidae	Trixagus	carinifrons	2002			
Throscidae	Trixagus	leseigneuri	2010		0	0
Throscidae	Trixagus	meybohmi	2010		0	
Throscidae	Aulonothroscus	brevicollis	2010		1	24
Buprestidae	Agrilus	biguttatus	2002			
Buprestidae	Agrilus	angustulus	2004			8
Buprestidae	Agrilus	viridis	2002			24
Clambidae	Clambus	simsoni	2010			
Clambidae	Clambus	punctulum	2010			
Clambidae	Clambus	pallidulus	2010		0	0
Clambidae	Clambus	armadillo	2010			
Scirtidae	Elodes	marginata	2010			
Scirtidae	Cyphon	coarctatus	2010			
Scirtidae	Prionocyphon	serricornis	2010		3	8
Heteroceridae	Heterocerus	fenestratus	2010			
Nosodendridae	Nosodendron	fasciculare	1997	3		
Byturidae	Byturus	tomentosus	2010			
Cerylonidae	Cerylon	histeroides	2010			4
Cerylonidae	Cerylon	ferrugineum	2010			2
Sphaerosomatidae	Sphaerosoma	pilosum	2010			
Nitidulidae	Carpophilus	sexpustulatus	2010			8
Nitidulidae	Meligethes	denticulatus	2010			
Nitidulidae	Meligethes	aeneus	2010			
Nitidulidae	Meligethes	difficilis	2010			
Nitidulidae	Epuraea	melanocephala	2010			
Nitidulidae	Epuraea	pallescens	2010			2
Nitidulidae	Epuraea	marseuli	2010			1
Nitidulidae	Epuraea	unicolor	2010			
Nitidulidae	Epuraea	variegata	2010			16
Nitidulidae	Epuraea	aestiva	2010			
Nitidulidae	Epuraea	melina	2010			
Nitidulidae	Epuraea	ocularis	2010			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Nitidulidae	Soronia	punctatissima	2010			2
Nitidulidae	Pocadius	ferrugineus	2010			
Nitidulidae	Pocadius	adustus	2010			
Nitidulidae	Cychramus	luteus	2010			
Nitidulidae	Cryptarcha	strigata	2010			8
Nitidulidae	Cryptarcha	undata	2010			8
Nitidulidae	Glischrochilus	quadriguttatus	2010			2
Nitidulidae	Glischrochilus	hortensis	2010			
Nitidulidae	Pityophagus	ferrugineus	2010			2
Kateretidae	Brachypterus	urticae	2010			
Monotomidae	Monotoma	brevicollis	2010			
Monotomidae	Rhizophagus	depressus	2002			2
Monotomidae	Rhizophagus	ferrugineus	2010			2
Monotomidae	Rhizophagus	perforatus	2002			2
Monotomidae	Rhizophagus	dispar	2002			1
Monotomidae	Rhizophagus	bipustulatus	2002			1
Monotomidae	Rhizophagus	nitidulus	2002		3	4
Monotomidae	Rhizophagus	parvulus	2010			24
Monotomidae	Cyanostolus	aeneus	2010	3		16
Cucujidae	Pediacus	depressus	2010		2	16
Silvanidae	Silvanus	bidentatus	2010		2	8
Silvanidae	Silvanus	unidentatus	2002		3	4
Silvanidae	Silvanoprus	fagi	2010			32
Silvanidae	Psammoecus	bipunctatus	2010			
Silvanidae	Uleiota	planata	2010		2	16
Erotylidae	Tritoma	bipustulata	2002		3	16
Erotylidae	Triplax	russica	2002		3	4
Erotylidae	Triplax	rufipes	2002	1		
Biphyllidae	Diplocoelus	fagi	2010		3	8
Cryptophagidae	Henoticus	serratus	2010	2		
Cryptophagidae	Cryptophagus	dentatus	2010			1
Cryptophagidae	Cryptophagus	distinguendus	2010			
Cryptophagidae	Cryptophagus	pallidus	2010			
Cryptophagidae	Cryptophagus	lycoperdi	2010			
Cryptophagidae	Cryptophagus	pilosus	2010			
Cryptophagidae	Antherophagus	nigricornis	1999			
Cryptophagidae	Antherophagus	pallens	1999			
Cryptophagidae	Caenoscelis	subdeplanata	2010			
Cryptophagidae	Atomaria	fuscata	2010			
Cryptophagidae	Atomaria	lewisi	2010			
Cryptophagidae	Atomaria	turgida	2010			
Cryptophagidae	Atomaria	testacea	2010			
Cryptophagidae	Atomaria	nigrirostris	2010			
Cryptophagidae	Atomaria	linearis	2010			
Cryptophagidae	Ootypus	globosus	2010			
Cryptophagidae	Ephistemus	globulus	2010			
Laemophloeidae	Laemophloeus	monilis	1902	3		32
Laemophloeidae	Cryptolestes	duplicatus	2010			2
Laemophloeidae	Leptophloeus	alternans	2002			
Latridiidae	Latridius	hirtus	2010	3		
Latridiidae	Enicmus	brevicornis	2010	3	3	8
Latridiidae	Enicmus	rugosus	2010		2	8
Latridiidae	Enicmus	testaceus	1999	2		2
Latridiidae	Enicmus	transversus	2010			
Latridiidae	Enicmus	histrio	2010			
Latridiidae	Dienerella	elongata	2010			
Latridiidae	Cartodere	nodifer	2000			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Latridiidae	Stephostethus	lardarius	2010			
Latridiidae	Stephostethus	angusticollis	1946			
Latridiidae	Stephostethus	alternans	2010			4
Latridiidae	Corticaria	alleni	2010	2		8
Latridiidae	Cortinicaria	gibbosa	2010			
Mycetophagidae	Litargus	connexus	2002			2
Mycetophagidae	Litargus	balteatus	2010			
Mycetophagidae	Mycetophagus	quadripustulatus	2002			2
Mycetophagidae	Mycetophagus	ater	2010	1		
Mycetophagidae	Mycetophagus	piceus	2010	3	2	4
Mycetophagidae	Mycetophagus	atomarius	2010		3	2
Mycetophagidae	Mycetophagus	quadriguttatus	2002		2	16
Mycetophagidae	Mycetophagus	multipunctatus	2010	3		2
Colydiidae	Cicones	undatus	2010	3		
Corylophidae	Orthoperus	mundus	2010			4
Endomychidae	Endomychus	coccineus	2010			2
Coccinellidae	Pullus	auritus	2000			
Coccinellidae	Harmonia	axyridis	2010			
Coccinellidae	Calvia	decemguttata	2010			
Coccinellidae	Calvia	quatuordecimguttata	2004			
Coccinellidae	Propylea	quatuordecimpunctata	2010			
Coccinellidae	Halyzia	sedecimguttata	2004			
Coccinellidae	Psyllobora	vigintiduopunctata	2010			
Sphindidae	Sphindus	dubius	2010			8
Sphindidae	Arpidiphorus	orbiculatus	2010			2
Ciidae	Octotemnus	glabriculus	2010			1
Ciidae	Ropalodontus	perforatus	2010	3		24
Ciidae	Sulcacis	affinis	2010			2
Ciidae	Cis	nitidus	2010			2
Ciidae	Cis	hispidus	2010			4
Ciidae	Cis	boleti	2010			1
Ciidae	Cis	punctulatus	2010			4
Ciidae	Cis	castaneus	2010			
Ciidae	Orthocis	alni	2010			2
Ciidae	Orthocis	festivus	2010			2
Ciidae	Ennearthron	cornutum	2010			2
Anobiidae	Hedobia	imperialis	2010			8
Anobiidae	Xestobium	plumbeum	2010			
Anobiidae	Anobium	punctatum	2000			1
Anobiidae	Anobium	costatum	2010			
Anobiidae	Priobium	carpini	2010			
