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Analysis of breeding habitats of the Lesser Spotted Eagle *Aquila pomarina* in Latvia

Ugis Bergmanis

ABSTRACT

The small distribution area of the Lesser Spotted Eagle *Aquila pomarina* (LSE), risk connected with migration to its wintering grounds, decreasing numbers in several parts of its range and intensive transformation of breeding and foraging habitats are the main reasons for including it in the category of especially endangered bird species.

Detailed investigations on breeding habitats of this species have been carried out in Latvia to substantiate conservation measures. Information on 252 LSE nests and their location in forest stands was summarized and analysed in 1979-2002. Thus additional statistically reliable information was obtained on the location of nests in forest stands in the central part of this species' distribution area where a considerable amount of the world population breeds.

INTRODUCTION

The Lesser Spotted Eagle *Aquila pomarina* (LSE) continues to decrease in some parts of its distribution area (in Germany, Moldova, Romania, Bulgaria, Greece, Albania) or has even disappeared in some regions (West Germany, Austria; Hagemeier & Blair 1997; Meyburg *et al.* 1997 Species Action Plan) contrary to some other species of European diurnal raptor, the numbers of which have tended to stabilize or even increase during recent decades.

The limited range, risk connected with migration to wintering grounds, decreasing numbers in W, S and SW parts of its distribution area, as well as intensive transformation of breeding and foraging habitats, are the main reasons for including the LSE in the category of endangered bird species and special attention must be paid to its study and protection. There are numerous publications stressing the urgency and shortcomings of studies on this species (Meyburg 1991, 1996). Detailed information on its breeding biology is

obtained by means of telemetry, remote control Videocamera, and also by DNA and number dynamics, but in spite of the impressive amount of available information there is a lack of sufficiently representative data on LSE breeding habitats in the central part of its distribution area. The aim of this article is to summarize and analyse these habitats in Latvia, which is one of the central regions of its distribution area where a significant part of the world population breeds. Such information is of particular importance in period at a time when, due to the now open market, intensive forest use has been taking place since the1990s in the countries of Eastern Europe. Intensive forest use is one of the factors endangering the LSE population, so that information on its breeding habitats is important for conservation of the species.

METHODS

To describe the breeding habitat the following data were collected: 1. location of nest tree in forest stand; 2. the tree as such and position of nest on it. Information from 252 nests of the LSE found in Latvia during 1979-2002 was used for analysis. For each of these nests its position in a particular forest management block and forest management section was clarified. For every section the data were obtained from the State Register of Forests together with parameters describing this forest stand. Height of the nest above ground was determined by inclinometer "Baumhoehenmesser Blumeleiss", age of the tree by Pressler increment borer drilling at the height 1.5m from the ground (five years being added to the age identified from the drilled-out core, which is an average time needed for a tree to gow 1.5m), and diameter of the tree by caliper 1.5m from the ground. To find the level of significance between different parameters their theoretical and observed proportions were compared. If the level of calculated significance is $\alpha<0.05$ the difference is significant (Plohinskij 1970).

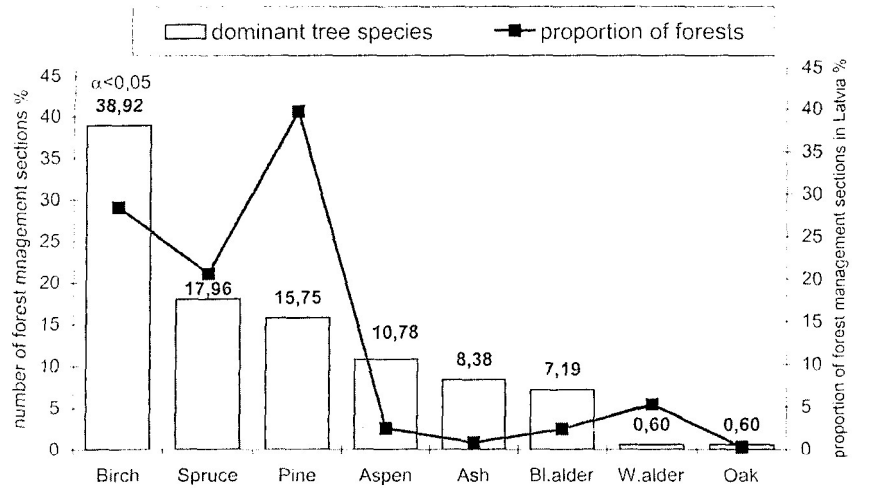
RESULTS

Characteristics of breeding forests

1. 1. Distribution of breeding area depending on dominant tree species in 1st layer of forest stand, age and structure of area.

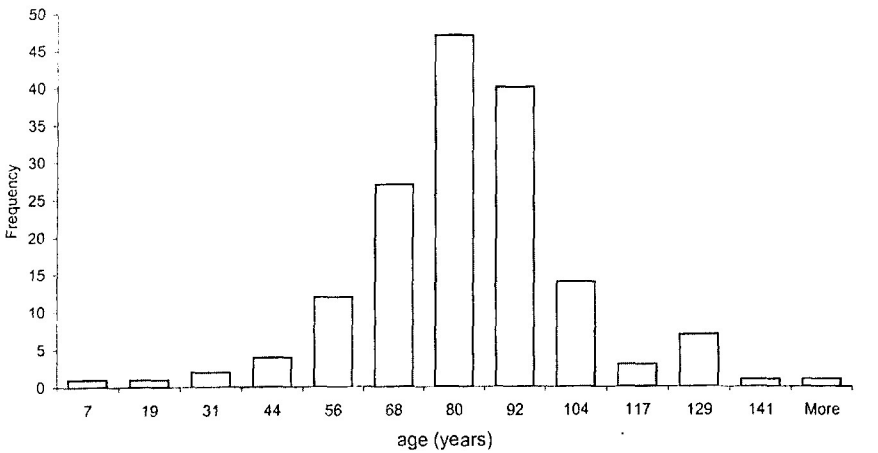
A significant importance for breeding choice falls to birch as a dominant species in the 1st layer of a forest stand (Figure 1.) – 39% of nests were found in forests where the dominant species is birch. Comparing the presence of nests in areas according to dominant tree species in the 1st layer with the distribution of such areas in Latvia (State Forest Service 1996) one can conclude that the LSE avoids breeding in forests where pine is dominant (only 16% nests found), nevertheless this type of forest is most abundant in Latvia (39.7%). Occurrence of nests in spruce forests approximately corresponds to the number of such forests but choice of aspen, ash, black alder and oak forests is higher than the overall percentage of these forests in the country.

