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The birds of the Białowieża Forest – additional data and summary

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Abstract. The paper presents correction of some estimates by BOROWSKI & OKOŁÓW (1988) or by earlier authors and adds new faunistical data on the bird occurrence in the Białowieża Forest in 1973-1995. Data on over 140 species are discussed. The results include, the first firm breeding records of the species: *Accipiter nisus*, *Chlidonias leucopterus*, *Glaucidium passerinum*, *Saxicola torquata*, *Regulus ignicapillus*, *Phylloscopus trochiloides*, *Lanius excubitor*, *Loxia curvirostra*, *Carduelis spinus*, possible breeding of *Fringilla montifringilla*, as well as the first observations of rare visitors. The overall number of species of the Białowieża Forest (Belarusian part included) together with its marshes and edges exceeds 250 species. Among them 177 (perhaps 180) that have ever bred and of which 133-134 species seem native to the area. About 21 species are represented by less than 20 pairs in the whole complex, while 5 have already been regionally extirpated. High species richness has been found in diurnal raptors (15 breeding species, plus 2 extirpated), owls (8 plus 1 extirpated), woodpeckers (eight of nine European species) and Sylvinae warblers (18 species). The considerable species diversity of Białowieża birds appears to be one of the pristine features typical of the avifauna of a primaeval lowland temperate forest.

Key words: Białowieża Primaeval Forest, native and alien birds, species richness.

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I. INTRODUCTION

The aim of this paper is to add new faunistical data and to comment on or to correct some statements made or quoted by BOROWSKI & OKOŁÓW (1988). These authors attempted to summarize all the published data on the Białowieża Forest avifauna, scattered over three-language literature, beginning from KARCEV's (1903) and REICHENOW's (1918) papers, and including a recent Belarusian summary by DACKEVICH (1971). Their review included also their own results of irregular observations carried out mainly during the 1960s and 1970s, as well as a few records by members of my working team, quoted sometimes inaccurately, on the basis of personal talks and memory. In several cases BOROWSKI & OKOŁÓW have characterized not so much the distribution of species in the Forest as its representation in the museum collections of Białowieża and Kamieniuki (Belarus). Consequently, for some species we still lack basic information on the: evidence of their breeding status, precise localization of several records, habitat distribution, and the size of local bird populations. It is also still difficult to divide the past data between two (Polish

and Belarusian) parts into the Forest has been recently split by the state frontier, or according to the main forest types (predominantly deciduous or coniferous). However, a research oriented on fulfilling these gaps is currently going on in the Forest.

As final summarizing paper on the Białowieża Forest avifauna is expected to be written by some other authors, the critical comments in this paper are intended to prevent the repetition of erroneous or imprecise data plaguing local literature.

Here I should like to express a gratitude for providing me with unpublished data to my colleagues: N. CHERKAS, J. LONTKOWSKI, W. PLATA, E. PUGACEWICZ, T. STAWARCZYK, W.WALANKIEWICZ, M. WANAT, T. WESOŁOWSKI, L. WILCZEK and K. WOŁK.

II. STUDY AREA AND METHODS

This study required clear-cut boundaries of the Białowieża Forest (further refered to as BF) so as to make it possible to decide which species should be included in the local avifauna and which treated as recorded only extraterritorially. Fortunately the boundaries of the BF were well defined as early as a century ago and here I follow those shown on maps in papers by FALIŃSKI (1968) and BOROWSKI & OKOŁÓW (1988). Thus, the records of birds from the Forest complex itself (including those nesting alongside its outer edges) do not raise problems. For example, the area around the newly formed dam-reservoir Siemianówka is consequently treated as extraterritorial to the Białowieża Forest. In the past, however, some slightly forested wetlands wedged from the eastern side into the Forest complex, Dikij Nikor fens being the largest. Traditionally they were treated as a part of the Forest, and this approach has been accepted here in spite of the fact of their later (during the 1950s) reclamation and transformation into dry meadows or fields. More detailed characteristics of the Białowieża Forest can be found in papers by FALIŃSKI (1968, 1986), TOMIAŁOJĆ, WESOŁOWSKI & WALANKIEWICZ (1984), BOROWSKI & OKOŁÓW (1988) or TOMIAŁOJĆ & WESOŁOWSKI (1990).

New observations reported below were made by our research team (J. LONTKOWSKI, T. STAWARCZYK, W. WALANKIEWICZ, T. WESOŁOWSKI and myself) mainly in a section of the primaeval forest within the Białowieża National Park (BNP), in the tracts of managed forests neighbouring upon it , as well as in the area of the Białowieża Glade (13 km^2). During the 1970s (later on only sporadically) we irregularly penetrated also the remaining part of the Polish part of the Forest (c. 580 km^2). A one-day visit to the Belarusian part was made in 1979. The observations were restricted to the breeding season (between late March and late June or mid-July). Each day one to several persons were active in the field, which enhanced the intensity of observation, though usually the attention was focused on aspects of bird ecology rather than on searching for rare species.

III. SYSTEMATIC LIST – ADDITIONAL DATA

The sequence of species and their scientific names are those used by BOROWSKI & OKOŁÓW (1988).

Gavia arctica (LINNAEUS, 1758). The Białowieża Forest (BF) originally lacked fairly large open water bodies, but it is situated on the main route of spring migration of divers from the Black to the Baltic Sea (TOMIAŁOJĆ 1990). This finds a reflection in the records of flocks of divers mostly unidentified to species, passing high over the BNP and Białowieża Glade to the N and NW. Here are the dates: 19 Apr. 1977 – 26 ind., 14 May 1982 – c. 40 (at least some were undoubtedly *G. arctica*), 14 Apr. 1985 – 2, 28 Apr. 1987 – 2, 17 June 1987 – two flocks of 18 and 15-20, 26 Apr.

1988 – 13, 23 May 1988 – 42 and 37, 4 May 1989 – c. 25 (certainly *G. arctica*), 1 May 1990 – 5 and 20 Apr. 1993 – 3 (one-two *G. arctica*). Usually the noise of wing-beats made these flocks conspicuous in spite of the high altitude of passage. The specimens shot (REICHENOW 1918, KARPIŃSKI 1935, DACKEVICH 1971) prove that some individuals visited the Białowieża pond and the water bodies of the Belarusian part.

– *Gavia immer* (BRÜNNICH, 1764). No unquestionable records. A vague hint by KARPIŃSKI (1954) on an alleged observation of it at Białowieża is doubtful in the light of past misidentifications. E.g. the specimen collected on 28 Sept. 1933 (not 1937) by J. GUNDŁACH (KARPIŃSKI, 1935) exists till now, but it has appeared to be a young specimen of *G. arctica* (the error already corrected by TISCHLER 1943b). In view of this the specimen in winter plumage collected on 8 Oct. 1972 in the Belarusian part (DACKEVICH, ms) needs confirmation of its identification.