Anobiidae	Ptilinus	pectinicornis	2010			1
Anobiidae	Dorcatoma	minor	2010			
Anobiidae	Dorcatoma	dresdensis	2010	3		16
Anobiidae	Dorcatoma	robusta	2010	2		
Ptinidae	Ptinus	fur	1972			
Oedemeridae	Ischnomera	cyanea	2010			4
Salpingidae	Vincenzellus	ruficollis	2010			2
Salpingidae	Salpingus	planirostris	2010			1
Salpingidae	Salpingus	ruficollis	2002			1
Pyrochoidae	Pyrochroa	coccinea	2010		3	4
Scraptiidae	Anaspis	humeralis	2010			2
Scraptiidae	Anaspis	lurida	2010	3		2
Scraptiidae	Anaspis	frontalis	2010			1
Scraptiidae	Anaspis	maculata	2010			
Scraptiidae	Anaspis	rufilabris	2010			1
Scraptiidae	Anaspis	flava	2010			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Aderidae	Euglenes	oculatus	2010	2		
Anthicidae	Omonadus	floralis	2010			
Mordellidae	Tomoxia	bucephala	2010		3	16
Mordellidae	Mordellistena	variegata	2010			8
Mordellidae	Mordellochroa	abdominalis	2010			4
Melandryidae	Hallomenus	binotatus	2010		3	8
Melandryidae	Orchesia	minor	2002			8
Melandryidae	Orchesia	undulata	2002		3	4
Melandryidae	Phloiotrya	rufipes	1996	3		
Melandryidae	Melandrya	caraboides	2002	3	3	4
Melandryidae	Conopalpus	testaceus	2004		3	8
Tetratomidae	Tetratoma	ancora	2010	3	3	8
Lagriidae	Lagria	hirta	2010			
Lagriidae	Lagria	atripes	2000			
Alleculidae	Prionychus	ater	2002	3	3	8
Alleculidae	Mycetochara	linearis	2002			
Tenebrionidae	Bolitophagus	reticulatus	2010	3		16
Tenebrionidae	Diaperis	boleti	2010			24
Tenebrionidae	Corticeus	unicolor	2002		3	24
Tenebrionidae	Nalassus	laevioctostriatus	2000			
Trogidae	Trox	scaber	2002			
Geotrupidae	Anoplotrupes	stercorosus	1942			
Scarabaeidae	Oxyomus	sylvestris	1944			
Scarabaeidae	Aphodius	rufipes	1942			
Scarabaeidae	Aphodius	zenkeri	1943			
Scarabaeidae	Aphodius	pusillus	2010			
Scarabaeidae	Aphodius	coenosus	1943			
Scarabaeidae	Aphodius	stictus	2010			
Scarabaeidae	Aphodius	sphacelatus	1941			
Scarabaeidae	Aphodius	prodromus	2010			
Scarabaeidae	Aphodius	fimetarius	1941			
Scarabaeidae	Aphodius	granarius	1942			
Scarabaeidae	Serica	brunnea	2010			
Scarabaeidae	Valgus	hemipterus	2010			
Scarabaeidae	Gnorimus	nobilis	1909	3		32
Lucanidae	Platycerus	caraboides	2002			
Lucanidae	Sinodendron	cylindricum	2002	3		2
Cerambycidae	Prionus	coriarius	2002		3	16
Cerambycidae	Rhagium	bifasciatum	2002			1
Cerambycidae	Rhagium	mordax	2002			1
Cerambycidae	Grammoptera	ruficornis	2010			1
Cerambycidae	Alosterna	tabacicolor	2010			2
Cerambycidae	Leptura	maculata	2002			1
Cerambycidae	Corymbia	rubra	2002			
Cerambycidae	Corymbia	scutellata	1999	3	1	16
Cerambycidae	Pachytodes	cerambyciformis	2002			2
Cerambycidae	Stenurella	melanura	2002			2
Cerambycidae	Molorchus	minor	2010			
Cerambycidae	Phymatodes	testaceus	2002		3	4
Cerambycidae	Clytus	arietis	1999			1
Cerambycidae	Anaglyptus	mysticus	2002			4
Cerambycidae	Mesosa	nebulosa	1999	3	2	24
Cerambycidae	Pogonocherus	hispidulus	2002			2
Cerambycidae	Pogonocherus	hispidus	1999			2
Cerambycidae	Leiopus	nebulosus	2004			2
Cerambycidae	Exocentrus	adspersus	2010	3		
Chrysomelidae	Donacia	simplex	1946			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Chrysomelidae	Aphthona	euphorbiae	2010			
Chrysomelidae	Longitarsus	parvulus	2010			
Chrysomelidae	Neocrepidodera	transversa	2010			
Chrysomelidae	Psylliodes	affinis	2010			
Scolytidae	Scolytus	intricatus	2010			2
Scolytidae	Phloeophthorus	rhododactylus	2002			
Scolytidae	Hylastes	opacus	2010			2
Scolytidae	Hylastes	attenuatus	2010			
Scolytidae	Lepersinus	fraxini	2002			
Scolytidae	Crypturgus	cinereus	1997			
Scolytidae	Dryocoetes	autographus	2010			2
Scolytidae	Dryocoetes	villosus	2010			2
Scolytidae	Ernoporicus	fagi	2002			8
Scolytidae	Taphrorychus	bicolor	2010			8
Scolytidae	Pityogenes	chalcographus	2010			
Scolytidae	Orthotomicus	laricis	2010			
Scolytidae	Xyleborus	dispar	2010		3	8
Scolytidae	Xyleborus	saxeseni	2002		3	4
Scolytidae	Xyleborus	monographus	2010			
Scolytidae	Xyleborus	germanus	2010			
Scolytidae	Xyloterus	domesticus	2010		3	2
Scolytidae	Xyloterus	signatus	2010		3	8
Scolytidae	Xyloterus	lineatus	2010			2
Rhynchitidae	Deporaus	betulae	2004			
Rhynchitidae	Lasiorhynchites	olivaceus	2010		0	0
Rhynchitidae	Caenorhinus	germanicus	2002			
Rhynchitidae	Rhynchites	cupreus	2010			
Rhynchitidae	Byctiscus	betulae	2002			
Attelabidae	Attelabus	nitens	2004			
Apionidae	Protapion	fulvipes	2002			
Curculionidae	Cossonus	linearis	2002			16
Curculionidae	Otiorhynchus	porcatus	2000			
Curculionidae	Caenopsis	fissirostris	2010			
Curculionidae	Caenopsis	waltoni	2010			
Curculionidae	Phyllobius	oblongus	2010			
Curculionidae	Phyllobius	argentatus	2004			
Curculionidae	Phyllobius	pomaceus	2010			
Curculionidae	Phyllobius	calcaratus	2010			
Curculionidae	Phyllobius	betulinus	2003			
Curculionidae	Polydrusus	pterygomalis	2010			
Curculionidae	Polydrusus	tereticollis	2004			
Curculionidae	Polydrusus	formosus	2003			
Curculionidae	Barypeithes	araneiformis	2010			
Curculionidae	Strophosoma	melanogrammum	2002			
Curculionidae	Strophosoma	capitatum	2004			
Curculionidae	Sitona	lineatus	2002			
Curculionidae	Anthonomus	pedicularis	2010			
Curculionidae	Curculio	venosus	2004			
Curculionidae	Curculio	glandium	2004			
Curculionidae	Curculio	salicivorius	2004			
Curculionidae	Curculio	pyrrhoceras	2004			
Curculionidae	Magdalis	barbicornis	2004			8
Curculionidae	Leiosoma	deflexum	2010			
Curculionidae	Acalles	ptinoides	2002			
Curculionidae	Rutidosoma	fallax	2010		0	0
Curculionidae	Coeliodes	rana	2004			
Curculionidae	Coeliodes	ruber	2002			