Figure 1. Distribution of breeding areas (n=167) of Lesser Spotted Eagle depending on dominant species of trees in the 1st layer



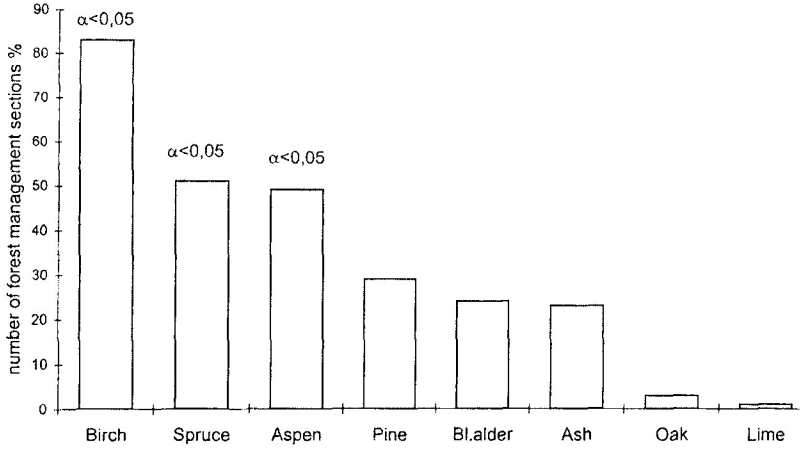
Analysing the age of dominant tree species of the 1st layer in breeding areas one can conclude that the majority of nests (88%) occur in forests of age 56 to 104 years (median=77 years, Figure 2). Occurrence of nests in forests with mean age classes 7; 19 and 31 years can occur when the nest tree stands in a clearing or in a young stand not far from mature forest.

Figure 2. Age distribution of 1st layer dominant species of trees in breeding areas of Lesser Spotted Eagle (when initially the nest was found)
Average=77; Min=7; Max=153; SD=22; Median=78; n=159



More often three 1st layer species of tree are to be found in LSE breeding areas – birch (83%), spruce (51%) and aspen (49%; Figure 3). When analysing breeding areas according to the 1st layer it was found that nests were situated in deciduous forest in 46% of cases, in mixed forest 47% and only 8% in coniferous forest. Only 4% of nests were found in homogenous stands with only one species of tree in one layer.

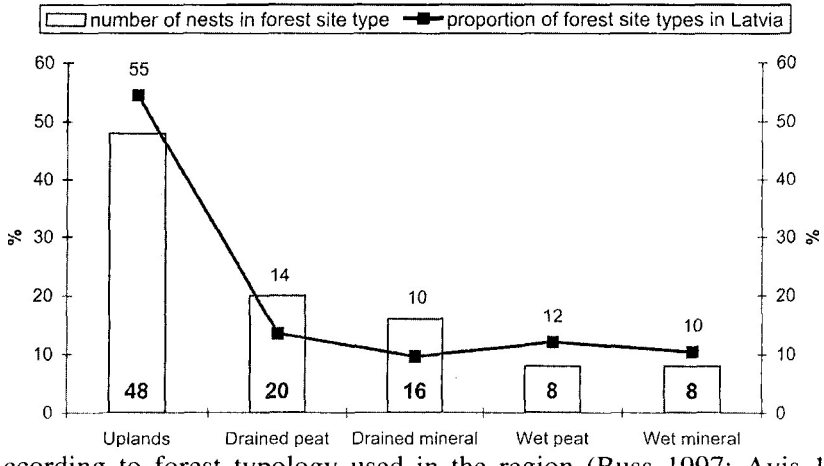
Figure 3. Occurrence of different species of trees in 1st layer of breeding areas of Lesser Spotted Eagle (n=160)



1.2. Forest types and forest growth condition types

Forest types and growth condition types are factors most objectively characterizing breeding from the ecological point of view. In general the location of nests in different forest types corresponds to their distribution in Latvia (according to the situation in 1996, State Forest Service; Figure 4.). The majority of nests are situated in uplands – 48% (corresponding to proportion of forest types in the country). Some 72% of breeding forests in total were found on mineral soil.

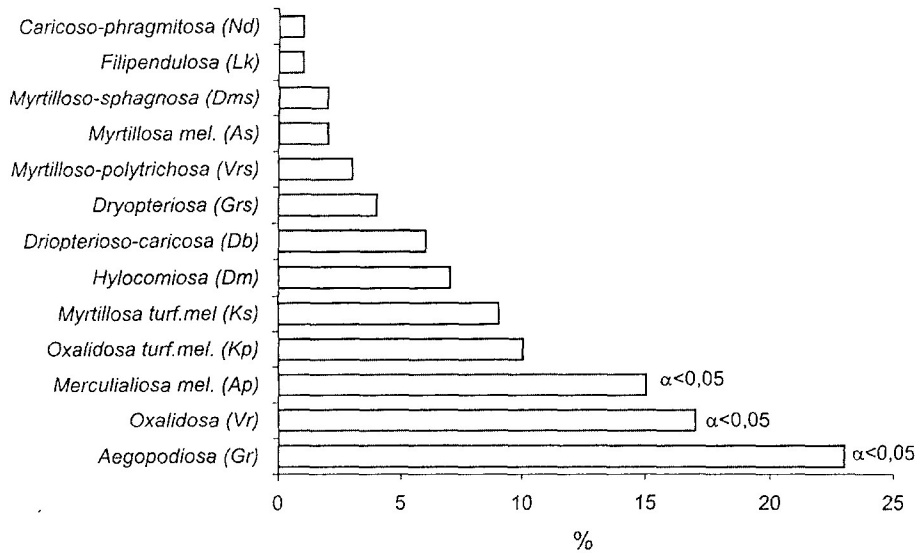
Figure 4. Occurrence of nests of Lesser Spotted Eagle (n=183) in different forest types