Podiceps ruficollis (PALLAS, 1764). Once considered to breed singly in the Forest (J. GUNDŁACH cit. after TISCHLER 1943b). Now in the central part of the complex only rarely recorded in spring (one observation on 13 Apr. 1979 on the Narewka flooded area near Białowieża), though it still may breed in other parts (E. PUGACEWICZ). In the Belarusian part it has probably been breeding on Lyatskiye lake (DACKEVICH 1971) since 1966-68.

Podiceps auritus (LINNAEUS, 1758). The specimen from 11 May 1923, once allocated to this species (KARPIŃSKI 1935, BOROWSKI and OKOŁÓW 1988), was in fact a Black-necked Grebe *P. nigricollis* (see TISCHLER 1943b). More recently Slavonian Grebe was recorded a few times from the reservoirs of the Belarusian part (DACKEVICH 1971, N. CHZERKAS).

Podiceps grisegena (BODDAERT, 1783). Status uncertain. In recent times sporadically recorded as a visitor to the Belarusian part (N. CHERKAS), where DACKEVICH (ms) considered it a new breeding species, but without indicating any proof.

Ardea cinerea LINNAEUS, 1758. In the pre-war times single pair of the species sporadically bred both in Polish (J. GUNDŁACH after TISCHLER 1943b) and in small groups till c. 1956 in the Belarusian part (DACKEVICH 1971). Recently foraging individuals much more frequent in the Forest owing to the construction of artificial water bodies.

Ardea purpurea LINNAEUS, 1758. Three records. Young specimen collected on 4 Sep. 1943 was a female (as TISCHLER 1943b has already indicated) not a male (BOROWSKI & OKOŁÓW 1988).

Egretta alba (LINNAEUS, 1758). Since 1992 observed each August on Lyatskiye lake in the Belarusian part (DACKEVICH, ms; N. CHERKAS).

Phalacrocorax carbo (LINNAEUS, 1758). The rare records of passing birds near Białowieża are as follows: 22 Apr. 1988 two birds, in April 1989 five and in May 1989 one circling above the Białowieża Palace pond (J. LONTKOWSKI). Also in the Belarusian part once a rare recently more frequent visitor (N. CHERKAS).

Ciconia nigra (LINNAEUS, 1758). Three pairs usually breed in the BNP, sometimes 4-5. E.g. in 1977 besides two nests mentioned by BOROWSKI & OKOŁÓW (1988) an occupied nest was in forest compartment 374 and another pair was somewhere in 288/289, while in 1976 a pair nested also in 222/254 (Fig. 1).

Anser erythropus (LINNAEUS, 1758). Occurrence uncertain. Sporadic records from the Polish part have appeared uncertain. An adult collected on Lyatskiye lake on 11 Oct. 1984 needs verification. A claim on its scarce but regular appearance on the passage in the Belarusian part (DACKEVICH, ms, N. CHERKAS) raises doubts in view of difficulties in the identification of flying geese and their absence on the Polish side.

Anser anser (LINNAEUS, 1758). This is a very scarce migrant in eastern Poland (TOMIAŁOJĆ 1990), hence the estimate offered by BOROWSKI and OKOŁÓW (1983) seems to rely on a misidentification of some passing flocks and repeats doubtful claims from older literature about allaged

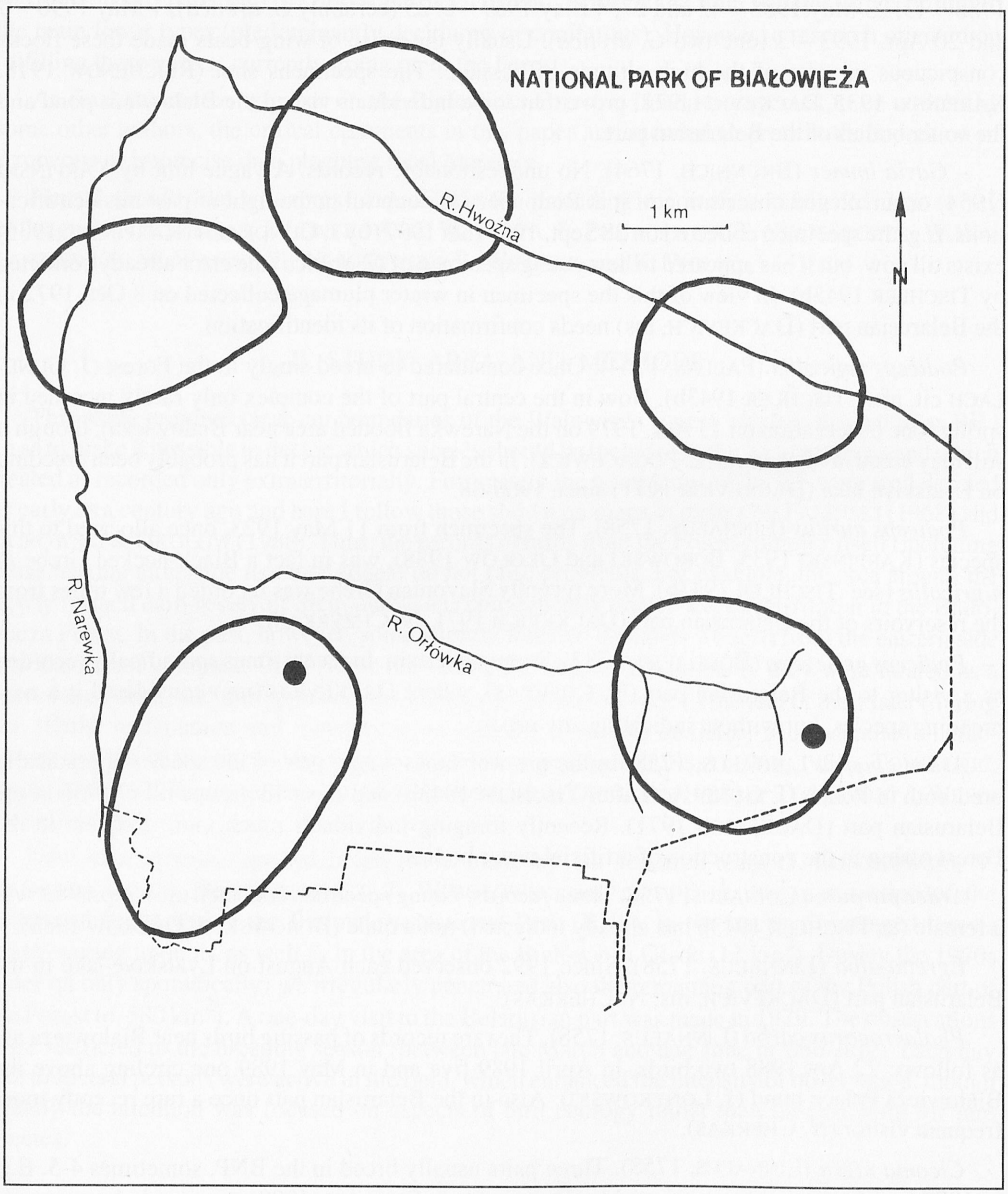

Fig 1. Distribution of the Black Stork *Ciconia nigra* breeding territories in BNP in 1976-77. Dots mean nests found.

numerous occurrence of this species. In 1982 and 1983 one or two pairs attempted or nested on Lyatskiye reservoir (DACKEVICH, ms).