Family	Genus	Species	Most recent	German RL	IEC England	SQIEngland
Curculionidae	Ceutorhynchus	pallidactylus	2010			
Curculionidae	Ceutorhynchus	contractus	2002			
Curculionidae	Nedyus	quadrimaculatus	2010			
Curculionidae	Rhynchaenus	signifer	2004			
Curculionidae	Orchestes	iota	2004			
Curculionidae	Orchestes	fagi	2010			
Curculionidae	Rhamphus	oxyacanthae	2010			

Annex 1B : list of Lachat et al (2012), with presence of species in the Sonian Forest.

Genus	Species	Family	IndVal	p-value	Priority	Sonian
Mycetochara	linearis	Alleculidae	0.584	0.005	C	1
Anobium	emarginatum	Anobiidae	0.435	0.014	C	
Dorcatoma	robusta	Anobiidae	0.477	0.026	C	1
Dryophilus	pusillus	Anobiidae	0.484	0.003	C	
Anthribus	albinus	Anthribidae	0.558	0.020	C	
Malthinus	punctatus	Cantharidae	0.530	0.015	C	1
Malthodes	alpicola	Cantharidae	0.402	0.016	C	
Malthodes	fuscus	Cantharidae	0.426	0.012	C	
Malthodes	hexacanthus	Cantharidae	0.407	0.027	C	
Malthodes	mysticus	Cantharidae	0.372	0.045	C	
Leiopus	nebulosus	Cerambycidae	0.459	0.040	C	
Leptura	quadrifasciata	Cerambycidae	0.462	0.014	C	
Pachytodes	cerambyciformis	Cerambycidae	0.419	0.047	C	1
Rhagium	bifasciatum	Cerambycidae	0.578	0.003	C	1
Rhagium	mordax	Cerambycidae	0.714	0.011	C	1
Cis	nitidus	Cisidae	0.554	0.047	C	1
Thanasimus	formicarius	Cleridae	0.498	0.047	C	1
Bitoma	crenata	Colydiidae	0.522	0.006	C	1
Cicones	variegatus	Colydiidae	0.600	0.003	C	
Synchita	humeralis	Colydiidae	0.481	0.015	C	1
Orthoperus	mundus	Corylophidae	0.509	0.049	C	1
Cryptophagus	micaceus	Cryptophagidae	0.389	0.042	C	
Acalles	dubius	Curculionidae	0.375	0.046	C	
Megatoma	undata	Dermestidae	0.506	0.007	C	1
Ampedus	pomorum	Elateridae	0.673	0.003	C	1
Melanotus	rufipes	Elateridae	0.718	0.003	C	1
Mycetina	cruciata	Endomychidae	0.510	0.003	C	
Dacne	bipustulata	Erotylidae	0.596	0.003	C	
Melasis	buprestoides	Eucnemidae	0.684	0.003	C	1
Abraeus	perpusillus	Histeridae	0.580	0.003	C	1
Paromalus	flavicornis	Histeridae	0.611	0.003	C	1
Paromalus	parallelepipedus	Histeridae	0.496	0.011	C	
Placonotus	testaceus	Laemophloeidae	0.443	0.036	C	1
Corticaria	abietorum	Latridiidae	0.511	0.005	C	
Corticarina	lambiana	Latridiidae	0.517	0.003	C	
Latridius	hirtus	Latridiidae	0.549	0.034	C	1
Stephostethus	rugicollis	Latridiidae	0.525	0.006	C	
Dorcus	parallelipipedus	Lucanidae	0.464	0.016	C	1
Platycerus	caprea	Lucanidae	0.463	0.022	C	
Platycerus	caraboides	Lucanidae	0.507	0.042	C	1
Platycis	minutus	Lycidae	0.396	0.035	C	1
Hylecoetus	dermestoides	Lymexylidae	0.723	0.027	C	1
Malachius	bipustulatus	Malachiidae	0.443	0.030	C	1
Serropalpus	barbatus	Melandryidae	0.343	0.049	C	

