

Nesting Sites of Black Stork, Lesser Spotted Eagle and Common Buzzard and Their Nest Exchange in the Forests of North, North-East and Central Lithuania

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In 1996–1998, investigations were carried out in North, north-east and Central Lithuania's districts of Akmenė, Anykščiai, Biržai, Joniškis, Kupiškis, Mažeikiai, Molėtai, Pakruojis, Panevėžys, Pasvalys, Radviliškis, Rokiškis, Šiauliai, Utena, and Zarasai. The attention was given to confirm the hypothesis about the nesting competition among Black Stork, Lesser Spotted Eagle, and Common Buzzard. Factors determining the choice of a breeding site have been established basing on 150 descriptions of nests and nesting sites of Black Stork and two bird of prey species. The main attention was focused on the parameters of a stand, individual nesting tree and distribution of a nest. The search of the nesting sites was carried out applying two methods: Route and Bird Observation method. During the investigations, exchange of nests between Black Stork and Lesser Spotted Eagle has been established which occurs due to interrupting factors (forest cutting). However, such factors as forest fragmentation and structure did not affect this competition.

Key words: Black Stork, Lesser Spotted Eagle, Common Buzzard, nesting site, nest exchange.

Introduction

Today, there are 18 bird of prey species inhabiting Lithuanian forests and 13 of them are found to be breeding species (Drobelis, 1990). The Black Stork and birds of prey differ in their systematic position, but are similar in their biology and ecology. Therefore, it is quite natural that while studying these two species, they are usually linked. Like Black Stork the majority of the birds of prey occupy forest stands similar in age and species composition also, their way of building nests and hatching is similar. These birds avoid building new nests, therefore, they often occupy their own empty reserve nests or those of other birds. The present study deals with the peculiarities of Black Stork and some other bird of prey species in choosing their nesting sites in North, north-eastern and Central Lithuania. An attempt is also made to confirm the hypothesis that in the studied area, some bird of prey species exchange the nests not only within the species, but also with the Black Stork. The study has also a practical protective meaning. All the investigation data have been used in

the forest management program, therefore no wood cutting projects in the nesting sites of these birds occurred.

Materials and methods

With reference to the tree species composition as well as to geographical regularities of stand habitats and their productivity, to the peculiarities of regional climate, soil and forest growth, there have been established 4 natural productive forest regions (Kuliešis, 1997). For our studies we have chosen forests that belong to Central Lithuanian productive mixed coniferous broad-leaved forest region and its two subregions: broad-leaved-spruce and coniferous-broad-leaved forests.

The productive mixed coniferous-broad-leaved Central Lithuanian forests grow in the plain. This is the largest selected area covering 42 % of the Lithuanian territory, though forests here make up only 36 % of the total forest area. Productive deciduous-coniferous forests grow on carbonate loamy soil, sometimes on limnoglacial clay or sandy loam that is usually wet. The most

carbonate soil is found in the northern and central parts of this region and ash trees predominate there. In some areas of this region, ash-trees make up 15-20 % of the total forest area. In Lithuanian forests pine (37 %), spruce (24 %), and birch trees (20 %) predominate, whereas in North and Central Lithuania soft deciduous, particularly birch trees prevail. Thus, birch makes up 35-48 %, soft deciduous trees 17-25 %, oak-tree 1-4 %, ash tree 7-14%, pine tree 1-6 %, and spruce 16-29 % of the territory. Onward to the East and West, pine (12-19 %) and spruce (18-34 %) forests mostly occur. In north-east Lithuania, pine and spruce trees are notably predominant. Hence, spruce makes up > 70 %, pine > 50 %, birch 7-20 %, and soft deciduous forests make up 3-14 % of the territory. (Kuliešis, 1997).