– *Anser brachyrhynchus* BAILLON, 1833. No firm records. The identification of the specimen shot in October 1979 and not preserved has been questioned by the Polish rarity committee because one cannot exclude the small individual of *A. fabalis rossicus* or "*A. f. neglectus*" (Komisja

Faunistyczna 1991a). A female specimen once preserved in the Białowieża museum, which in TISCHLER's (1943b) opinion, might belong to this species, no longer exists.

Cygnus cygnus (LINNAEUS, 1758). Once a rare visitor, it may soon start to breed in the area, as during May 1995 a nonbreeding pair was staying on Górniańskie Łąki near Hajnówka, close to the Forest boundary (M. SKAKUJ and own obs.), and probably the same pair was later met on Topiło pond in the Forest (E. PUGACEWICZ).

Cygnus columbianus (ORD, 1815). On 18 Apr. 1986 four individuals of the bewickii form were seen and heard flying low along the Narewka valley near Białowieża (L. T. and J. LONTKOWSKI).

Anas platyrhynchos LINNAEUS, 1758. Its broods were recorded even near the smallest pools amongst high stands of BNP, e.g. a family in May 1983 in comp. 288 or a nest found in the spring area of the Orłówka rivulet. So the species may be truly a forest inhabitant.

Anas crecca LINNAEUS, 1758. Extremely rare breeder. No proof of its breeding occurrence in the BNP; also its qualification as a breeding bird by earlier authors lacked evidence. Only a bird shot on 17 May 1917 at the Hwoźna rivulet suggested its past breeding there (REICHENOW 1918). That does not exclude its recent breeding, however, which is known from other parts of the Forest (E. PUGACEWICZ), e.g. a nest found in 1968 in the Belarusian part (DACKEVICH, ms).

Anas clypeata LINNAEUS, 1758. The species was considered to be a scarce breeder by GUNDŁACH (after TISCHLER 1943b) probably in Dikij Nikor fens, and before 1960 it bred at Pererev (DACKEVICH 1971). This species may be a native bird to the area.

Pandion haliaetus (LINNAEUS, 1758). Regular though scarce passage can be observed also in the Polish part. Each year in April and May single individuals were recorded there, while on 4 Apr. 1989 as many as five individuals passed (J. LONTKOWSKI & T. STAWARCZYK). The latest spring observation was made on 25 May 1980 (WALANKIEWICZ).

Pernis apivorus (LINNAEUS, 1758). Fairly widespread in the Polish part, showing clear fluctuations in number. In 1975 displaying pairs or individuals were recorded in 15-20 sites while in June 1983 in 4-5 sites along the edges of BNP alone (Fig. 2). Occupied nests were repeatedly found in comp. 255 and 399. So far it has been impossible for me to evaluate the reliability of the estimate (80-85 pairs in the Polish part alone) presented on the map published by the North Podlassian Society for Bird Protection (P.T.O.P. 1993) without information on the method used.

Milvus milvus (LINNAEUS, 1758). In the first half of this century there were no records of its breeding. In 1958 and during July-August 1959 a breeding pair or family was regularly seen in the Białowieża Glade (MRUGASIEWICZ & WOŁK 1958, own obs.,) and 2-4 pairs were known from the Belarusian part (DACKEVICH 1971). During the last twenty years there were only 2-3 records of passing individuals in the western part, including a pair on 13 May 1984, but in 1994 again a pair was breeding at the Forest edge (E. PUGACEWICZ).

Milvus migrans (BODDAERT, 1783). In the Belarusian part 2-3 pairs bred, chiefly before 1960 (DACKEVICH 1971). In the Polish part during the last twenty years a breeding attempt was recorded from comp. 398 in May 1976 and it was also probable, in 1975. Remarkably, this species bred exactly there in 1916-18 (TISCHLER 1943b). Later on only in spring 1989 a pair probably bred somewhere in the Narewka valley near BNP.

Haliaeetus albicilla (LINNAEUS, 1758). Sporadic observations of non-breeding individuals have been recurring recently in the Polish part: on 1 July 1957 (MRUGASIEWICZ & WOŁK 1958), an adult on 9 May 1978 in the Hwoźna valley (W. WALANKIEWICZ) and on 14 June 1979 an immature near Łozice in the Leśna Prawa valley. During last years a pair bred in the northern section of the Belarusian part (N. CHERKAS).