Genus	Species	Family	IndVal	p-value	Priority	Sonian
Dasytes	plumbeus	Melyridae	0.535	0.037	C	1
Rhizophagus	grandis	Monotomidae	0.408	0.010	C	
Tomoxia	bucephala	Mordellidae	0.654	0.003	C	1
Litargus	connexus	Mycetophagidae	0.791	0.003	C	1
Mycetophagus	atomarius	Mycetophagidae	0.615	0.003	C	1
Mycetophagus	multipunctatus	Mycetophagidae	0.443	0.035	C	1
Mycetophagus	quadripustulatus	Mycetophagidae	0.601	0.003	C	1
Cryptarcha	strigata	Nitidulidae	0.509	0.035	C	1
Cryptarcha	undata	Nitidulidae	0.494	0.034	C	1
Cychramus	luteus	Nitidulidae	0.619	0.029	C	1
Epuraea	binotata	Nitidulidae	0.373	0.027	C	
Epuraea	variegata	Nitidulidae	0.487	0.044	C	1
Bibloporus	minutus	Pselaphidae	0.474	0.029	C	1
Salpingus	planirostris	Salpingidae	0.709	0.046	C	1
Cetonia	aurata	Scarabaeidae	0.423	0.035	C	
Valgus	hemipterus	Scarabaeidae	0.398	0.045	C	1
Cyclorhipidion	bodoanus	Scolytinae	0.553	0.003	C	1
Ernoporicus	fagi	Scolytinae	0.699	0.044	C	1
Hylastes	cunicularius	Scolytinae	0.569	0.010	C	
Hylurgops	palliatus	Scolytinae	0.530	0.015	C	
Ips	typographus	Scolytinae	0.513	0.003	C	
Pityophthorus	pityographus	Scolytinae	0.579	0.003	C	
Polygraphus	poligraphus	Scolytinae	0.506	0.003	C	
Scolytus	intricatus	Scolytinae	0.521	0.035	C	
Taphrorychus	bicolor	Scolytinae	0.770	0.016	C	1
Trypodendron	lineatum	Scolytinae	0.616	0.003	C	
Xyleborus	saxeseni	Scolytinae	0.737	0.003	C	1
Xylosandrus	germanus	Scolytinae	0.731	0.003	C	1
Xyloterus	domesticus	Scolytinae	0.727	0.003	C	1
Anaspis	flava	Scraptiidae	0.449	0.040	C	1
Anaspis	frontalis	Scraptiidae	0.545	0.003	C	1
Anaspis	maculata	Scraptiidae	0.401	0.034	C	1
Anaspis	thoracica	Scraptiidae	0.458	0.044	C	1
Stenichnus	godarti	Scydmaenidae	0.492	0.016	C	
Uleiota	planata	Silvanidae	0.503	0.007	C	1
Atrecus	pilicornis	Staphylinidae	0.549	0.003	C	
Hapalaraea	pygmaea	Staphylinidae	0.457	0.039	C	
Hypnogyra	glabra	Staphylinidae	0.411	0.041	C	1
Phloeopora	corticalis	Staphylinidae	0.553	0.035	C	1
Phyllodrepa	linearis	Staphylinidae	0.333	0.044	C	
Quedius	plagiatus	Staphylinidae	0.561	0.003	C	
Scaphisoma	agaricinum	Staphylinidae	0.626	0.005	C	1
Siagonium	quadricorne	Staphylinidae	0.392	0.036	C	1
Velleius	dilatatus	Staphylinidae	0.510	0.014	C	1
Xylostiba	monilicornis	Staphylinidae	0.333	0.049	C	
Corticeus	unicolor	Tenebrionidae	0.621	0.011	C	1