The investigations were carried out in 1996-1998, applying the fragmentary data of 1995. The registration of the Black Stork and birds of prey has been carried out in Akmenė, Anykščiai, Biržai, Joniškis, Kupiškis, Mažeikiai, Molėtai, Pakruojis, Panevėžys, Pasvalys, Radviliškis, Rokiškis, Šiauliai, Utena, and Zarasai districts. Most nests of the Black Stork, Lesser Spotted Eagle, and Common Buzzard have been found (150 nests in total). The material collected in the above-mentioned districts is analysed in this study.

The search of bird nests and observations were carried out at several stages during three seasons: spring, summer and autumn. First of all, the inquiries were carried out among local people in several areas, as well as among naturalists living nearby or carrying out observations on birds, and among the local forest owners. The inquiry data were carefully checked and analysed immediately. Secondly, the direct search of nests was carried out applying two methods: Route and Observation: 1) Route Method. It was applied in each forestry, where nests were searched along a route planned in advance in such a way that it would be possible to check mature and overmature stands. Also, biotopes characteristic of a certain bird species were taken into account. The routes were planned according to the stand plans available at the forestries. 2) Bird Observation Method. It was applied during mating and nesting periods of the birds of prey. Hence, during mating or flying to the feeding areas and afterwards when returning back, birds approximately show the place of a nest. This place can be disclosed by uneasy nestlings or mature birds, when an observer approaches their nesting site. This method was applied very cautiously, in order not to frighten the birds.

Each newly detected nesting site was described and evaluated by means of special methodological rec-

ommendations (Drobelis, 1989 a) according to the following plan:

1. Habitat. Stand. Criteria applied: stand age, (for all tree species the age class has been 10 years). The data have been compiled from the forest management data: site quality classes (5 classes), stand species composition, density (scored from 0 to 1), and hydrological regime (scored from 1 to 5 on standard hydrological regime).

2. A tree with a nest. Its species, age, development are indicated.

3. Nest. Its height from the ground, distribution in a tree, orientation to a part of the world.

Forest plots with breeding species have been described according to an original typological classification of Lithuanian forests (Karazija, 1988).

All the data were recorded in a special nest card. "Statistics for Windows" computer analysis system was used to process the data.

Results

The Black Stork (*Ciconia nigra*). The registration of birds of this species carried out in 1995 showed that 447-484 pairs of this species nested in Lithuania (Drobelis, Matiukas, Vaitkus, 1996). A total of 78 nests have been found and described in our study.

Most nests of Black Stork (65 %) in the studied area were built in highly productive stands of the I-II site quality classes, and less in the stands of III-IV site quality class. The following forest types predominated in the nesting sites: *Myrtillosa*, *Oxalidoso*, and *Myrtillo-oxalidoso*. It corresponds with the data from other districts of Lithuania (Drobelis, 1993). Stand density determined by us on Black Stork nesting sites ranged mainly from 0.4 to 0.6 points (in 75.64 % of the nesting sites), whereas the whole interval of the density scale ranged from 0.3 to 0.8. The average stand density was equal to 0.53 (± 0.24). The majority of nests were built in mixed stands and only the minority were in pure pine stands or those of pine with admixture of spruce. In accordance with the published data, the Black Stork breeds in oak and black alder woods (Red Data Book of Belorussia, 1981). The nests have been found in the stands aged 30-160-years-old, with the average age of 87.22 years (± 25.11) (Figure 1). Black Stork nests were found mainly in 60-110 year old stands (52 nests; or 66.7 % of all the nests found). The latter birds gave the preference to the stands with seasonal flooding. The average value of hydrological regime was 3.93 points

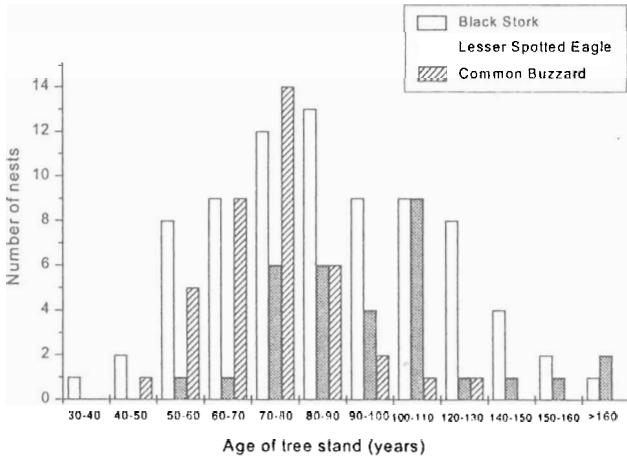


Figure 1. Distribution of Black Stork, Lesser Spotted Eagle and Common Buzzard nests according to tree stand age in the nesting sites.