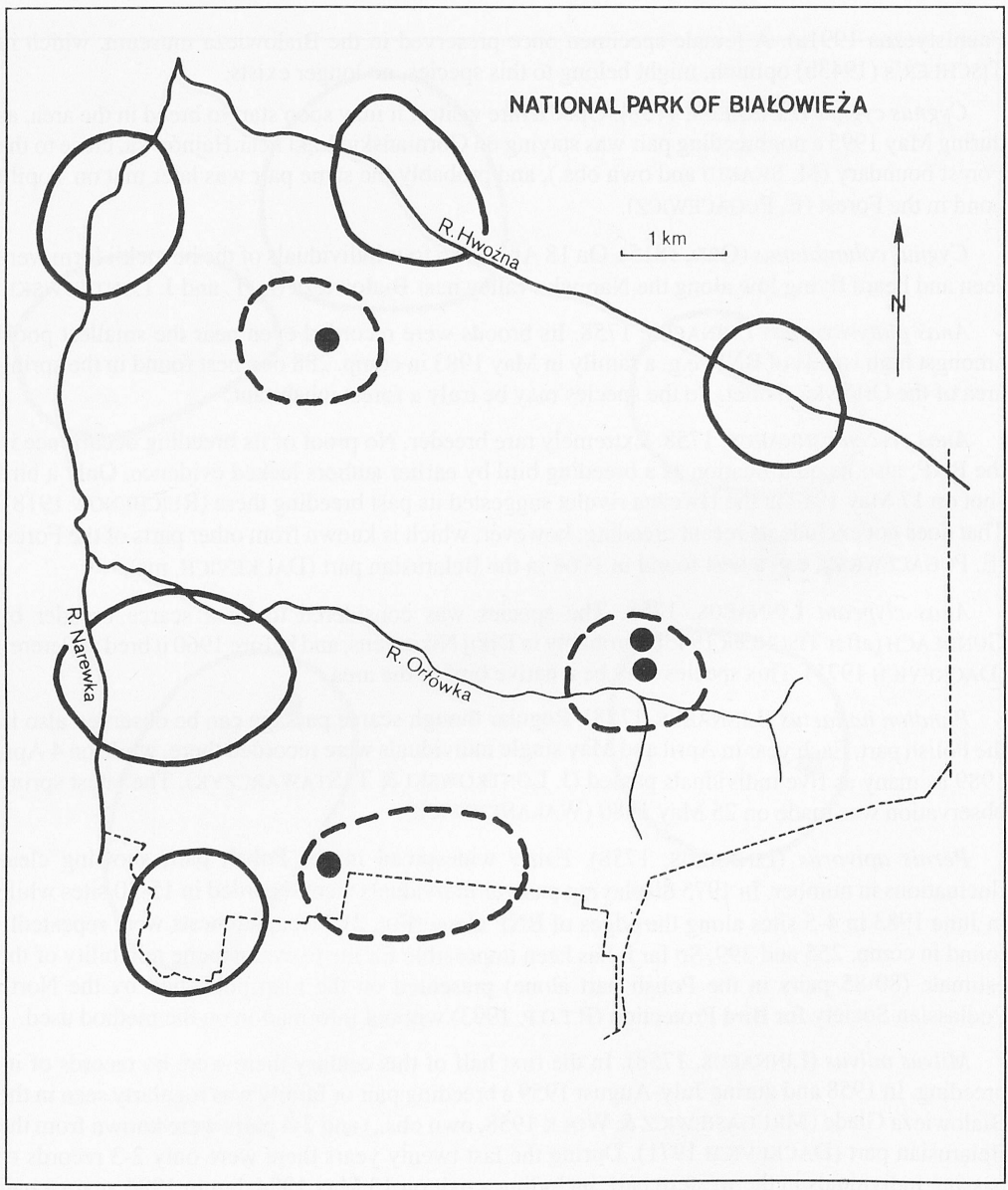

Fig. 2. Distribution of the Honey Buzzard *Pernis apivorus* breeding territories in BNP during 1975-76, with additions from later years. Solid line denotes territory during 1975-76, broken line that from later years.

Gyps fulvus (HABLIZL, 1783). Recorded twice: on 19 June 1979 an adult caught in comp. 825 of Belarusian part (DACKEVICH, ms; N. CHERKAS) and 9 June 1990 one individual seen above Białowieża (R. CISAKOWSKI & W. WALANKIEWICZ).

Accipiter gentilis (LINNAEUS, 1758). In the 1950s up to 45 breeding pairs were reported from the Belarusian part (DACKEVICH 1971). In 1975-76 in the BNP (47.5 km^2) four breeding territories

were known (comp. 254, 316, 319 and 254), including three occupied nests. Later the species became less frequent, in the breeding season virtually only sporadically seen. Now it can hardly be regarded as "fairly common".

Accipiter nisus (LINNAEUS, 1758). It is doubtful wether now it is less numerous than the Goshawk, at least in BNP, where in 1977 four territories of apparently breeding pairs were known. Its nests were found (in June 1975, 1976, 1990, 1993) in coniferous stands of comp. 318/319, while in 1993-94 a pair was regularly seen in the riverine and lime-oak-hornbeam stands of comp. 398-401.

Hieraaetus pennatus (GMELIN, 1768). The breeding species (though the only two nests found appeared to be empty) whose 3-4 pairs occurred in the Polish part of the Forest in 1975-90 (PUGACEWICZ 1993, own obs.), while in the Belarusian part three pairs were known in the 1950s (DACKEVICH 1971). In 1980-82 a pair (male of dark phase, female of pale phase) bred somewhere in comp. 398 of BNP; in June the male was seen to deliver food to the incubating or brooding female, though the nest itself was not discovered. In 1983 probably the same pair moved to the region of Dziedzinka. Around Białowieża Glade the birds were regularly observed also in 1985-86 and 1988, but not in 1987 and neither have been seen since 1989. In the whole Forest five or more pairs may still breed irregularly (PUGACEWICZ 1993). All records from the Polish part have been verified by the Avifaunistic Commission.

Aquila clanga PALLAS, 1811. During twenty years of spring-time field work of our team this species was met in the Forest only once: 12 June 1975 an immature in the Hwoźna valley close to the state border. Probably this species was also seen in May 1992 in the Leśna Prawa valley. This conflicts with the information about frequent records of this species (BOROWSKI & OKOŁÓW 1988) and excludes the possibility of its permanent occurrence at least after 1974. However, also during a stay at Białowieża in July-August 1959 I found merely the presence of numerous Lesser Spotted Eagles, contrary to MRUGASIEWICZ & WOŁK (1958). It is safer to assume that most old reports relied on the misidentification of the Lesser Spotted Eagle owing to wrong diagnostic characters given in older Polish literature (see Komisja Faunistyczna 1991a). Only the winter observation of a pair on 19 Febr. 1981 (BOROWSKI & OKOŁÓW 1988) strongly suggests the Greater Spotted Eagle. This does not mean, however, that one should doubt the very fact of the past breeding of *A. clanga* in the Forest, most probably in its eastern, marshy, section (TISCHLER 1943b). Its former breeding is supported by the evidence (adult specimens and eggs) preserved in the local collections. It is justified to assume that the species ceased to occur in the Forest after the total reclamation of the Dikij Nikor fens. Surprisingly enough, DACKEVICH (1971) did not mention this species at all.

Aquila pomarina C. L. BREHM, 1831. Along the outskirts of BNP 6-8 pairs used to breed in the 1970s and 1980s, and 5-6 in 1990s, while the total population of the Polish part explored was estimated at least 25-30 pairs in 1975-76, which number probably was incomplete. Recently PUGACEWICZ (1990) counted as many as 61 pairs in the Polish part, while 50-60 pairs were reported for the Belarusian part before 1953, later only 10-15 (DACKEVICH 1971). The species avoids deep forest-interior habitats of BNP (Fig. 3). Therefore, with a secondary forest succession recently invading the no longer mowed meadows of the mid-forest river valleys, the species may locally decline in the future.

Aquila chrysaetos (LINNAEUS, 1758). After decades of absence one pair settled to breed in the Belarusian part in 1975-78 and recently (N. CZERKAS). In the Polish part only sporadic sight records: an immature seen above comp. 398 on 9 June 1981, an adult in the Hwoźna valley going into the Belarusian part on 6 May 1986 and a subadult displaying above Białowieża on 18 June 1989.

