

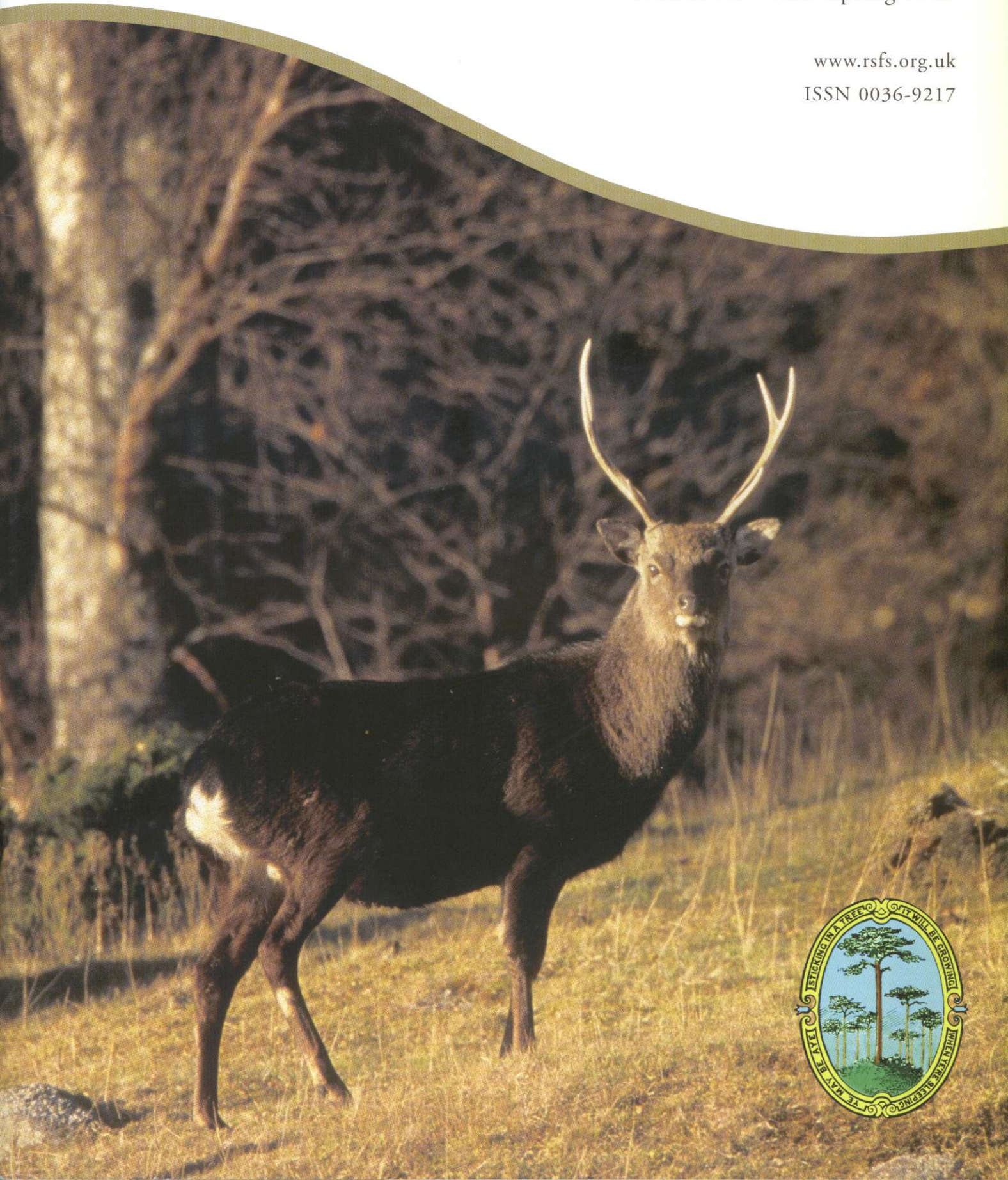
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Front cover picture

Sika stag (copyright Neil McIntyre). See article page 12 on Sustainable deer management in Scotland.

Croatian Forests

Croatian Forests

by Maurice Rogers

The European Forestry Network gathers representatives from those countries wishing to confer with English as the common language. A typical meeting will spend an afternoon when each country has an opportunity to high-light its current pertinent conditions and events. A further full day offers an insight into the host country's forestry. Timing may take advantage of some national event of potential interest. In September 2010 Croatia hosted the meeting to coincide with the 29th International Logging Competition being held in its capital Zagreb.