Genus	Species	Family	IndVal	p-value	Priority	Sonian
Nemosoma	elongatum	Trogossitidae	0.590	0.034	C	1
Allecula	morio	Alleculidae	0.449	0.015	P	
Allecula	rhenana	Alleculidae	0.368	0.044	P	
Pseudocistela	ceramboides	Alleculidae	0.384	0.044	P	
Dorcatoma	dresdensis	Anobiidae	0.512	0.005	P	1
Anoplodera	sexguttata	Cerambycidae	0.407	0.010	P	
Plagionotus	arcuatus	Cerambycidae	0.353	0.043	P	
Cis	castaneus	Cisidae	0.516	0.045	P	1
Cis	jacquemartii	Cisidae	0.415	0.013	P	
Pediacus	depressus	Cucujidae	0.517	0.006	P	1
Dryophthorus	corticalis	Curculionidae	0.352	0.037	P	
Ampedus	erythrogonus	Elateridae	0.505	0.006	P	
Ampedus	nigrinus	Elateridae	0.519	0.003	P	
Anostirus	castaneus	Elateridae	0.530	0.003	P	
Denticollis	rubens	Elateridae	0.590	0.006	P	
Diacanthous	undulatus	Elateridae	0.378	0.016	P	
Hypoganus	inunctus	Elateridae	0.417	0.044	P	1
Hylis	cariniceps	Eucnemidae	0.504	0.006	P	1
Hylis	olexai	Eucnemidae	0.582	0.012	P	1
Abraeus	granulum	Histeridae	0.376	0.040	P	1
Aeletes	atomarius	Histeridae	0.399	0.044	P	1
Dendrophilus	punctatus	Histeridae	0.444	0.022	P	1
Plegaderus	dissectus	Histeridae	0.599	0.005	P	1
Sinodendron	cylindricum	Lucanidae	0.587	0.035	P	1
Phloiotrya	rufipes	Melandryidae	0.416	0.029	P	1
Mycetophagus	piceus	Mycetophagidae	0.487	0.014	P	1
Cychramus	variegatus	Nitidulidae	0.574	0.035	P	
Calopus	serraticornis	Oedemeridae	0.361	0.034	P	
Platypus	cylindrus	Platypodinae	0.433	0.034	P	1
Vincenzellus	ruficollis	Salpingidae	0.650	0.007	P	1
Xyleborus	monographus	Scolytinae	0.581	0.003	P	1
Xylechinus	pilosus	Scolytinae	0.444	0.006	P	
Xyloterus	laevae	Scolytinae	0.333	0.044	P	
Silvanus	unidentatus	Silvanidae	0.460	0.010	P	1
Thamiaraea	hospita	Staphylinidae	0.464	0.040	P	
Bolitophagus	reticulatus	Tenebrionidae	0.552	0.013	P	1
Uloma	culinaris	Tenebrionidae	0.387	0.035	P	

6. Annex 2 : Compiled list of hoverflies (Syrphidae) in the Sonian Forest.

Species	Latest re	Saproxy	Forest	Speight 1
Anasimyia contracta Claussen & Torp, 1980	1979	0	0	
Anasimyia interpuncta (Harris, 1776)	2011	0	0	
Anasimyia lineata (Fabricius, 1787)	2003	0	0	
Anasimyia transfuga (Linnaeus, 1758)	1979	0	0	
Arctophila bombiformis (Fallén, 1810)	1899	0	0	
Arctophila superbiens (Müller, 1776)	1979	0	0	
Baccha elongata (Fabricius, 1775)	2011	0	1	
Blera fallax (Linnaeus, 1758)		1	1	
Brachyopa bicolor (Fallén, 1817)	2011	1	1	1
Brachyopa dorsata	2011	1	1	
Brachyopa insensilis Collin, 1939	2011	1	1	
Brachyopa panzeri Goffe, 1945	2011	1	1	1
Brachyopa pilosa Collin, 1939	2011	1	1	
Brachyopa scutellaris Robineau-Desvoidy, 1843	2011	1	1	
Brachyopa testacea (Fallén, 1817)	1973	1	1	
Brachypalpoides lentus (Meigen, 1822)	2011	1	1	
Caliprobola speciosa (Rossi, 1790)	2011	1	1	1
Ceriana conopsoides (Linnaeus, 1758)	1894	1	1	1
Chalcosyrphus nemorum (Fabricius, 1805)	2011	1	1	
Chalcosyrphus piger (Fabricius, 1794)	2009	1	1	1
Cheilosia albipila Meigen, 1822	2011	0	0	
Cheilosia albitarsis (Meigen, 1822)	2011	0	0	
Cheilosia barbata Loew, 1857	1979	0	0	
Cheilosia bergenstammi Becker, 1894	1979	0	0	
Cheilosia canicularis (Panzer, 1801)	1976	0	0	
Cheilosia carbonaria Egger, 1860	1976	0	0	
Cheilosia chloris (Meigen, 1822)	2011	0	0	
Cheilosia chrysocoma (Meigen, 1822)	2011	0	1	
Cheilosia fraterna (Meigen, 1830)	2011	0	0	
Cheilosia himantopus (?)	2011			
Cheilosia illustrata (Harris, 1780)	2009	0	0	
Cheilosia impressa Loew, 1840	1987	0	0	
Cheilosia latifrons (Zetterstedt, 1843)	1979	0	0	
Cheilosia lenis Becker, 1894	2011	0	0	
Cheilosia mutabilis (Fallén, 1817)	1979	0	0	
Cheilosia nebulosa (Verrall, 1871)	1945	0	1	
Cheilosia nigripes (Meigen, 1822)	1899	0	0	
Cheilosia pagana (Meigen, 1822)	2011	0	0	
Cheilosia proxima (Zetterstedt, 1843)	1987	0	0	
Cheilosia scutellata (Fallén, 1817)	1987	0	1	
Cheilosia semifasciata Becker, 1894	2011	0	1	
Cheilosia variabilis (Panzer, 1798)	2011	0	0	
Cheilosia velutina Loew, 1840		0	0	
Cheilosia vernalis (Fallén, 1817)	1997	0	0	
Cheilosia vulpina (Meigen, 1822)	2011	0	0	
Chrysogaster coemiteriorum (Linnaeus, 1758)	1979	0	0	
Chrysogaster solstitialis (Fallén, 1817)	2009	0	1	
Chrysogaster virescens Loew, 1854	2011	0	0	
Chrysotoxum arcuatum (Linnaeus, 1758)	1979	0	1	
Chrysotoxum bicinctum (Linnaeus, 1758)	2009	0	0	
Chrysotoxum cautum (Harris, 1776)	1979	0	0	
Criorhina asilica (Fallén, 1816)	2011	1	1	
Criorhina berberina Fabricius, 1805	2011	1	1	
Criorhina floccosa Meigen, 1822	2011	1	1	