According to forest typology used in the region (Buss 1997; Avis 1997) several growth condition types correspond to every forest type (4). In addition to soil conditions also certain vegetation is of importance. Although nests have been found in all forest types (Figure 4.) as a rule they are absent from those with poorest growth condition types. With virtually, only one species of tree – a pine -- these forests have a low productivity.

More often the nests are to be found on fertile uplands *Aegopodiosa* (23%), *Oxalidosa* (17%) and drained mineral *Merculialiosa* (15%). In total 55% of all nests have been found on these growth condition types and their observed proportion differs from the theoretical one significantly ($\alpha<0.05$).

Figure 5. Occurrence of nests of Lesser Spotted Eagle (n=183) in different forest growth condition types



The relative frequency of occurrence of nests in forest growth condition types was calculated, to identify those forests most preferred by the LSE (Figure 6.), indicating a correlation between the number of positive observations of the type and its distribution in Latvia. The more numerous the observations and the lower the percentage of the corresponding type in Latvia, the higher the relative frequency.

The highest relative frequency was found for fertile uplands *Aegopodiosa,* wet mineral *Dryopteriosa* and drained mineral *Merculialiosa turf.mel.*, followed by some other wet and comparatively fertile wet peat and drained peat forest. One can conclude that the highest relative frequency of occurrence of nests is connected with fertile and wet forest growth condition types (Figure 7). The correlation seems evident – the more fertile the forest the more nest occur there.

Presence of nests in different quality classes of forest may be connected with their location in certain growth condition types, as quality classes do characterize fertility of forest. Certain quality classes correspond to every growth condition type. There are no nests of LSE in forests of IV and V quality as these are a poor forest growth condition type where pine is the only tree species.

Figure 6. Relative frequency of occurrence of nests of Lesser Spotted Eagle (n=183) in different forest growth condition types

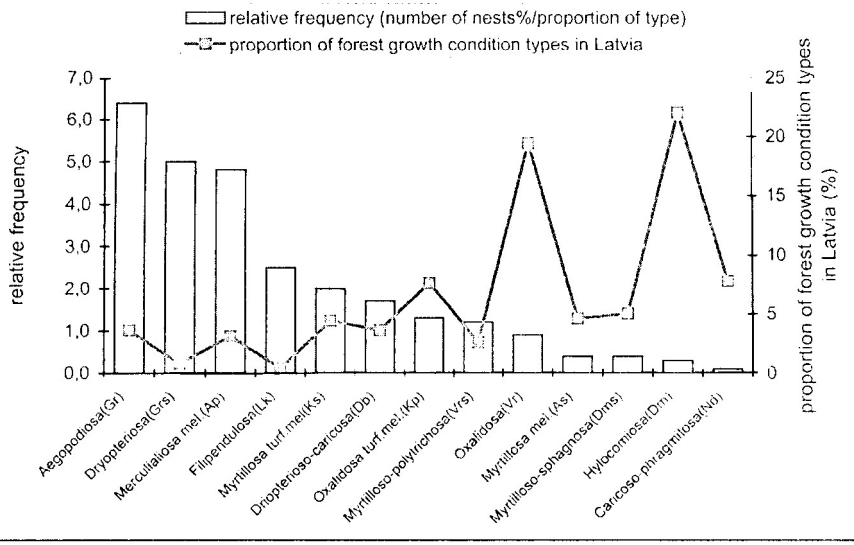
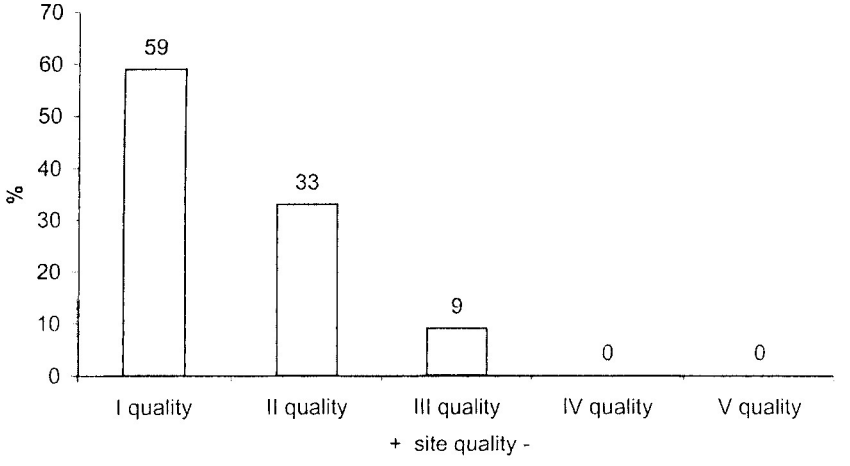


Figure 7. Occurrence of nests of Lesser Spotted Eagle in forests of different site quality classes



2.Characteristics of breeding trees.

2.1. Species of the breeding tree, position of nest and its height above ground

No correlation was found between choice of tree species for nest building and its abundance in the forest. However more often spruce and birch seem to be prefered ($\alpha<0,05$; Figure 8.). Some 69% of known nests are built on these trees. There are different positions of nests (Figure 9.), the majority being built on forks (43%) or lateral branches (38%). In mixed and coniferous forests it seems specific for the LSE to build nests on the curved continuation of a broken trunk or on the broken top of the tree (more often with spruces). Deformed trunk or treetop provides a possibility for the bird to build on comparatively younger trees. This seems most important at sites where the

percentage of older trees is insufficient. The height of the nest above ground is from 7 to 24 m (Average=16; Median=16; n=92).