(± 2.4) (n = 78). Most of nests of Black Stork were built in oaks (33; 42.31 %) and spruce trees (16; 20.51 %) (Figure 2). These numbers correspond to the published data by Drobelis, Matiukas, Vaitkus, 1996 and which were assessed for the whole area of Lithuania, i.e. 128 nests were found in oaks (51.40 %); 34 nests were found in pine trees (13.65 %). However, we have established that according to the preference of the nesting site, birch tree was the third (12 nests; 15.38 %) and black

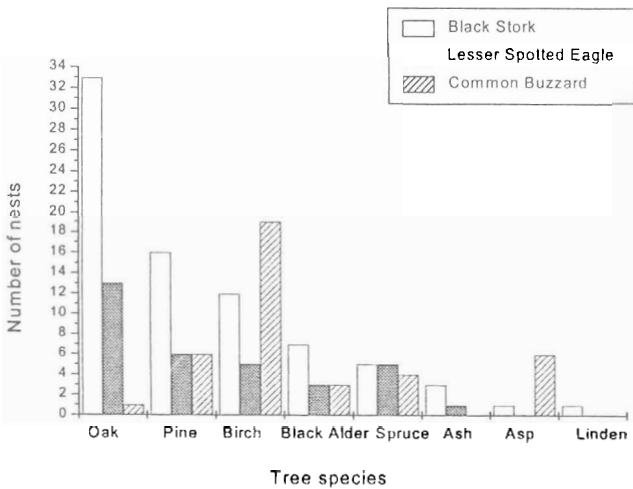


Figure 2. Distribution of Black Stork, Lesser Spotted Eagle and Common Buzzard nests according to nesting tree species.

alder was the fourth (7 nests; 8.97 %), whereas on the scale of Lithuania, it is black alder (25 nests; 10.04 %) and spruce (21 nests; 8.43 %), respectively. The differences are reliable. The average age of a tree with a nest was 117.4 years (± 29.9) (n = 78), and 41 nests were built on 80-120-year-old trees. Black Stork preferred higher trees in the stand (Figure 3). Since mature and

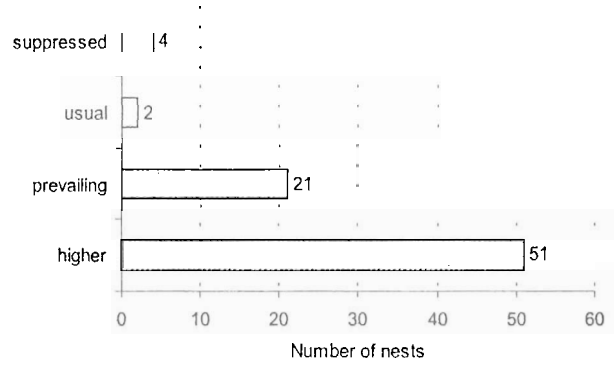


Figure 3. Distribution of Black Stork nests according to nesting tree categories.

prevailing trees suppress the growth of other trees it gives more favourable conditions for larger and less manoeuvrable storks to reach the nests. The data collected have shown that these birds give the same preference to the following nest-building sites: at the trunk branching (22 nests; 28.2 %), on side branches at the trunk (23 nests; 29.49 %), and on side branches 0.5-3.5 m from the trunk (21 nest; 26.92 %). The highest number of nests was recorded for those built at 9-15 m from the ground (55 nests; 70.51%). The average nest height was 12.63 m (± 4.99) and the lowest one was built at 6 m height while the highest one at 15 m height (Figure 4).