Circaetus gallicus (GMELIN, 1788). Two or three pairs were reported from Belarusian part (DACKEVICH 1971) and also two or three undoubtedly breeding pairs were known in the 1970s,

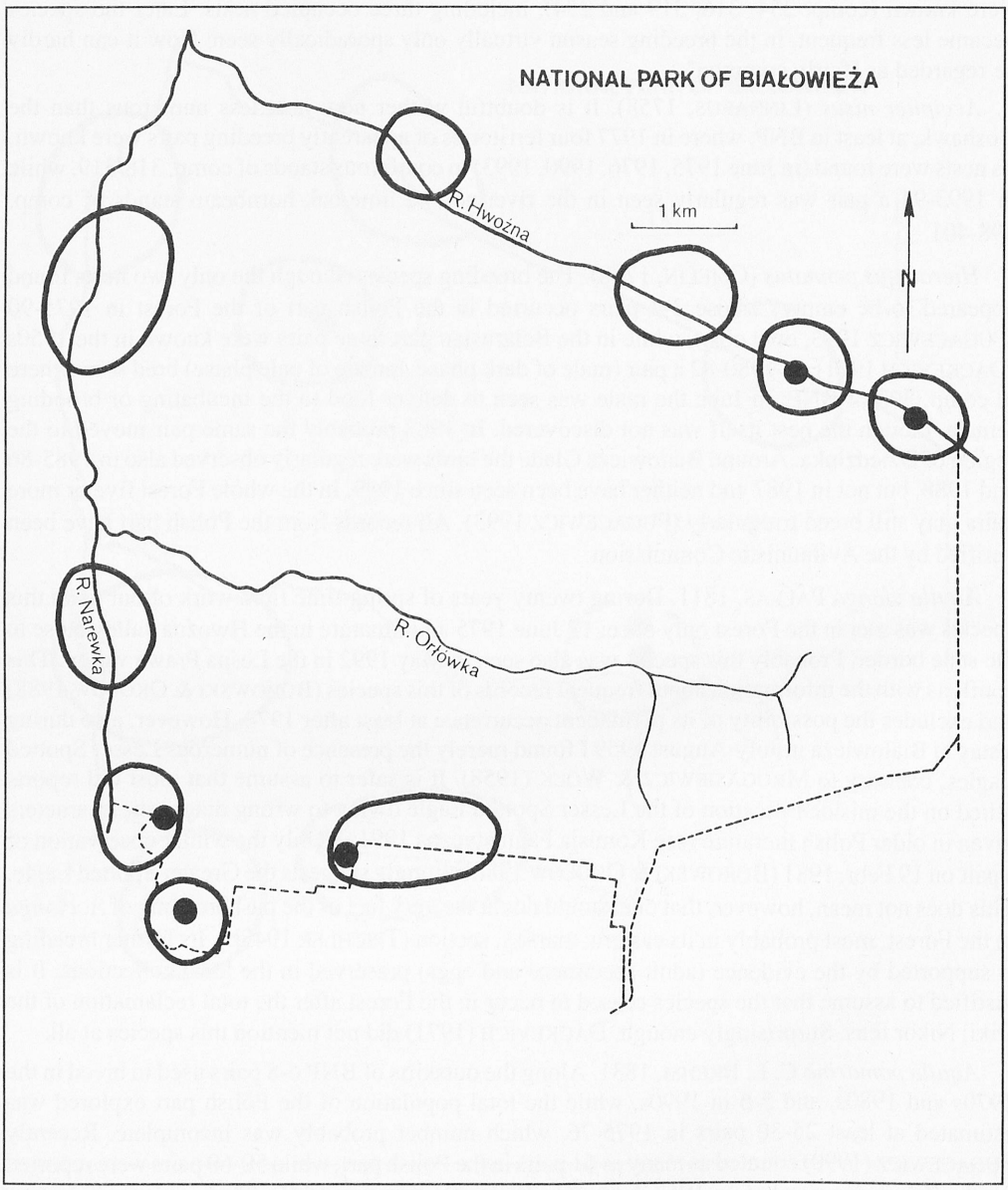

Fig. 3. Distribution of the Lesser Spotted Eagle *Aquila pomarina* territories in BNP in 1975-77. Dots mean nests found.

and one or two in the 1980s, from the Polish part. One was at the Hwoźna mouth (where in 1975 an old nest was found in the BNP, while displaying adults were seen there on 21 June 1975, 3 May 1977 and 16 May 1981). Another – in 1979 south of the Białowieża Glade, and the third and most persistently occurring one – in the Leśna Prawa valley, in most years including 1992-93. Its population size in the whole Forest seems to remain the same as in the 1940s when half-a-dozen pairs occurred (TISCHLER 1943b).

Circus macrourus (GMELIN, 1771). One new record of a migrant seen in the Białowieża Glade – adult male on 26 Apr. 1988 (J. LONTKOWSKI) – has been accepted by the Avifaunistic Commission. The other one of a female from 1990 appeared to be uncertain.

Circus pygargus (LINNAEUS, 1758). A regular spring migrant and rare breeder. In 1976-77, 1979, 1985 and 1989-93 a pair bred in the Narewka valley below Białowieża, where a nest was found in 1985. Its nesting was observed also in the Belarusian part, chiefly before the wetland reclamation (DACKEVICH 1971).

Circus cyaneus (LINNAEUS, 1766). No proof of its breeding in the area, because past Belarusian records were extraterritorial (DACKEVICH 1971). In the Polish part it is a regular but scarce migrant, only in May 1942 a female was often seen in the Białowieża Glade but this cannot be accepted as evidence of breeding (TISCHLER 1943b).

Circus aeruginosus (LINNAEUS, 1758). From time to time single pairs intrude the Forest river valleys: one bred in 1989 at the Narewka river near Pogorzelce. It is not clear if this is the same site that was vaguely mentioned by BOROWSKI & OKOŁÓW (1988).

Falco peregrinus GMELIN, 1788. In the 1950s some 4-5 breeding pairs in the Belarusian part, but by the 1960s the species became extinct in the Forest (DACKEVICH 1971, ms). In view of lack of recent observations (even of nonbreeders) the quotation of the old data in the present tense by BOROWSKI & OKOŁÓW (1988) is not justified.

Falco subbuteo LINNAEUS, 1758. A scarce bird in the Forest, its brood was recorded from some managed coniferous stands of the central part of the Forest in the 1970s. No broods were found in BNP, only in 1989 a pair probably bred somewhere at the Białowieża Glade edges.

Falco columbarius LINNAEUS, 1758. A visitor seen three times in the Białowieża Glade: 25 Apr, 1975 a male, 5 May 1978 a female (J. TIAINEN & K. VEPSALAINEN) and one bird on 22 Apr. 1993.

Falco vespertinus LINNAEUS, 1766. The species undoubtedly visits the area, including a flock of 50-60 staying from 5 to 12 September 1968 on the Forest edge (DACKEVICH 1971, ms). However, its three sightings from December and January 1962-1974 (BOROWSKI & OKOŁÓW 1988) should be deleted as improbable, for this tropical migrant has never been met with in Poland in winter time (TOMIAŁOJĆ 1990) and the above-mentioned report lacks information on sex and identification features.

Falco tinnunculus LINNAEUS, 1758. Always rather scarce breeder, recently it has probably ceased to breed in the Polish part (E. PUGACEWICZ), as well as has become a rare breeder in the more fragmented eastern part.