Figure 8. Species of the nest trees of Lesser Spotted Eagle

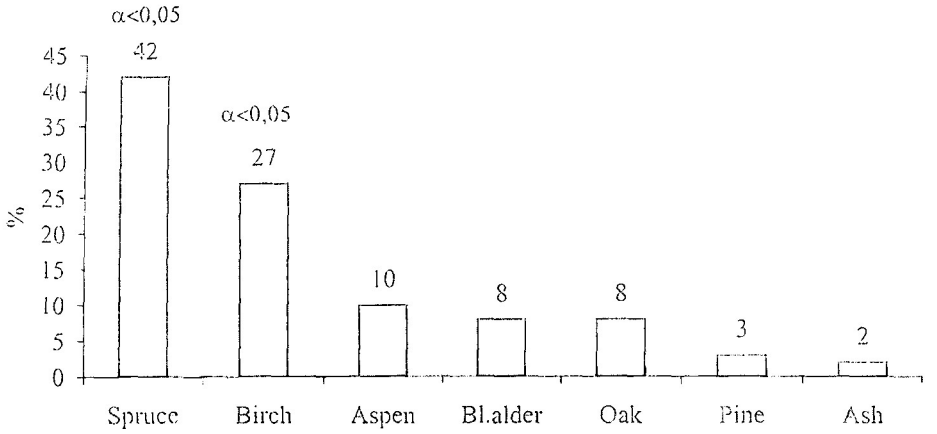
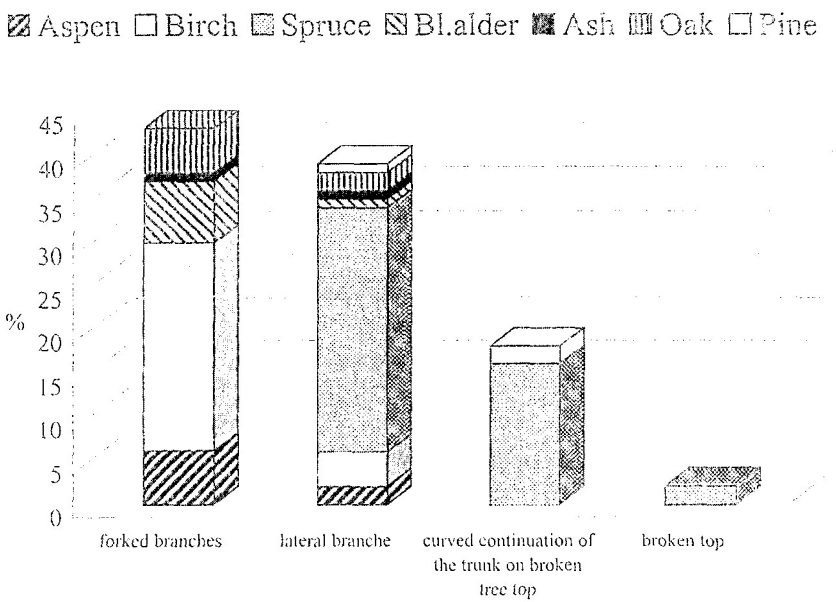


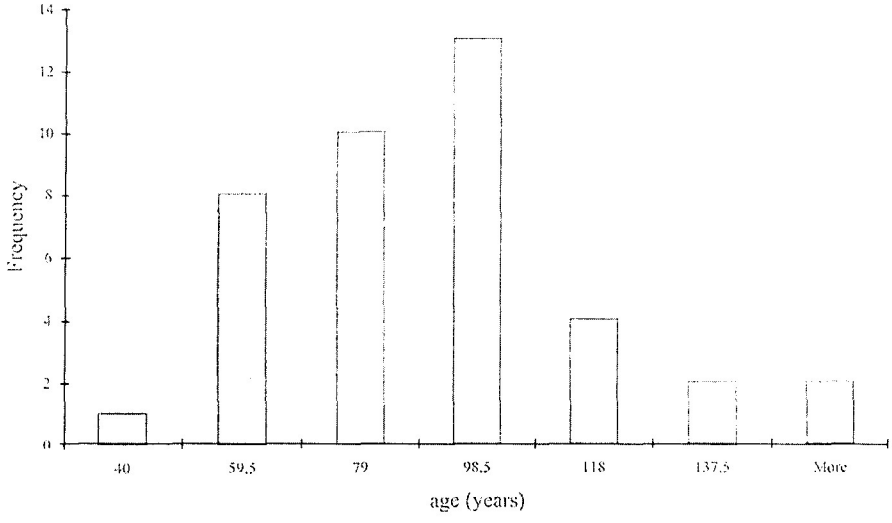
Figure 9. Position of the nests of Lesser Spotted Eagle on trees