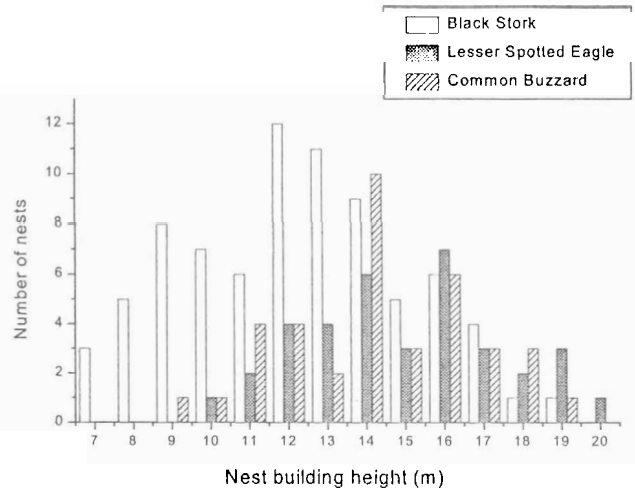


Figure 4. Distribution of Black Stork, Lesser Spotted Eagle and Common Buzzard nests according to the nest building height (in metres).

In accordance with nest orientation to the parts of the world, the following directions have been distinguished: south, south-west, and west (36 nests; 46.1%). Westward direction was most frequent (14 nests; 17.9 %), whereas northward and north-eastward directions were rarest (each comprised 6 nests or 7.7 %) (Figure 5).

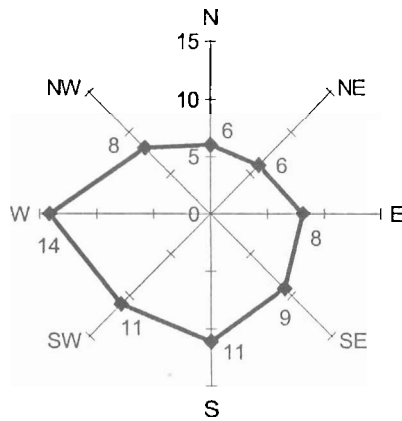


Figure 5. Orientation of Black Stork nests towards world parts.

The Lesser Spotted Eagle (*Aquila pomarina*). Its breeding population in Lithuania is stable and gradually growing and its abundance ranges from 500 to 750 pairs (Žalakevičius, 1995). We have found this species mainly in the districts of Pakruojis, Biržai, Rokiškis, and Panevėžys with 33 nests and the data on them was recorded in the cards. Most of the nests of Lesser Spotted Eagle (64.8 %) in the studied area were built in fertile and highly productive stands of the I-II site quality classes. The following forest types predominated on the nesting sites of these bird species: *Hepatico-oxalidos*, *Oxalido-nemorosa*, *Aegopodiosa*, and *Urticosa*, similarly to other sites in Lithuania (Drobėlis, 1994). 72.72 % of the nests (n = 33) occur in forests of middle density (0.5 and 0.7 points), like in Latvian forests where 87 % of nests have been found there (n = 37) (Bergmanis, Petriņš, Strazds, 1990). The whole interval of the density scale on the nesting sites ranged from 0.3 to 0.9 and the average of density was 0.6 points (± 0.24). The age of the stands ranged from 60-160 years, or on average 103 years (± 34.05 , n = 33) (Figure 1). The majority of nests (25; 75.75 %) were found in 80-120-year-old stands. All the nests were on the breeding sites with the hydrological regime which was determined to range from 2 to 5 points, with on average 4.27 points (± 2.76 ; n = 33). The Lesser Spotted Eagle preferred stands affected by seasonal floods or dry ones (93.9 % of the nests detected); the nests were built mainly in oak (13; 39.39 %) and pine (6; 18.18 %) trees (Figure 2). In Latvia 40 nests (45 %) of the Lesser Spotted Eagle were found in spruce, 26 nests (29 %) - in birch, and the rest 26 % of nests were situated in the following types of trees: oak (only 6 cases), black alder (6), asp (4), pine (4), and ash (3) (n = 98) (Bergmanis, Petriņš, Strazds, 1990). The age of a tree with a nest was usually 80-100 years and that comprised 51.5 % of all the trees found with nests, whereas the average age of a tree with a nest was 103.3 years (± 0.25 ; n = 33). Like Black