Species	Latest re	Saproxy	Forest	Speight 1
Criorhina pachymera (Egger, 1858)	197	1	1	1
Criorhina ranunculi (Panzer, 1804)	197	1	1	
Dasysyrphus albostriatus (Fallen,1817)	201	0	1	
Dasysyrphus hilaris (Zetterstedt, 1843)	199	0	1	
Dasysyrphus pinastri (De Geer, 1776)	198	0	1	
Dasysyrphus tricinctus (Fallen, 1817)	198	0	1	
Dasysyrphus venustus (Meigen, 1822)	201	0	1	
Didea alneti (Fallen, 1817)	189	0	1	
Didea fasciata Macquart, 1834	201	0	1	
Didea intermedia Loew, 1854	190	0	1	
Doros profuges (Harris, 1780)	189	0	1	
Epistrophe eligans (Harris, 1780)	201	0	1	
Epistrophe grossulariae (Meigen, 1822)	196	0	1	
Epistrophe melanostoma (Zetterstedt, 1843)	200	0	1	
Epistrophe nitidicollis (Meigen, 1822)	201	0	1	
Epistrophe ochrostoma (Zetterstedt, 1849)	197	0	1	
Epistrophella euchroma (Kowarz, 1885)	194	0	1	
Episyrphus balteatus (De Geer, 1776)	200	0	1	
Eristalinus aeneus (Scopoli, 1763)		0	0	
Eristalinus sepulchralis (Linnaeus, 1758)	201	0	0	
Eristalis abusivus (?)	197			
Eristalis arbustorum (Linnaeus, 1758)	201	0	0	
Eristalis interrupta (Poda, 1761)	201	0	0	
Eristalis lineata (Harris, 1776)	200	0	1	
Eristalis pertinax (Scopoli, 1763)	201	0	1	
Eristalis picea (Fallén, 1817)	201	0	1	
Eristalis rupium Fabricius, 1805		0	1	
Eristalis tenax (Linnaeus, 1758)	200	0	0	
Eumerus sabulonum (Fallén, 1817)	197	0	0	
Eumerus sogdianus Stackelberg, 1952	191	0	0	
Eumerus strigatus (Fallén, 1817)		0	0	
Eumerus tarsalis Loew, 1848	190	0	0	
Eupeodes corollae (Fabricius, 1794)	199	0	0	
Eupeodes latifasciatus (Macquart, 1829)	197	0	1	
Eupeodes luniger (Meigen, 1822)	201	0	0	
Ferdinandea cuprea (Scopoli, 1763)	201	1	1	
Helophilus hybridus Loew, 1846		0	0	
Helophilus pendulus (Linnaeus, 1758)	201	0	1	
Helophilus trivittatus (Fabricius, 1805)	199	0	0	
Heringia heringi (Zetterstedt, 1843)		0	1	
Heringia latitarsis (Egger, 1865)		0	1	
Heringia pubescens (Delicchi & Pschorn-Walcher, 1955)	201	0	1	
Heringia vitripennis (Meigen, 1822)	201	0	1	
Ischyrosyrphus glaucius (Linnaeus, 1758)	198	0	1	
Ischyrosyrphus laternarius (Müller, 1776)	197	0	1	
Lapposyrphus lapponicus (Zetterstedt, 1838)	190	0	1	
Lejogaster metallina (Fabricius, 1781)	197	0	0	
Leucozona lucorum (Linnaeus, 1758)	198	0	1	
Mallota fuciformis (Fabricius, 1794)	194	1	1	1
Melangyna compositarum (Verrall, 1873)	197	0	1	
Melangyna lasiophthalma (Zetterstedt, 1843)	201	0	1	
Melangyna quadrimaculata Verrall, 1873	194	0	1	
Melangyna umbellatarum (Fabricius, 1794)	197	0	1	
Melanogaster hirtella (Loew, 1843)	201	0	1	
Melanogaster viduata (Linnaeus, 1758)	201	0	0	
Melanostoma mellinum (Linnaeus, 1758)	201	0	0	
Melanostoma scalare (Fabricius, 1794)	201	0	1	
Meligramma cincta (Fallén, 1817)	201	0	1	

Species	Latest re	Saproxy	Forest	Speight 1
Meligramma guttata (Fallén, 1817)	197	0	1	
Meligramma triangulifera (Zetterstedt, 1843)	200	0	1	
Meliscaeva auricollis (Meigen, 1822)	197	0	1	
Meliscaeva cinctella (Zetterstedt, 1843)	198	0	1	
Merodon equestris (Fabricius, 1794)	198	0	1	
Myathropa florea (Linnaeus, 1758)	201	1	1	
Myolepta dubia (Fabricius, 1805)	187	1	1	
Myolepta vara (Panzer, 1798)		1	1	1
Neoascia interrupta (Meigen, 1822)	198	0	0	
Neoascia meticulosa (Scopoli, 1763)	201	0	0	
Neoascia obliqua Coe, 1940	200	0	1	
Neoascia podagrica (Fabricius, 1775)	201	0	1	
Neoascia tenur (Harris, 1780)	197	0	1	
Orthonevra brevicornis Loew, 1843	201	0	0	
Orthonevra elegans (Meigen, 1822)	197	0	0	
Orthonevra geniculata (Meigen, 1830)	191	0	1	
Orthonevra nobilis (Fallén, 1817)	200	0	1	
Paragus haemorrhous Meigen, 1822	197	0	0	
Parasyrphus lineolus (Zetterstedt, 1843)	198	0	1	
Parasyrphus malinellus (Collin, 1952)	198	0	1	
Parasyrphus punctulatus (Verrall, 1873)	200	0	1	
Parasyrphus vittiger (Zetterstedt, 1843)	197	0	1	
Parhelophilus frutetorum (Fabricius, 1775)	201	0	1	
Parhelophilus versicolor (Fabricius, 1794)	201	0	0	
Pipiza austriaca Meigen, 1822	197	0		
Pipiza bimaculata Meigen, 1822	201	0		
Pipiza lugubris (Fabricius, 1775)	197	0		
Pipiza noctiluca (Linnaeus, 1758)	201	0		
Pipiza quadrimaculata (Panzer, 1804)	197	0	1	
Pipizella viduata (Linnaeus, 1758)	201	0	1	
Pipizella virens (Fabricius, 1805)	200	0	1	
Platycheirus albimanus (Fabricius, 1781)	201	0	0	
Platycheirus angustatus (Zetterstedt, 1843)	198	0	0	
Platycheirus clypeatus (Meigen, 1822)	198	0	0	
Platycheirus discimanus (Loew, 1871)	194	0	1	
Platycheirus fulviventris (Macquart, 1829)	201	0	0	
Platycheirus manicatus (Meigen, 1822)	191	0	0	
Platycheirus parmatus Rondani, 1857	197	0	1	
Platycheirus peltatus (Meigen, 1822)	197	0	1	
Platycheirus scutatus (Meigen, 1822)	199	0	1	
Portevinia maculata (Fallén, 1817)	191	0	1	
Pyrophaena granditarsa (Foster, 1771)	198	0	1	
Pyrophaena rosarum (Fabricius, 1787)	198	0	1	
Rhingia campestris Meigen, 1822	201	0	1	
Riponnensia splendens (Meigen, 1822)	198	0	1	
Scaeva pyrastri (Linnaeus, 1758)	200	0	0	
Scaeva selenitica (Meigen, 1822)	200	0	1	
Sericomyia lappona (Linnaeus, 1758)	201	0	1	
Sericomyia silentis (Harris, 1776)	200	0	1	
Sphaerophoria batava Goeldlin de Tiefenau, 1974	198	0	0	
Sphaerophoria interrupta (Fabricius, 1805)	197	0	0	
Sphaerophoria philanthus (Meigen, 1822)	189	0	1	
Sphaerophoria rueppelli (Wiedemann, 1830)		0	0	
Sphaerophoria scripta (Linnaeus, 1758)	200	0	0	
Sphaerophoria taeniata (Meigen, 1822)	197	0	0	
Sphaerophoria virgata Goeldlin de Tiefenau, 1974	195	0	0	
Sphegina clunipes (Fallen, 1816)	201	1	1	
Sphegina elegans Schummel, 1843	197	1	1	