2.2. Age and diameter of nest trees

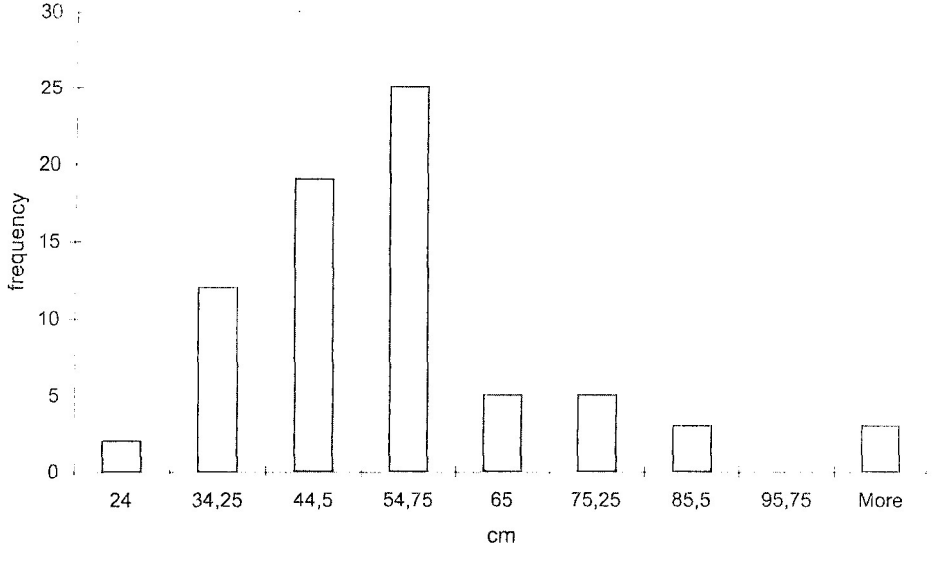
More often trees with mean value age class 98.5 years are used (average age of trees is 83 years) (Figure 10). At age classes older than 80 years there are 53% of nest trees. Significant differences have not been found comparing age of nest areas with age of trees there. There is a significant difference ($p<0.01$) between mean age of deciduous trees (68 years; n=16) and coniferous trees (93 years; n=24).

Figure 10. Age of nest trees of Lesser Spotted Eagle (when the nest was initially found) Average=83; Min =40; Max=157; SD=27; Median=83; n=40



The determining factor for choice of nest tree is its diameter (Figure 11) but not its age as in certain forest growth conditions an old tree might also be comparatively thin and not suitable for nestbuilding. Comparing the average diameter (26 cm) of dominant tree species in forests with that of nest trees there (48 cm; n=62) a significant difference ($p<0.01$) was found – LSEs prefer to build on thicker trees. The majority are built on trees with diameter from 34.25 to 54.75 cm.

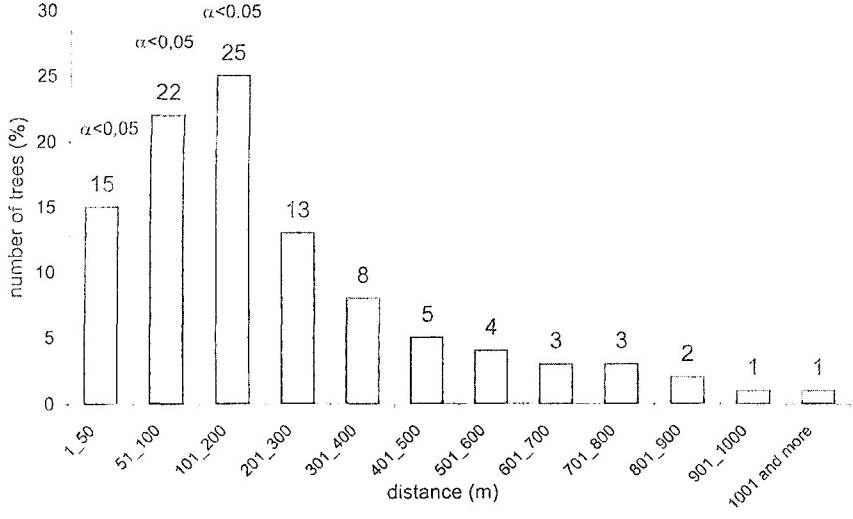
Figure 11. Diameter of nest trees of Lesser Spotted Eagle Average=48; Min=24; Max=106; SD=17; Median=46; n=74



2.3. Distance of nest trees from forest edges, settlements and roads

Contrary to previous visual estimations nest trees are not usually in direct vicinity to forest edges (agricultural land – meadows etc.) but farther inside the forest. However the zone up to 200 m from the forest edge seems to be the most essential for nestbuilding ($\alpha<0.05$) as 62% of all known nests were found there (Figure 12).

Figure 12. Distance of nest trees of Lesser Spotted Eagle from the forest edge Average=236; Min=10; Max= 1510; SD=236; Median=140; n=158



Concerning the distance of nest trees from nearest settlements (Figure 13.) in all cases these were individual farms, not villages or towns. Individual farms in Latvia are dispersed over the country and usually consist of one living-house, byre, and one or several outhouses managed by one to two families or only solitary people. The shortest distance of a nest tree from such settlements is 200m which shows that they have no significant influence on choice of nest tree. However, the majority of nests (80%) are situated at a distance ranging between 499 and 1396m but usually up to one kilometre from settlements (Median=835). Disposition of LSE nests regarding settlements and roads in the study plot "Zuklis" is presented in Figure 14. Here the highest known breeding density in the whole distribution area of the species was found – 31.9 pairs present/100 km^2 of the total area in 2002. Distances from settlements in this study plot are shorter than mean distances in Latvia: Average=966; Min=200; Max=2620; SD=615; Median=730; n=35.

Concerning the nearest distance of nest trees from roads one can conclude that only in 8% of cases were they were tarred roads of regional importance and in 1% railway. In all other cases they were local country or forest roads (in most cases tarred) with low intensity of traffic, Average=596; Median=580; Min=60; Max=1550; n=105. Such long distances from roads may be explained by their comparatively low density in the country.