Stork, the Lesser Spotted Eagle preferred the highest trees in the stand. Our data had shown that Lesser Spotted Eagle preferred two nest building sites on a tree: there were 12 nests (36.3 %) built on side branches at the trunk and 11 nests (33.3 %) on the trunk branching. There were 5 nests (15 %) built on side branches, 0.5-2 m from the trunk, as well as 2 nests (6 %) on the trunk bending, and 3 nests (9 %) on the top branches. The majority of nests (24; 72.7 %) were found at 12-16 m height from the ground. The average height of the nest was 12.9 m (± 4.20). The lowest nest was found at 10 m whereas the highest one was built at 20 m from the ground (Fig. 4). The nests were mostly orientated westwards, south-westwards, southwards, and south-eastwards (22; 66.7 %). The rarest direction was north and north-east with 1 (3 %) and 3 nests (9 %), respectively (Figure 6).

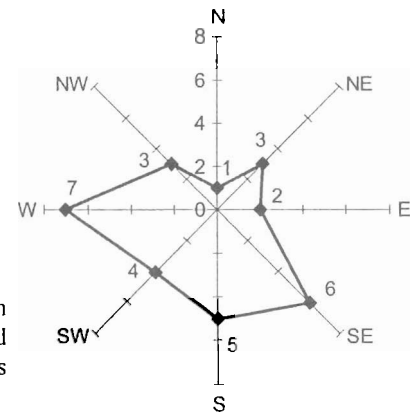


Figure 6. Orientation of Lesser Spotted Eagle nests towards world parts.

The Common Buzzard (*Buteo buteo*). This is the most numerous bird of prey in Lithuania with the growing nesting population. Its abundance is determined to range from 3500 to 5000 nesting pairs (Žalakevičius, 1995). This species is common to all the forests of the studied area. Cards were filled up for 39 detected nests. Productive stands (of I and II bonity) predominated on the nesting sites, and the birds were not so selective about a stand. The following forest types predominated on their nesting sites: *Myrtillosa*, *Caricosphagnosa*, *Oxalidos*, *Myrtillo-oxalidos*, *Hepatico-oxalidos*, *Oxalido-nemorosa*, and *Urticosa*. In accordance with the published data, the Common Buzzard is rather flexible in choosing its nesting site and its nests were found even in 36 types of woods. Hence, most of the nests were built in spruce forests (31.7 %) and in birch groves (19.5 %) (n = 125) (The Fauna of Lithuania, 1990). The density of stands on Common Buzzard nesting sites ranged from 0.4-0.7 points (87.1 % of the nesting sites). The whole interval of the stand density scale with Common Buzzard nests ranged from 0.2 to 0.8 points, with

the average density of 0.55 points (± 0.23 ; $n = 39$). One nest of Common Buzzard was especially distinguished, since it was built in a rare stand (0.2 point of density) of a high moor. The age of the stands ranged within 50-110 years, with on average 76.15 years (± 29.7). Common Buzzard nests were built mainly in 70-90-year-old stands (21; 53.8 % of all nests). In contrast to Black Stork or Lesser Spotted Eagle, the Common Buzzard preferred younger stands (Figure 1). They often bred in small groves in the fields, whereas in larger forest massifs they built their nests near the outskirts, forest meadows or clearings. Hydrological regime of the Common Buzzard breeding sites ranged from 2 to 5 points, with an average 3.85 points (± 2.22). Like previously described species, Common Buzzard preferred seasonally flooded or dry (according to hydrological regime) stands. The majority of nests were built in birch trees (19; 48.72 %) (Figure 2). The most typical age of nesting trees was 70-80 years (58.98 %). The average age of nesting trees was 78.7 years. In contrast to Black Stork and Lesser Spotted Eagle, the Common Buzzard preferred the predominating trees of the stand (Figure 7). The most nests were built on the trunk branching (16; 41%) and on the side branches at the trunk (14; 35.9 %). Moreover, seven nests (17.9 %) were built on