Species	Latest re	Saproxy	Forest	Speight 1
Sphiximorpha subsessilis (Illiger in Rossi, 1807)	201	1	1	1
Syritta pipiens (Linnaeus, 1758)	201	0	1	
Syrphus ribesii (Linnaeus, 1758)	201	0	1	
Syrphus torvus Osten-Sacken, 1875	201	0	1	
Syrphus vitripennis Meigen, 1822	201	0	1	
Temnostoma bombylans (Fabricius, 1805)	201	1	1	
Temnostoma vespiforme (Linnaeus, 1758)	201	1	1	
Triglyphus primus Loew, 1840	194	0	0	
Tropidia scita (Harris, 1780)	197	0	0	
Volucella bombylans (Linnaeus, 1758)	200	0	1	
Volucella inanis (Linnaeus, 1758)	197	0	1	
Volucella pellucens (Linnaeus, 1758)	200	0	1	
Volucella zonaria (Poda, 1761)	197	0	1	
Xanthogramma festivum (Linnaeus, 1758)	191	0	0	
Xanthogramma laetum (Fabricius, 1794)	201	0	1	
Xanthogramma pedissequum (Harris, 1776)	197	0	0	
Xylota florum (Fabricius, 1805)	197	1	1	
Xylota meigeniana Stackelberg, 1964	198	1	1	1
Xylota segnis (Linnaeus, 1758)	201	1	1	
Xylota semulatra Meigen, 1822	200	1	1	
Xylota sylvarum (Linnaeus, 1758)	200	1	1	
Xylota xanthocnema Collin, 1939	197	1	1	

7. Annex 3 : Fungi on dead wood of beech in the Strict Forest Reserve Joseph Zwaenepoel: results of the inventory in the framework of the NAT-MAN-protocol (Walleyn & Vandekerkhove, 2003).

Species	Kersselaerspleyn- NATMAN-inven	INDICATORS (Christensen et al. 2	INDICATORS (JHC & MC 2000)	Signalarter (Sweden)	SSI A	SSI B	SSI C
Abortiporus biennis	1						1
Antrodiella onynchoides	1						1
Antrodiella semisupina	1						
Armillaria lutea	1						
Armillaria mellea	1						
Ascocoryne cylichnium	1						
Ascocoryne sarcoides	1						
Ascotremella faginea	1						
Aurantioporus fissilis	1		1		1		
Auricularia auricula-judae	1						
Biscogniauxia nummularia	1						1
Bjerkandera adusta	1						
Bjerkandera fumosa	1						
Bolbitius reticulatus	1						
Botryobasidium aureum	1						
Botryobasidium conspersum	1						
Botryobasidium subcoronatum	1						
Botryohypochnus isabellinus	1						
Bulgaria inquinans	1						
Callistosporium luteo-olivaceum f. minor	1					1	
Calocera cornea	1						
Camarops lutea	1						
Ceriporia excelsa s.l.	1						1
Ceriporiopsis gilvescens	1	1	1			1	
Ceriporiopsis pannocincta	1	1			1		
Chondrostereum purpureum	1						
Clitopilus hobsonii	1						1
Clitopilus scyphoides	1						
Coniophora puteana	1						
Conocybe brunnea	1						
Conocybe subpubescens	1						
Coprinus disseminatus	1						

Species	Kersselaerspleyn- NATMAN-inver	INDICATORS (Christensen et al. 2	INDICATORS (JHC & MC 2000)	Signalarter (Sweden)	SSI A	SSI B	SSI C
Coprinus lagopides	1						
Coprinus lagopus	1						
Coprinus laanii	1						
Coprinus micaceus	1						
Coprinus spelaiophilus	1						
Crepidotus applanatus	1						1
Crepidotus cesatii	1						1
Crepidotus epibryus	1						
Crepidotus mollis	1						
Crepidotus variabilis	1						
Crepidotus versutus	1						
Cyathus striatus	1						
Cylindrobasidium evolvens	1						
Datronia mollis	1						
Delicatula integrella	1						1
Eutypa spinosa	1		1				
Exidia glandulosa	1						
Exidia nucleata	1						
Flammulaster limulatus	1	1	1			1	
Fomes fomentarius	1						
Galerina ampullaceocystis	1						
Galerina heimansii	1						
Galerina marginata	1						
Galerina nana	1						
Ganoderma lipsiense	1						
Ganoderma pfeifferi	1	1	1			1	
Gymnopilus junonius	1						
Gymnopilus sapineus	1						
Henningsomyces candidus	1		1				
Hericium erinaceus	1	1	1				
Hohenbuehelia auriscalpium	1	1	1			1	
Hyphoderma puberum	1						
Hyphoderma setigerum	1						
Hyphodontia flavipora	1						
Hyphodontia paradoxa	1						
Hyphodontia radula	1						
Hypholoma fasciculare	1						
Hypholoma lateritium	1						