Figure 13. Distance of nest trees of Lesser Spotted Eagle from settlements Average=1072; Min=200 Max=3190; SD==695; Median=835; n=110

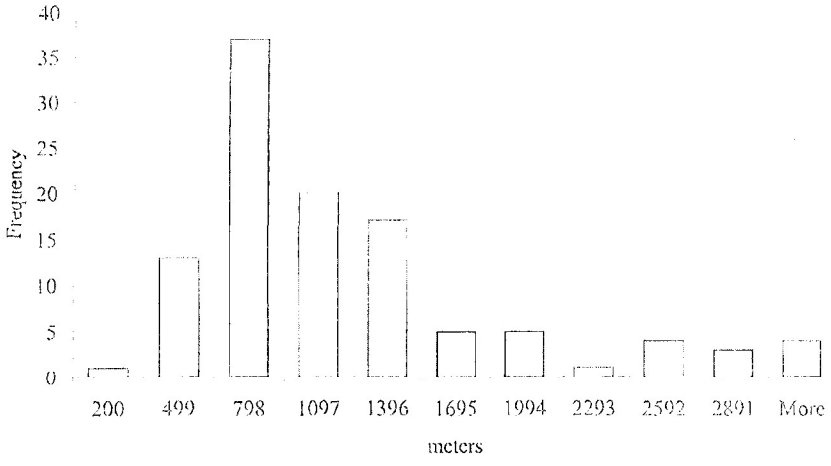
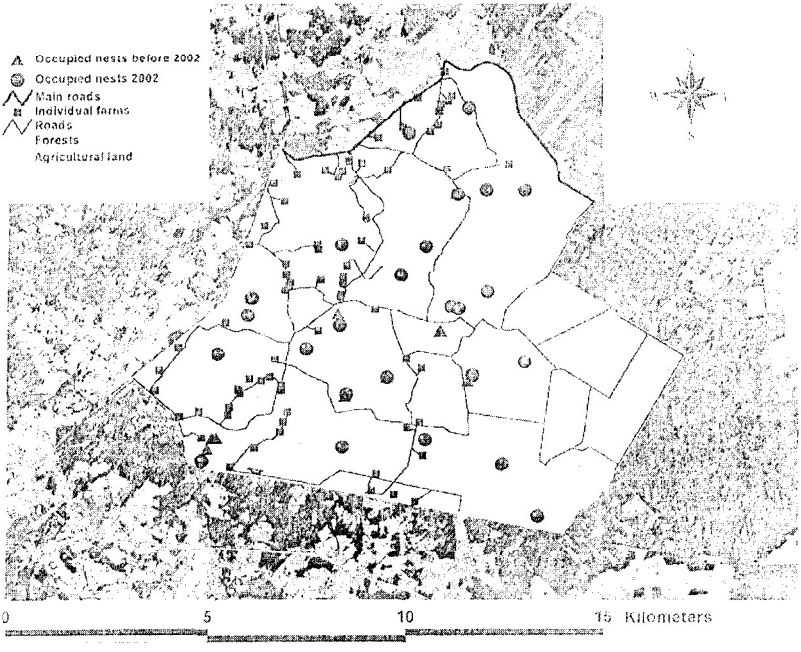


Figure 14. Location of nests of Lesser Spotted Eagle, individual farms and roads in sample plot: Zuklis"



DISCUSSION

There is a considerable amount of published information on the LSE enabling one to analyse and identify different regularities connected with choice of breeding habitat. The territory of Latvia is situated within the zone of boreal-nemoral or mixed forests (transitional zone between northern coniferous or boreal and southern deciduous or nemoral forests, Prieditis 1999). Such information can accordingly be compared with that obtained in Latvia.

Breeding forest

Most detailed and methodologically more easily comparable information on breeding habitat is obtainable from Lithuania (Drobelis 1994), the neighbouring country to the south of Latvia. In both countries standardised and fairly similar forest categories for Baltic countries is used. Dominant tree species in the 1st layer of Latvian forests where the LSE breeds are more often birch (39%), spruce (18%), pine (16%) and aspen (10%) and less often ash (8%), black alder (7%) and oak (0.6%). In Lithuania nests more often were found in spruce (33%), oak (28%) and black alder (17%) but less often also in aspen (8%), birch (7%) and pine (4%) forests.

As in Latvia and Lithuania, also in Belorussia (Ivanovsky 2000) nests were often found in spruce forests (25%) but contrary to both Baltic countries more often also in black alder forests (25%). Also in Germany LSEs rather often breed in black alder forests (Scheller *et al.* 2001). It is known that further south or southwest the dominant tree species, according to forest growth condition type in breeding forests there, are more often oak and black alder but much less birch, aspen and pine. According to distribution of the 1st layer of dominant tree species in deciduous and coniferous (spruce) forests the location of nests in Latvia and Belorussia seems more similar – 47% and 50% in mixed, 46% and 25% in deciduous with 8% and 25% of cases in coniferous (spruce) forests respectively. Breeding in deciduous forests seems to be more common in the western part of the distribution area – up to 91%, e.g. in Germany (Scheller *et al.* 2001; Langgemach *et al.* 2001). Comparable quantitative information on the distribution of nests among different forest types is obtainable only from Lithuania (Drobelis 1994) and Latvia. More often nests in Latvia are situated on uplands – 48% (27% in Lithuania) but on drained peat and drained mineral the situation is quite similar (36% and 38% respectively) but less frequent in Latvia on wet peat and wet mineral (16% and 34% respectively). It seems reliable that in Latvia, Belorussia (Ivanovsky 2000), Germany (Langgemach *et al.* 2001; Scheller *et al.* 2001) and some parts of Lithuania (Skuja & Budrys 1999) LSEs prefer to breed in forests with a constant or periodically increased level of humidity. This points to a considerable importance of humid forests for breeding. Investiagations in Lithuania (Drobelis 1994) and in Latvia support the view that the LSE prefers to breed in fertile forests – in I site quality class forests 59% and 60%, in II site quality class forests 33% and 28%, and in III site quality class forest 9% and 10% respectively. In Lithuania 0.85% of nests were found also in IV site quality class forests. To these quality classes correspond certain forest growth condition types but their classification in both countries is somewhat different, regardless of which nests were more often found in *Aegopodiosa* and *Oxalidiosa* forest growth condition types – 40% in Latvia and 38% in Lithuania.