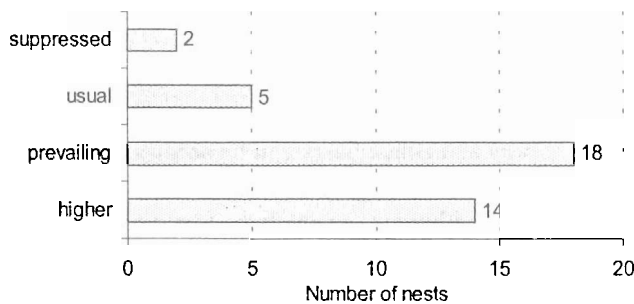


Figure 7. Distribution of Common Buzzard nests according to nesting tree categories.

the top branches, and 1 nest (2.6 %) was on a side branch at 0.5 m from the trunk, and also one nest was on a trunk bending. The nests usually were built at 14-16 m height from the ground (19; 48.7 %), with the average height of 14.1 m (± 4.36 %). The lowest nest was built at 3 m height, and the highest one was at 19 m (Figure 4). The nests were orientated mainly westwards (7; 17.9 %) and southwards (5; 12.8 %). However, there were also other directions of orientation detected (eastward, northward, north-eastward and other directions had approximately 3-4 nests in each). (Figure 8).

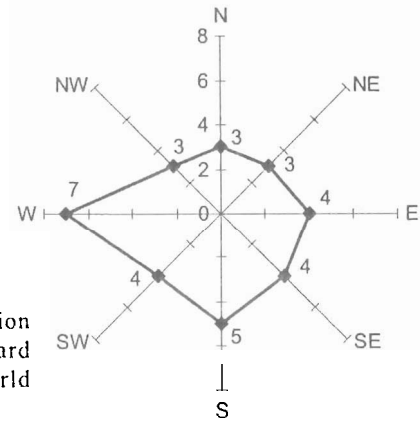


Figure 8. Orientation of Common Buzzard nests towards world parts.

Discussion

In choosing breeding areas, different bird species are thought firstly to give the preference to their feeding conditions (Ilyichov, 1984). Another favourable factor for breeding is, in our opinion, the surroundings of the possible nesting site. Thus, after finding a proper feeding territory both, Black Stork and birds of prey immediately search for a proper breeding stand some distance at the feeding site. In accordance with the examples from the region studied, it can be affirmed that most frequently Lesser Spotted Eagle and Black Stork were choosing mature, productive (of the I-II site quality class) stands for their nesting. Occasionally the latter bird species nested in premature and half-aged stands, although they prefer mature or overmature trees for nest building. The published data gives the stand formula of the optimal breeding of the Black Stork: 3-4 pine 1-2 spruce 2 birch 1 oak 1-2 black alder 0-1 asp (Drobelis, Matiukas, Vaitkus, 1996). Like Black Stork, the Lesser Spotted Eagle gives preference to mixed forest stands. Thus, the established stand formula of Lesser Spotted Eagle nesting site is: spruce 2.91, oak 2.17, black alder 1.75, birch 1.39, asp 0.92, pine 0.54, ash 0.23, lime tree 0.05 alder 0.04, maple 0.01 (Drobelis, 1994). Common Buzzard also chose productive and fertile forest stands (of the I-II site quality class), however, the nesting stand age, its specific composition, and the age of a nesting tree was not so important. Thus, such ecological flexibility might be the reason for the abundance of the latter species. While investigating the nests, there distinguished some species-common peculiarities.