Damir Delac. Discussion on oak regeneration

The Republic of Croatia

The Republic of Croatia was formed in 1991 as one of the countries arising from the break up of Yugoslavia. It is bounded by the Adriatic to the south; it is separated from Italy and Austria in the west by Slovenia. Hungary lies to its north. The curve between these two horns form the western side of Bosnia and Herzegovina.

Croatia is a member of NATO. It has a land mass of just under 56.6 million hectares and its population of about 4.5 million is mainly centred around Zagreb or along the Adriatic coast. Neanderthal man was here before the Greeks, the Romans, the Austro-Hungarian Empire, and forays by the Arabs, Venetians, Turks, the French, and the Germans.

State and private forest

The State manages 2.1 million hectares of forest, and private owners some 0.6 million hectares. Both sectors have an interest in the production of timber, harvesting 6.6 million cbm, 85% of annual increment. Some estates have a major interest in hunting red deer (*Cervus elaphus*) and wild boar (*sus scrofa*). The annual number of deer that may be culled is assessed by authority and tends to vary around two per 100 ha. The value of standing timber is calculated at 6,376 million euros with various multiplying factors such as carbon sequestration also taken into account.

Croatian forests

Forest management has certainly featured since 1770, "sustainability" appearing in print in 1852. The major host of our visit, The Croatian Forestry Society, was founded in 1846. It has a current membership of 3,000 distributed over 19 divisions.

Foresters have three distinct geographical and climatic conditions to consider. In the south, the 1,500 metre mountains along the Adriatic coast rise abruptly leaving a relatively narrow fertile littoral. Although Dubrovnik in the east derives its name from "oak forest", as the current broadleaves include species such as tangerine and olive, in earlier times the oak may have been an evergreen, the *Quercus ilex*. The tree that now copes with the alkaline and sometimes arid conditions is Aleppo pine (*Pinus halepensis*). Its major contribution to the scenery and the important tourist industry may justify a longer rotation than that suitable for timber.

In the west, any low-lying woodland tends to have mixed broadleaves - sweet chestnut, both sessile and pedunculate oak, hornbeam, and beech.

The beech becomes more dominant with increasing altitude and black pine (*Pinus nigra*) and silver fir (*Abies alba*) also appear. Closer to the Alps, the silver fir becomes dominant and is the last timber tree to reach the tree line. Trees make a significant contribution to the environment, mitigating the cold winds off the high round - the bora. They also reduce the risks of avalanches. Trees provide the scenery which is enjoyed both by the public and the winter sports enthusiasts. The forester needs to avoid clear felling and practise selection forestry - continuous cover. Some increment may still be harvested but the volume will be less concentrated and its sizes more diverse.

Central Croatia

It was to a third region that our kind hosts had arranged for us to visit. Our driver of the society's coach had been one of the musicians entertaining us the previous evening in the courtyard of Sumaraski Dom - Forestry House. Our 140-mile circular route took us into the Pannonian Plain. Central Croatia is influenced by three major rivers, the Danube in the north, the boisterous Drava with its waters from the Alps, and the

Sarva - named after Sarbus the god of still water: its waters rising in the Dinaric Alps - Dinara at 1,837m being the country's highest mountain.

Forestry in flood plains

Over thousands of years these rivers have flooded, changing their courses, eroding their banks and depositing silt each spring. Once flood waters start to fall, any banks that arise may attract reeds around their edges and such as phragmites and support a succession of woody plants on their surface. Typical early colonisers will be willows (*Salix purpurea* and *S. triandrae*). These may make way for poplars (*Populus nigra* and *P. alba*) and black and grey alders (*Alnus glutinosa* and *A. incana*). The alders fix nitrogen with their root nodules and as they have lenticels higher up their stems can offer the transfer



Trees survive months in water

of oxygen to their roots beneath the water and also remove unwanted carbon dioxide.

Each subsequent flood may deposit more sediment. This was demonstrated in a poplar sample plot. It was measured at breast height with a band painted at 1.3m. When re-measured some 10 years later, the painted bands were only at 0.6m; the soil level had risen by 0.7m.

Later arrivals may include bird cherry (*Prunus padus*) and hornbeam (*Carpinus orientalis*) and a range of broadleaves including elms, sycamore, narrow leaved ash (*Fraxinus angustifolia*), and oak (*Quercus robur*). Flooding may still be a regular feature, but as long as the trees can enjoy a two month period above the floods during the growing season, they can survive. Ice may damage bark and open the way for fungal attack.

The 1996 census classified these forests as 100,000 ha of oak, and 67,000 ha of sub climax forest of which 30,000 ha were ash and 30,000 ha were of poplar. It is thought that an earlier 100,000 ha of oak had been logged during the early 1700s - the timber being rafted down to the Danube. The ash, with clean stems of 20 to 30m, can fetch a price which compares with that of the oak.