Lyrurus tetrix (LINNAEUS, 1758).The species on the verge of local extinction. Formerly a common breeder: in 1951 several hundred displaying males were reported from Belarusian part alone, though only few dozens in 1969 (DACKEVICH 1971). Recently it was no more "fairly common" as BOROWSKI & OKOŁÓW write (1988). During the first ten years we failed to see it at all in the Forest. Only on 22 Apr. 1987 three nomadic females were met with in comp. 398 (W. PLATA and others), and in spring 1988 and 1989 a single male displayed along the edge of BNP.

Tetrao urogallus LINNAEUS, 1758. Once a common breeder with the population size estimated in the whole Forest for 1925-28 at 125-150 males (DOMANIEWSKI 1933); in 1957 it was widespread in the Polish part (FISCHER 1961); in the Belarusian part 62 males were still present in 1969, while in 1984 there were only 21 males (DACKEVICH 1971 and ms). Recently there has been no evidence of its breeding in the BNP, though single females were twice recorded from the sites distant from the known breeding areas situated in the managed Forest stands: in the spring of 1987 a female displaying to people was caught at the former "bison reserve" (L. WILCZEK) while another female

was seen flying from BNP to Palace Park at Białowieża and back on 9 Apr. 1990 (L.T.). Only 3-5 males have remained in the Polish part till now (GROMADZKI et al.1994).

Coturnix coturnix (LINNAEUS, 1758). This species fluctuates in number: usually only 1-2 birds heard in the northern part of the Białowieża Glade, though in June 1989 even c. 6 males were heard there (WALANKIEWICZ). It is probably a native breeder to the area, once known to occur in the fens wedging into the Forest (TISCHLER 1943b, DACKEVICH 1971).

Grus grus (LINNAEUS, 1758). Its population is probably (no old estimates) slightly increasing. Several dozens of pairs were reported from each part. In BNP 2-3 pairs usually breed, but in 1982 there were four of them, while in 1985-87 again probably only a single one. Adults with nonflying young were seen in the riverine forest stands of comp. 254 and 255 on 19 June 1978 and 15 June 1990 (WALANKIEWICZ), some two km inside of the BNP. In some years single pairs were breeding outside BNP near Dziedzinka, and in 1992-93 in the Narewka valley near Pogorzelce. In the whole Polish part 30-35 pairs were counted (GROMADZKI et al. 1994).

Porzana porzana (LINNAEUS, 1766). Extremely rare in the part of Forest known to us, though it may have sporadically bred there. E.g. in June 1986 and 1988 regularly 1-2 males were calling in the Narewka valley near forest comp. 398, while on 28 Apr. 1993 one male was heard in the Leśna Prawa valley. Before the reclamation of the wetlands it was fairly common in the Belarusian part, where in the 1980s only single males were heard on "Dikoye" marsh and alongside the shores of the Lyatskiye reservoir (DACKEVICH 1971, and ms).

Porzana parva (SCOPOLI, 1769). Quite surprising was the sighting of a male in comp. 398, some 80 m deep inside the ash-alder high forest stand on 14 May 1977 (W. WALANKIEWICZ). Quotation of REICHENOW (1918) and DACKEVICH (1971) by BOROWSKI & OKOŁÓW (1988) is erroneous: the former authors failed to find this species during a breeding period. Evidence of its rare breeding is now known only from the Leśna river valley in the Polish part (E. PUGACEWICZ).

Crex crex (LINNAEUS, 1758) and *Gallinula chloropus* (LINNAEUS, 1758) still breed though scarcely in both parts. The dates of the collection of two specimens in 1917 have been cited erroneously in BOROWSKI & OKOŁÓW (1988): it should be 14th June not July (cf REICHENOW 1918, TISCHLER 1943b).

Charadrius dubius SCOPOLI, 1786. A pair stayed and probably bred in May and June 1977 in the Narewka valley below Białowieża, which agrees with the claim (DACKEVICH 1971) on its rare nesting in the Belarusian part.

Vanellus vanellus (LINNAEUS, 1758). The species is no longer "fairly common in river valleys". One of the last breeding places in the Forest, apart from the farmland around this complex, is the Białowieża Glade. The species ceased to breed in the forest river valleys by the early 1970s, after their exploitation by mowing or cattle grazing had been given up.

Calidris temminckii LEISLER, 1812. The specimen collected on 24 July 1930 appeared to be a Common Sandpiper *Tringa hypoleucos* LINNAEUS, 1758, not a stint (see TISCHLER 1943b). The observation on 7 May 1974 (BOROWSKI & OKOŁÓW 1988) remains the only valid record of the Temminck's Stint.

Tringa ochropus LINNAEUS, 1758. During the late 1970s, characterized by a high ground-water table, it was a widespread breeder, with over 10 pairs in BNP and at least 100 pairs in the Polish part. During drought period of late the 1980s and early 1990s the population in BNP declined: only a few pairs have remained. The estimate given on the back-side of the map by The North Podlassian Society for Bird Protection (330-390 pairs for the Polish part), and published without information concerning the methodology applied (P.T.O.P. 1993), seems too high.

Tringa hypoleucos LINNAEUS, 1758. No evidence of recent breeding in the Polish part, only in 1918 it probably bred in the Narewka valley (ZIMMERMANN after TISCHLER 1943b). Sporadic breeding attempts are reported from the eastern part (DACKEVICH 1971, N. CHERKAS).

Glareola pratincola (LINNAEUS, 1766). The only sight record (BOROWSKI & OKOŁÓW 1988) needs correction: an individual was seen on 8 Apr. 1969 at the Narewka river; and the record has only been accepted (not stated) by the Avifaunistic Commission.

Larus minutus PALLAS, 1776. The correct date of collecting the museum specimen (precisely from where?) was 24 June 1923, not April (KARPIŃSKI 1935 and TISCHLER 1943b). During the 1980s the species was four times recorded while on passage on the Lyatskiye reservoir (DACKEVICH, ms).

Larus fuscus LINNAEUS, 1758. Białowieża is situated on the species' migratory route between the Black and the Baltic Seas. Therefore these birds regularly pass over the Forest in flocks which in spring are composed exclusively of adults. In the springs of 1973-89 in 20 particular days a total of 24 sightings were recorded. In 17 cases it was proved that the birds were actually adults of this species, while in remaining cases the specific identity of "big gulls" could not be checked. The main direction of the passage was NW and N. The extreme dates were: 6 April (1987) and 5 June (1983). The flocks counted up to 20 and 26 birds.

There is no doubt that, notably in preceding decades when the Herring Gull *Larus argentatus* was a rarity in the inland Europe (TOMIAŁOJĆ 1990), flocks of Lesser Black-backed Gulls and not Herring Gulls (as FEDIUSHIN & DOLBIK 1967 wrongly suggested and BOROWSKI & OKOŁÓW 1988 repeated after them) regularly passed over the Belarusian part. After all, the birds of both species look quite alike when seen from below.