From the conservation point of view the age of forests where this species breeds is essential. According to published information the age of breeding forests in the LSE distribution to the S and SW of Latvia seems to be older. If the age of forests in Latvia (see under RESULTS) is 7–153 years (Average=77; n=159) then in Lithuania 60 – 160 years (Average=103; n=33; (Skuja & Budrys 1999) or 40 --180 years (Average=94; n=127; Drobelis 1994) and in

Poland 45-205 years (n=29; Trznadel-Waclawek *et al.* 1996). Comparing both largest and most representative samplings from Lithuania (n=127) and Latvia (n=159) and in spite of different averages, most often the age of breeding forests is similar – in Lithuania the majority of nests are in forests 80 years old and in Latvia the median age is 78 years. Breeding forests in regions S and SW of Latvia are much older, which could be explained by the fact that nests were more often built there in oak forests, where the felling age also is older than in birch, spruce, pine and aspen forests in Latvia. Some 56.71% of breeding forests in Latvia (n=157) have already reached their cutting age. The same could also refer to all the forests in the country, meaning that more than a half the forests available for breeding might be cut. This could have a bad influence on the LSE population in general if the speed of removal of available breeding forests exceeds that of their renewal.

Breeding trees

Considerable importance for nest building in Latvia relates to spruce (42%) and a similar situation prevails in Lithuania -25% (Drobelis 1994), in Belorussia – 47% (Ivanovsky 1993) and 61% (Goloduskko 1965) as well as in Poland – 35% (Pugacewicz 1996) and 59% (Trznadel-Waclawek *et al.* 1996). Similarly to that with 1st layer dominant species the proportion of nests on birch and aspen also decreases to the S and SW whereas on oak and black alder it increases. If in Latvia only 8% of nests are built on oak, in Lithuania it reaches 39% (Skuja & Budrys 1999) and 45% (Drobelis 1994), in Germany 35% (Langgemach *et al.* 2001; Scheller *et al.* 2001), in Poland 22% (Pugacewicz 1996). Also on black alder only 8% of nests are built in Latvia but 17% (Golodushko 1965) and 21% (Ivanovsky 1993) in Belorussia and 29% in Germany (Langgemach *et al.* 2001).

More often the nest is positioned on a fork or on lateral branches. On forks there are 43% of nests in Latvia; in Lithuani 33% (Skuja & Budrys 1999), in Poland 26% (Pugacewicz 1996) and in Germany 58% (Langgemach *et al.* 2001). On lateral branches 38% of nests were found in Latvia, in Lithuania 36% (Skuja & Budrys 1999) and 40% (Drobelis 1994), in Poland 48% (Pugacewicz 1996), in Belorussia 67% (Ivanovsky 1996) and in German only 8% (Langgemach *et al.* 2001). Only some authors mention nests built on a fork/bend of a broken spruce or pine or on the deformed top of the tree – in Latvia 18% and 2% of all nests respectively, in Lithuania 6% and 9% (Skuja & Budrys 1999), in German 3% (Langgemach *et al.* 2001).

Information on age of nest trees is scarce as special equipment is needed to determine it. Some data are available only from Lithuania but the methods used for age determination are not known. In Latvia the age of trees was determined by means of Pressler increment borer taking a sample from a cross-section of the tree and counting its annual rings. The determined age was 40-157 years (Average =83; n=40) in Latvia which is less than in Lithuania – 50-220 years (Average=101; Drobelis 1994) and 80-100 years (Average=103; Skuja & Budrys1999). In Lithuania nests are more often built on oaks which may exceed the age of other tree species. Presumably also in Latvia such nest trees must be older as samples were not taken from oaks and ashes due to lack of borer of sufficient length. Moreover it was not possible to age also slow -

growing trees at wet places as the central cores of their trunks were usually damaged and without countable annual rings.

As already pointed out, in Latvia LSEs usually prefer thicker trees for nest building comparing with the diameters of dominant trees in a certain forest. Regardless of this regularity the range of nest tree diameters is rather wide – in Latvia 24-106 cm (Averahe=48; Median=46), in Germany 33-121 cm (Average=59; Median=54) (Langgemach *et al.* 2001). In Lithuania on thicker trees there are 37% of nests, on predominant trees 50% and on thinner trees 10% (Drobelis 1994). In Poland rather often one can find nests on trees with a diameter of 20-30 cm (Rodziewicz 1996). Also in Latvia nests are sometimes built on thin trees. Usually these are II layer spruces if their tops become deformed. This relates also to coniferous trees with forked branches at breaking point of the trunk.

Distances of nest from forest edge differ somewhat in different parts of the distribution area, nevertheless the nest is usually up to 300 m from the forest edge. Average distances in Poland are 110m (Trznadel-Waclawek *et al.* 1996) and 342m (Pugacewicz 1996), in Lithuania 255 m (Drobelis 1994), in Germany 182m (Langgemach *et al.* 2001) and in Latvia 236m. There is a striking similarity of median distances in Germany and Latvia – 140m. This confirms our conclusion that most important for LSE breeding is a forest zone up to 200m from the forest edge.

Tolerance of anthropogen elements in the landscape is characterized by distances of the nest from human settlements, roads etc.

Distances of nests from settlements differ in different parts of the LSE distribution area. Minimal distances from individual farms or villages in Latvia are 200 m, in Lithuania 200m (Drobelis 1994) and in Germany 280m (Langgemach *et al.* 2001). Most informative are data from sample plot "Zuklis" where the disposition of occupied LSE nests and inhabited individual farms is known. This is a territory with the highest known breeding density within the whole distribution area of this species, with 31.9 pairs present/100 km^2 and with 77 individual farms/100 km^2. In two cases the minimal distance between occupied nests (directly inside the forest or close to its edge) and farms were 200-240 m. Other farms were situated away from forests and it was no possible to judge a minimal admissible distance to breeding sites. Bearing these cases in mind one can presume that inhabited farms approximatelly 200 m away from nest sites may have no negative influence on breeding. In general nests are roughly evenly distributed in uninhabited as well as in territories densely inhabited (Figure 14). In Lithuania only 8% of nests are 200-900m from individual farms, the rest being more distant (n=127). On the other hand in Germany 21% of nests are situated at a distance of up to one km from individual farms or villages and in Latvia more often – 59%. There are no significant differences between distances of nests from inhabited places in Latvia with a comparatively low population density (average 13 people/km^2) and those in breeding areas of the LSE in German, where population density is much higher (14-35 or in some places up to 75 people/km^2). Both in Latvia and Lithuania the nearest inhabited place to the breeding site was an individual farm.