Bjelovar oaks

Our coach took us to forests and foresters of Bjelovar. A warm

and fortifying welcome informed us that even aged oak would reach maturity at 100 to 130 years. A preliminary felling, some 40 years before the clear fell, would free the crowns of trees considered the most suitable parents for the next generation. A further felling 20 years later allows the crowns of the best trees to develop.

An understory of hornbeam is retained. This suppresses epicormics and lateral branching. Too much light is discouraged from reaching the forest floor otherwise there is a risk of invasion by unwanted blackberry (*Rubus caesius*). Final felling may take into account a regular 10 or 11 year cycle of severe summer drought as this is followed by a massive leaf-eating caterpillar population of the Gypsy moth (*Lymantra dispar*). Another consideration is that no felling is allowed during the first six months of the year of any tree



Elite group by elite oak tree

within 500m of nests of white-tailed sea eagles, black storks, saker falcons, or herons.

We visited a recently felled 10ha compartment which had been fenced to keep out deer and wild boar. A random spot check showed a square metre to contain some 50 one and two year oak seedlings. If it should be required, a mechanically

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sprayed dressing would be applied to destroy oak mildew. An adjacent compartment had reached a height of five to six metres. Although the stocking was dense it would be possible to pass beneath the canopy. A chain of men could pass through the crop, keeping in touch with their neighbours, and cutting to waste any weed trees such as willow and any forked or misshapen trees. Some hornbeam would be accepted with the oak. This was recognised as being labour intensive but gave excellent results. Forestry employs some 40,000 people, and



Bright group in dense young oak

there were a further 3,000 who lived well collecting truffles. A good truffling dog might sell for 10,000 euros.

Over one half of the country's roads are within the forest but which are not open to public vehicles. They also give access to a network of water table gauges. There is lateral movement of water beneath the forest and although drainage may be important, the greater risk appears to be from drought. When the water table drops below the depth of the roots, the trees' crowns die. Damming of drainage ditches keeps the water table sufficiently high. There is a worrying increase in oak die-back downstream from the dozen or so hydro-electric schemes both in Croatia and its western neighbours.

Cigoc and Krapje

We returned to our reception group where a cauldron was being stirred by the erstwhile chef of Josip Broz Tito. His recipe was secret but no doubt included venison, Croatian red wine and wild boar. We had seen no sign of badger or beaver and the only sign of a bear was on the labels of San Hubert. The appropriate cry to follow this particular bear was "jele" (*cheers*).

One of the region's tourist attractions was the village of Cigoc with its seasonal population of roof nesting storks. We were treated with a visit to the similar village of Krapje. The river bank houses were based on solid baulks of pedunculate oak with just a few of the roofs being sessile. Families moved upstairs during the floods. A film presentation gave us an insight into the rural life of the locality. In the small farms we

had seen there had been maize, cattle, horses and pigs, but no sheep. Local snails acted as vectors between sheep and man, carrying the liver fluke (*Fascioloides magna*) which could introduce trichinosis and death. Life centred around the river, the fish and birdlife and the tourists who were made welcome.

We passed the town of Sisak to reach the European Wetland Reserve of Lonjsko Polje. Our narrow road led into the waters of a reservoir. It would only reappear to reach the distant bank during the next drought. Ash, poplar and alder appeared quite content to stand in at least a metre of water on the edge of our causeway. San Hubert gave us confidence as our driver reversed the coach and took us to the lodge of the Country Park and an evening meal courtesy of USP Sisak.

Zagreb

En route to Brezgovia on our final morning, we became tourists seeing the sights of Zagreb with its attractive treescape which included avenues of horse chestnut and lime. Teams from some 18 countries, including Japan, were in the final stages of demonstrating their skills. There appeared to be only one representative of the UK. It is hoped his yellow high visibility jacket and RSFS logo would be caught on the television cameras. Log floating was not on the programme but the autumn rains made it feasible. The weather encouraged visitors to concentrate on displays that were under canvas. This included our reserved corner of the hospitality tent where we were joined by the Minister of Agriculture, Forestry and Water Management – he had fond memories of Scotland. We showed our appreciation to our hosts, Hrvatsko Sumarsko Društvo, before returning to the Forestry House to thank Damir Delac and his team.

We appeared convinced that any merit the proposed four-metre deep navigational canal from the Drava to the Sarva might have, it would not compensate for the potential damage to Croatia's flood plain forests. Even the extension of the canal to bisect Bosnia and Herzegovina and pass Sarajevo to reach Mostar and the Adriatic at Methovik would risk losing a major asset of the European environment.

Hvala Croatia, we salute your forests and foresters

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