Black Stork bred in considerably open nests, where it was easy to land. Therefore, under such conditions, orientation towards the parts of the world was not important. With reference to all the sites, open nests were

under good lighting and heating conditions. The Lesser Spotted Eagle and Common Buzzard nested in both open and hidden nests, since their manoeuvring capability was higher. However, hidden nests are less sun heated, therefore, the orientation of the nest is more important; thus, Lesser Spotted Eagle and Common Buzzard were choosing well sun lighted sites. If these birds occupied Black Stork nests, they did not pay, yet much attention to their orientation. Moreover, Common Buzzard also occupied the nests of the Lesser Spotted Eagle. Most of the nests of Black Stork and Lesser Spotted Eagle were built on oak trees. However, the height of a nest and its distribution on a tree differed in these two species. Hence, Lesser Spotted Eagle preferred the places at the trunk branching or on the top branches and more nests of this species were built in the middle and top part of a tree, while two thirds of Black Stork nests were built on side branches at the trunk and 0,5-3,5 m from the trunk. Therefore, that was relatively lower, i.e. on the middle or lower part of a tree. Exchange of nests between these two species was detected in the cases, when birds occupied the nests of their rival species in the middle part of a tree, i.e. 13-19 m from the ground (direct correlation coefficient was 0.71). Upwards from this level, the typical nests belong to the Lesser Spotted Eagle, while the lower nests are characteristic of the Black Stork. Medium level nests could be called intermediate ones. These were the nests which were most frequently exchanged between the both species. We have recorded 7 similar cases (Table 1). There was also one case, when birds exchanged their nests 3 times over a period of 3 years. One more interesting case in the nest exchange between Black Stork and Lesser Spotted Eagle was recorded over a period of one year. Immediately after Black Stork pair began to breed, a part of the nest with eggs fell down; then, afterwards, Lesser Spotted Eagle occupied the nest and started to breed a nestling. Usually the Black Stork breeds in the same nest for several years. Latvian ornithologists (Strazds, Lipsbergs, Petriņš, 1990) point out the examples of this kind of nest choosing of Black Stork pairs: two nests have been used at least for 17 (1971-1987) and 14 (1973-1986) years, respectively. There was one case when the Black Stork did not give up breeding in the next years after a clutch was destroyed and another case when two dead almost fully feathered young birds were found in the nest but the next year 3 young were fledged in the same nest.

Another potential host of an intermediate nest could be Common Buzzard. Most nests of the latter

birds have been found on birch trees. They chose both, trunk branching and side branches at the trunk for their nesting site and mostly in the middle or top part of a tree. Sometimes, Common Buzzard occupied the nests that were not typical of their species. Our investigations recorded such cases when they occupied 1 nest of Black Stork and 2 nests of Lesser Spotted Eagle which were distributed in the middle part of a tree (Table 1).

Sometimes there have been observed the cases when birds of prey or Black Stork did not "choose" nest sites. Although the feeding base was favourable, a forest plot, a stand and its maturity seemed to be favourable, nesting of birds of a certain species has not been observed in such an area. The birds seemed to be lacking the last component in the signal-informational biological field (Naumov, 1977) - the nest itself. The idea of a nest as an important component was applied in building artificial nests for birds of prey and Black Stork. After a long break, such artificial nests have revived the nesting of White-Tailed Eagle (*Haliaeetus albicilla*) in Lithuania (Drobelis, 1989 b) as well as the nesting conditions in other countries (Barnaby, Frost, 1990; Lipsbergs, 1993). In addition, artificial nests have attracted Golden Eagle (*Aquila chrysaetos*) to breed in Belarussian high-moors (Ivanovskii, 1982, 1985). Nests of birds of prey and Black Stork make a very important environmental component for these species in Europe (Tucher, Heath, 1994).