Species	Kersselaerspleyn- NATMAN-inver	INDICATORS (Christensen et al. 2	INDICATORS (JHC & MC 2000)	Signalarter (Sweden)	SSI A	SSI B	SSI C
Hypocrea aureoviridis	1						
Hypocrea citrina	1						
Hypocrea gelatinosa	1						
Hypocrea rufa	1						
Hypoxylon cohaerens	1		1				
Hypoxylon fragiforme	1						
Hypoxylon macrocarpum	1						
Hypoxylon rubiginosum	1						
Inonotus nodulosus	1		1				1
Kretzschmaria deusta	1						
Laetiporus sulphureus	1						
Laxitextum bicolor	1						
Lentinellus ursinus	1	1					
Lentinus cyathiformis	1						
Lycoperdon perlatum	1						
Lycoperdon pyriforme	1						
Marasmiellus ramealis	1						
Megacollybia platyphylla	1						
Melanamphora spinifera	1						
Meripilus giganteus	1						1
Merismodes anomalus	1						
Mutinus caninus	1			1			1
Mycena abramsii	1						
Mycena acicula	1						
Mycena adscendens	1						
Mycena arcangeliana	1						
Mycena crocata	1						
Mycena galericulata	1						
Mycena haematopus	1						
Mycena hiemalis	1						
Mycena picta	1					1	
Mycena purpureofusca	1						1
Mycena speirea	1						
Mycena vitilis	1						
Mycoacia aurea	1						
Mycoacia fuscoatra	1						
Mycoacia uda	1						
Myxarium nucleatum	1						

Species	Kersselaerspleyn- NATMAN-inver	INDICATORS (Christensen et al. 2	INDICATORS (JHC & MC 2000)	Signalarter (Sweden)	SSI A	SSI B	SSI C
Nectria coccinea	1						
Nemania chestersii	1		1				
Nemania serpens	1						
Neobulgaria pura	1						
Oudemansiella mucida	1						
Oxyporus latemarginatus	1						1
Pachyella babingtonii	1						
Panellus serotinus	1						
Panellus stipticus	1						
Parthenope pilatii	1						
Peniophora cinerea	1						
Peziza micropus	1						
Phallus impudicus	1						
Phanerochaete filamentosa	1						
Phanerochaete velutina	1						
Phellinus ferruginosus	1			1			
Phlebia livida	1						
Phlebia radiata	1						
Phlebia rufa	1						
Phlebia tremellosa	1						
Phleogena faginea	1		1			1	
Pholiota adiposa	1						
Pholiota aurivellus	1		1				
Pholiota flammans	1						1
Pholiota gummosa	1						
Pholiota mutabilis	1						
Pholiota squarrosa	1						
Pholiota tuberculosa	1					1	
Physisporinus vitreus	1						
Pleurotus dryinus	1						1
Pleurotus ostreatus	1						
Pleurotus pulmonarius	1						
Plicaturopsis crispa	1			1			
Pluteus cervinus	1						
Pluteus chrysophaeus	1			1			
Pluteus hispidulus	1			1			
Pluteus insidiosus	1						
Pluteus leoninus	1			1		1	

Species	Kersselaerspleyn- NATMAN-inver	INDICATORS (Christensen et al. 2	INDICATORS (JHC & MC 2000)	Signalarter (Sweden)	SSI A	SSI B	SSI C
Pluteus luctuosus	1		1	1			
Pluteus nanus	1			1			
Pluteus phlebophorus	1		1	1			
Pluteus plautus	1			1			1
Pluteus podospileus	1						
Pluteus romellii	1			1			
Pluteus salicinus	1						
Pluteus thomsonii	1			1			
Pluteus umbrosus	1	1	1	1		1	
Polyporus badius	1		1				1
Polyporus brumalis	1						
Polyporus ciliatus	1						
Polyporus squamosus	1						
Polyporus varius	1						
Postia stiptica	1						
Postia subcaesia	1						
Postia tephroleuca	1						
Psathyrella cotonea	1						
Psathyrella laevissima	1						
Psathyrella maculata	1						
Psathyrella multicystidiata	1						1
Psathyrella piluliformis	1						
Psathyrella scobinacea	1						
Pseudoclitocybe cyathiformis	1						1
Psilocybe horizontalis	1						1
Ramaria stricta	1						
Resupinatus applicatus	1						
Schizophyllum commune	1						1
Simocybe centunculus	1						
Simocybe rubi	1						
Simocybe sumptuosa	1						
Skeletocutis nivea	1						
Sphaerobolus stellatus	1						
Spongipellis pachyodon	1				1		
Steccherinum nitidum	1						
Steccherinum ochraceum	1						
Stereum hirsutum	1						
Stereum ochraceoflavum	1						

Species	Kersselaerspleyn- NATMAN-inver	INDICATORS (Christensen et al. 2	INDICATORS (JHC & MC 2000)	Signalarter (Sweden)	SSI A	SSI B	SSI C
Stereum rugosum	1						
Stereum subtomentosum	1		1				
Trametes gibbosa	1						
Trametes hirsuta	1						
Trametes ochracea	1						
Trametes versicolor	1						
Trechispora farinacea	1						
Tremella foliacea	1						
Tubaria conspersa	1						
Tubaria furfuracea sl	1						
Tulasnella violea	1						
Xerula radicata	1						
Xylaria hypoxylon	1						
Xylaria polymorpha	1						
Species total Fagus:	197	7	17	13	3	9	21
Indicator species (Denmark)	18						
Indicator species (Europe)	8						
SSI A	3						
SSI B	10						
SSI C	21						
All SSI	34						