Much more considerable are the differences in distances from nests from roads

in Latvia and in Germany, where there are more densely distributed road systems. If in Germany the average distance of nest from country/forest road is 120 m (Mean=120m, Range=1-360m) than in Latvia it means 596 m (Median=580 m, Range=60-1550m). In Latvia only in 8% of cases was the nearest road of regional importance; otherwise they were all small country or forest roads.

REFERENCES

ANONYMOUS 1996. Forest Statistics. State forest service of Latvia.

AVIS, P. G. 1997. The forest typology of Latvia: an overview and comparison. *Proceedings of the Latvian Academy of Sciences. Section B*, Vol. 51, (592/593),. 195-199.

BUSS, K. 1997. Forest ecosystem classification in Latvia. *Proceedings of the Latvian Academy of Sciences. Section B*, Vol. 51, (592/593),. 204-218.

DROBELIS, E. 1994. Biology and protection of the Lesser Spotted Eagle (*Aquila pomarina*) in Lithuania. *Acta Ornithologica Lituanica* 9-10, 130-137. Vilnius.

GOLODUSHKO, B. Z. 1965. Raptors and their role in game management of Belovezh Forest. Ph. D. Dissertation. Minsk: Byelorussian State Univ. *In*: V.V. Ivanovsky & A.K. Ti shechkin 1993. Monitoring of Lesser Spotted Eagle (*Aquila pomarina*) in Belarussia. *The Ring* 15: 266-273.

HAGENMEIJER, W.J.M. & M.J. BLAIR, (eds). 1997. *The EBCC Atlas of European Breeding Birds: Their Distribution and Abundance*. T & A D Poyser, London: 164-165

IVANOVSKY, V. 1996. Notes on the Breeding Biology of Spotted Eagles *Aquila clanga* and *A. pomarina* in Byelorussia. *In*: B.-U. Meyburg & R. D. Chancellor (Eds). *Eagle Studies* WWGBP. Berlin, London & Paris: 297-299.

IVANOVSKY, V. V. & A.K. TISHECHKIN 1993. Monitoring of Lesser Spotted Eagle (*Aquila pomarina*) in Belorussia. *The Ring* 15: 266-273.

IVANOVSKY, V. V. 2000. Monitoring of raptors in Vitebsk region in 1999. *Subbuteo* 3 N 1: 20-25.

LANGGEMACH, T., T. BLOHM & T. FREY 2001. Zur Habitatstruktur des Schreiadlers (*Aquila pomarina*) an seinem westlichen Arealrand – Untersuchungen aus dem Land Brandenburg, *Acta ornithoecologica* 4: 237-267.

MEYBURG, B.-U. 1991. Der Schreiadler (*Aquila pomarina*): bisherige und zukünftige Bemühungen um seine Erforschung und seinen Schutz. *In*: M. Stubbe (Ed.): *Populationsökologie Greifvogel- und Eulenarten 2:* 89-105 Wiss. Beitr. Univ. Halle 1991/4 (P 45)

MEYBURG, B.-U. 1996. Der Schreiadler *Aquila pomarina*: Bestandssituation und derzeitiger Stand seiner Erforschung. *In*: B.-U. Meyburg & R. D. Chancellor (eds.) *Eagle Studies*. WWGBP,. Berlin, London & Paris: 377-387.

MEYBURG, B.-U., L. HARASZTHY, M. STRAZDS & N. SCHAFFER 1998. European Species Action Plan for Lesser Spotted Eagle (*Aquila pomarina*). Annex 6. Species Action Plans for 8 European Threatened Bird Species. RSPB, The Lodge, Sandy, Bedfordshire.

PLOHINSKIJ, N. A. 1970. Biometrija. Izdatelstvo Moskovskogo Universiteta: 368.

PRIEDITIS, N. 1999. *Latvian forest: nature and diversity*. Riga: pp. 209

PUGACEWICZ, E. 1996. Birds of prey breeding in the Polish part of the Bialowieza primaeval forest. *Notaki Ornitologiczne* 37: 173-224.

RODZIEWICZ, M. 1996. The Status, Range and Breeding Success of the Lesser Spotted Eagle *Aquila pomarina* in Poland. *In*: B. U. Meyburg & R. D. Chancellor (Eds.) *Eagle Studies*. WWGBP, Berlin, London & Paris: 291-295.

SCHELLER, W., E. FRANKE, J. MATTHES, M. NEUBAUER & C. SCHARNWEBER 2001. Verbreitung, Bestandsentwicklung und Lebensraumsituation des Schreiadlers *Aquila pomarina* in Mecklenburg-Vorpommern. *Vogelwelt* 122:233-246.

SKUJSA, S. & B.R.BUDRYS 1999. Nesting sites of Black Stork, Lesser Spotted Eagle and Common Buzzard and Theit Nest Exchange in the Forests of North, North-East and Central Lithuania. *Baltic Forestry* 2: 67-74.

TRZNADEL-WACLAWEK, M., A. RYS, K. WACLAWEK & J. TERLECKI 1996. The White-tailed Eagle (*Haliaeetus albicilla*), Lesser Spotted Eagle (*Aquila pomarina*) and Osprey (*Pandion haliaetus*) breeding in the Mazurian landscape park in 1993-1995. *Notaki Ornilogiczne* 37: 25-38.

Dr. Ugis Bergmanis
Nature Reserve Teici
Aiviekstes-3
LV-4862 Laudona, Madonas raj.
Latvia