Generalising the data obtained, the presence of nesting competition and nest exchange among forest birds of prey and Black Stork can be ascertained. Inter-specific competition seems to occur most frequently in such areas of Lithuania, where large forest massifs predominate with less expressed fragmentation, and where younger forests and monoculture areas cover larger areas (e.g. South and East Lithuania). In Central Lithuania in general and in our studied region, such behaviour of birds is less feasible due to better feeding conditions and larger fragmentation of forests. Nevertheless, nest exchange due to various disturbing factors, including cutting, is also observed in the studied area. It is predicted that in the next ten years, the annual wood cutting in Lithuania will make 5 mln m³ each year and would increase in future (Rutkauskas, 1997). With increasing cutting intensities, the value of the nests of Black Stork and birds of prey as a very important environmental component of the latter species will rise too. One of the main statute of biodiversity preservation in the regulations of wood cutting prohibits from clear or not clear cuttings around the nesting sites of rare birds.

In that way, forest preservation is legitimate and has a radius (a certain number of meters from a nest) for the nests of the rare bird species including Lesser Spotted Eagle - 100 m, Black Stork - 100 m. Also other cuttings on sites with nests of this bird species are prohibited from April 1 to September 1. In Lithuania the number of the Black Stork decreases (Žalakevičius, 1995), whereas in Latvia it increases (Strazds, Lipsbergs, Petriņš, 1990), and one of the possible reasons for this increase is the improvement of the protection of the Black Stork. Due to the creation of microreserves and popularization of the species protection among foresters, the perishing of nests due to clear cuttings has practically stopped.

Therefore, only when we protect the nesting sites of the forest birds during wood cutting, we will be able to ensure adequate living conditions for these birds in our forests.

Conclusions

1. For nest-building Black Stork, Lesser Spotted Eagle and Common Buzzard choose tree stands similar in species composition and age, as well as similar nest trees; moreover, the exchange in nests among rival species is possible.

2. Common Buzzard build their nests in various types of forests choosing premature stands and trees, mostly birch trees. Sometimes they occupied the nests of Black Stork and Lesser Spotted Eagle in cases when their hosts had been frightened of cuttings.

3. The nests built by Black Stork and birds of prey make a very important environmental component; hence, they should be protected, even if no birds nest there in a certain year.

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ГНЕЗДОВЬЯ ЧЁРНОГО АЙСТА, МАЛОГО ПОДОРЛИКА И КАНЮКА И ИХ МЕЖВИДОВАЯ СМЕНА ГНЁЗД В ЛЕСАХ СЕВЕРНОЙ, СЕВЕРО-ВОСТОЧНОЙ И ЦЕНТРАЛЬНОЙ ЛИТВЫ

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Резюме

Исследования проводились в 1996-1998 г. в лесах на территории 15 административных районов Литвы: Акмяпес, Анишкию, Биржу, Ёнишкиса, Купишкиса, Мажейкю, Молету, Пакруонса, Папевежиса, Пасвалиса, Радвилншкиса, Рокишкиса, Шяулю, Утянос и Зарасу. Регистрировались и изучались гнездовые станции и гнёзда чёрного аиста, малого подорлика и канюка. Найдено и описано 150 гнёзд указанных видов. В описанных гнездовьях установлен тип леса, бонитет, возрастной и видовой состав древостоя, возраст и вид гнездового дерева, положение гнезда в кроне дерева, ориентация гнезда относительно сторон света, высота строения гнезда от поверхности земли и др. Специальное внимание уделялось возможной межвидовой гнездовой конкуренции или смене гнёзд. Установлено, что наиболее часто попеременно чёрным айстом и малым подорликом использовались гнёзда, устроенные на высоте 13-19 м от поверхности земли в средней трети кроны гнездового дерева (коэффициент корреляции - 0,71). Зарегистрировано 10 случаев смены гнездящегося вида птиц в 10 отдельных гнёздах: 7 случаев гнездовой конкуренции между чёрным айстом и малым подорликом; и 3 случая, когда канюк занял одно гнездо чёрного аиста и два гнезда малого подорлика.

Ключевые слова: чёрный аист, малый подорлик, канюк, гнездовье, межвидовая смена гнёзд.