Larus argentatus PONTOPPIDAN, 1763. In contrast with earlier authors we failed to spot this species. The only record from the Polish part was the observation of an adult passing from above the Forest to Górniańskie Łąki near Hajnówka on 10 March 1994 (E. PUGACEWICZ). It is suggested therefore that only two Belarusian older reports are fairly reliable (DACKEVICH 1971): the presence of some birds between 1 and 16 May 1949 in the marshland (Dikij Nikor ?) and the remains of a specimen found near Pererew on 2 Apr. 1950, though only on condition that they were birds in adult plumage (which is not known).

– *Larus hyperboreus* GUNNERUS, 1767. No firm records. The sighting mentioned vaguely by BOROWSKI & OKOŁÓW (1988) cannot be verified because the identification characters remain not known (Komisja Faunistyczna 1991a).

Larus canus LINNAEUS, 1758. Single immatures of this species were seen passing twice: 24 May 1975 near Teremiski and 14 May 1982 over Białowieża (not in April 1979 as quoted by BOROWSKI & OKOŁÓW 1988).

Sterna albifrons PALLAS, 1764. In the spring of 1976 three individuals foraged shortly above the Białowieża pond (W. WALANKIEWICZ). This is the first record of the species in the Polish part of BF.

Chlidonias leucopterus (TEMMINCK, 1815). The species was repeatedly seen by local taxidermist GUNDŁACH in earlier times, e.g. on 25 May 1942 (TISCHLER 1943b). A few adults passing over the Polish part of BF were seen on 24 May 1975 near Teremiski and 13 May 1977 above Białowieża. On 13 June 1979 on the artificial lake Lyatskiye 5 pairs behaved as at a newly established breeding colony (DACKEVICH, L.T. and WOŁK). Soon afterwards the site was flooded by rising water but the species nested there in 1982-85 (DACKEVICH, ms). The nearest breeding colony of up to 80 pairs was known in 1979 near Czeremcha, SW of the Forest (SOKOŁOWSKI & WOŁK 1980), the site destroyed later by land reclamation works.

Chlidonias niger (LINNAEUS, 1758) and *Sterna hirundo* LINNAEUS, 1758. Both species started to breed on the Lyatskiye lake in the eastern part of the Forest (DACKEVICH 1976).

Columba livia GMELIN, 1787. Feral form of this species, whose increasing numbers have been breeding in the Hajnówka town and in some villages at the edge of Forest for years, penetrates the Forest complex and sometimes breeds in its human settlements. E.g. two pairs of "wild" pigeons once nested at the Masiewo village (E. PUGACEWICZ). Though it is highly probable that these birds interbreed with escapees from the domestic stock, yet their phenotypic characters suggest that they are the descendents of a synanthropic feral form. The hesitations of earlier authors (e.g. DACKEVICH 1971) who often deleted this species from the BF list are not maintained here.

Columba oenas LINNAEUS, 1758. Though widespread in the Forest it is a rather a rare breeder. I agree on this point with BOROWSKI & OKOŁÓW (1988) and think that earlier estimates by TISCHLER (1943b) and FISCHER (1961), who claimed it to be more numerous than Woodpigeon *C. palumbus*, were clearly biased, as both observers visited the Forest in May when few Woodpigeons commence breeding.

Streptopelia decaocto (FRIVALDSKY, 1838). During the 1980s single males or pairs started to leave villages and to visit the forest edges of the BNP. Persistently displaying males were heard in comp. 398 on 12 June 1985 and 6 May 1987, while on 18 May 1986 as far as one km into the forest (comp. 370).

Streptopelia turtur (LINNAEUS, 1758). This is an extremely rare breeder now, not "a fairly numerous" one (BOROWSKI & OKOŁÓW 1988). It avoids dense high stands of BNP: breeds in single pairs only along the forest edge and amidst some extensive (0.5-1 km^2) windfalls (317, 318, 344). In June 1984 a tame male was persistently calling in the middle of the Białowieża village.

Bubo bubo (LINNAEUS, 1758). Though a few pairs actually breed in the Forest (DACKEVICH 1971, DOMASZEWICZ 1993) the species was never met with during our work. We decidedly exclude a possibility of its permanent occurrence in the comp. 398 (BOROWSKI & OKOŁÓW 1988), large parts of which constitute our extensive census plots regularly visited day and night each spring during the last 20 years.

Asio otus (LINNAEUS, 1758). In some years a common (REICHENOW 1918) or fairly common (DOMASZEWICZ 1993), breeder in the Forest. Its present scarcity in BNP remains in contrast with those claims, which can be explained by strong fluctuations in number (DOMASZEWICZ 1993). Besides a pair breeding from time to time in the Palace Park of Białowieża a family was also met with on 2nd and 13th June 1990 in a windbreak amidst high coniferous stands deep in the BNP – comp. 288 (WALANKIEWICZ, J. LONTKOWSKI). A calling bird was heard there in 1993.

Asio flammeus (PONTOPPIDAN, 1763). According to GUNDŁACH (after TISCHLER 1943b), it singly and irregularly bred in the area, which was confirmed for the Belarusian part for the period before the wetlands reclamation (DACKEVICH 1971). It is not clear from where (from Dikij Nikor ?) the eggs of this species were collected for the Białowieża museum (TISCHLER 1943b). FISCHER (1961) reported (quoting the opinion of the director of the national park) on its breeding in the Leśna valley still during the 1950s though without giving any details; the information seems uncertain. The species no longer breeds in the BF.

Aegolius funereus (LINNAEUS, 1758). In BNP recorded only exceptionally: in comp. 255 a bird calling on 9 May 1976 in response to the replay of a tape-recorded call (L.T. and WALANKIEWICZ), and single birds calling in the daytime heard in comp. 318 (28 Apr. 1986 and seen on 2 May 1990) and 289 (18 June 1988). Likewise only two breeding sites have been indicated by DOMASZEWICZ (1993) in the BNP area, contrary to dozens of pairs known from the managed coniferous stands.

Glaucidium passerinum (LINNAEUS, 1758). 6-10 pairs occur in the BNP (DOMASZEWICZ 1993). A pair bred (holes or families seen) in the coniferous stand of comp. 318 (or adjacent 288) in the years 1983, 1988, 1989, 1990 , 1993 and 1995, while the birds were heard there almost every year

(sometimes two pairs). There was also an occupied nest in comp. 284 in 1994. Calling individuals were heard during the breeding season in two other parts of BNP: in comp. 255 on 22 Apr. 1986 and three times in May 1989, while in comp. 319/320 on 8 May 1979 and twice in May 1993.

Strix nebulosa FORSTER, 1772. The most recent data confirm its occurrence in the Forest. Repeated records from the Belarusian part may suggest its infrequent breeding (DEMIANCHIK 1990), while in the Polish part only sporadic observations of single individuals, like those of a single bird in the Leśna valley between 3 and 26 May 1987 (Komisja Faunistyczna 1991a, DOMASZEWICZ 1993).

Tyto alba (SCOPOLI, 1769). In the spring seasons of 1977, 1978 and 1981 its calls were regularly heard in the Palace Park of Białowieża where sure enough, its nesting site was.

Caprimulgus europaeus LINNAEUS, 1758. A regular breeder in the managed conifer-dominated stands with clearings (a nest found in the late 1970s). On the contrary, there is no proof of its breeding in the BNP, though during the 1970s some birds were seen at the forest edge north-east of Białowieża and on 24/25 May 1977 at the main gate to the BNP.

Apus apus (LINNAEUS, 1758). Scattered pairs breed regularly throughout the Forest, not only in the old pine stands (comp. 574), but also in huge dead oaks amongst the lime-oak-hornbeam stands (comp. 341) and in the ash-alder stands at the forest edge (comp. 398). The birds circling above the remote rivulet valleys in the forest tend to occur in twos/pairs (29 of 38 cases).

Coracias garrulus LINNAEUS, 1758. Once a common breeder in the Białowieża Glade and BNP, chiefly alongside the southern edge of the National Park, where "several pairs" used to breed (TISCHLER 1943b, FISCHER 1961). Now only sporadically single individuals fly over the area: 12 June 1975 (Hwoźna valley), May 1976 and June 1977 in the Narewka valley and near Białowieża, June 1979 in the Leśna valley. On 16 June 1993 a bird stayed for a short time in the Białowieża Glade. Thus, the breeding occurrence of the species is of much older time, before the 1970s (cf. DACKEVICH 1971), and should not be reported in the present tense.

Merops apiaster LINNAEUS, 1758. In May 1994 this species was observed near Białowieża by Ch. KEMPF (Strassbourg).

Alcedo atthis LINNAEUS, 1758. A scarce breeder in the Narewka valley. Exceptionally penetrates the BNP: 26 Apr. 1975 – one bird flying upstream in the dense ash-alder stand of the comp. 398. An old claim on its past breeding on the Orłówka river in a dense high forest stand of the present BNP area (REICHENOW 1918) has found a new support: in 1994 a nest with nestlings was found earthy roots-disc of a fallen tree near the Narewka river in the edge zone of BNP (E. PUGACEWICZ).

Upupa epops LINNAEUS, 1758. Once a common breeder in the Białowieża Glade (TISCHLER 1943b). In 1975-76 a pair bred at the forest edge close to the main gate to BNP, and sporadically penetrated the interior of BNP: once heard in the windfall area of comp. 342. In following years only passing individuals were recorded in the Białowieża Glade, mainly in April.

Jynx torquilla LINNAEUS, 1758. Two-four pairs breed along the southern edge of BNP, both in lime-oak-hornbeam and in ash-alder stands.

Picus viridis LINNAEUS, 1758. No evidence of its breeding in the BNP, where only sporadically single individuals were heard, chiefly in March-April in comp. 398, and exceptionally on 22 June 1977 in the Hwoźna valley (comp. 258) or on 5 June 1994.

Picus canus GMELIN, 1788. A rare breeder at the edges of BNP: in 1976 in the Narewka valley near Cupryk, in 1975 and 1979 near Hwoźna at the state border, in 1992 an occupied hole and in 1993 and 1995 an occupied territory in comp. 398 (T. STAWARCZYK). Each year in April single nonbreeders roam along southern edge of BNP, sometimes visiting larger windfalls inside.

Dryocopus martius (LINNAEUS, 1758). Widespread but rather scarce breeder in all types of forest stands. Higher than usual numbers were recorded in 1976, when in BNP over a dozen territories were registered and four occupied holes found. Some nests were less than 30 m from the forest edge, both in ash-alder and in lime-oak-hornbeam stands.

Dendrocopos syriacus (HEMPRICH & EHRENBERG, 1833). Single adult males were met with twice: 11 May 1989 at the BNP edge and 11 Apr. 1992 in Palace Park of Białowieża (Komisja Faunistyczna 1991, J. LONTKOWSKI).

Dendrocopos leucotos (BECHSTEIN, 1803). Its abundance in BNP is estimated at 28-29 pairs. Dozens of nests were found (WESOŁOWSKI & TOMIAŁOJĆ 1986). In the whole Polish part of the Forest some 115-130 pairs have been found (WESOŁOWSKI 1995), while the map by The North Podlassian Society for Bird Protection (P.T.O.P. 1993) offers an estimate of 200-220 pairs without indicating the method applied. In the Belarusian part clearly less numerous, comparable in abundance with very scarce *Picus viridis* (DACKEVICH 1971).

Picoides tridactylus (LINNAEUS, 1758). For the late 1970s its numbers in BNP were estimated at c. 20 pairs (WESOŁOWSKI & TOMIAŁOJĆ 1986). At present it may be somewhat more numerous owing to the increased windfall area and the dying off of spruces, thus, a rise in abundance of the nesting and feeding substrate. Over 35 occupied holes were found, mainly in the ash-alder and wetter forms of lime-oak-hornbeam stands, though also in mixed coniferous ones (Białowieża Nest-record Scheme). In the Belarusian part very scarce (DACKEVICH 1971) probably as a result of the lack of dying spruces in those on average younger stands.

Hirundo rustica LINNAEUS, 1758 and *Delichon urbica* (LINNAEUS, 1758). Both sometimes breed in remote forest river valleys far from human settlements. E.g. two nests of the Swallow and 11 of the House Martin were found on 13 June 1975 under the bridge over the Narewka below its junction with the Hwoźna, while under a bridge across the Leśna Prawa 1-3 pairs of Swallows breed in most years.

Eremophila alpestris (LINNAEUS, 1758). Usually recorded in the autumn, but appears also in spring: on 8 March 1975 three birds near Pogorzelce in the Białowieża Glade.

Galerida cristata (LINNAEUS, 1758). No recent data on its breeding in the area, though according to REICHENOW (1918) and TISCHLER (1943b), in 1916-18 it bred and wintered in forest villages, and this was later confirmed for the Belarusian part by DACKEVICH (1971). A specimen was collected on 14 July 1922 (KARPIŃSKI 1935).

Lullula arborea (LINNAEUS, 1758). Breeds in clear-cut areas of managed stands, while probably has never been breeding in the BNP. One-two pairs breed at the forest edge east of the Białowieża village.

Anthus campestris (LINNAEUS, 1758). A single territory was regularly occupied in 1975-88 at the damping place near Białowieża. In 1989 a single individual was sporadically there, while later the site was deserted after the trees had been planted.

Motacilla cinerea (TUNSTALL, 1771). An adult male was seen on 26 Apr. 1988 to pass down the Narewka valley (J. LONTKOWSKI). Some unusually early or winter observations of *M. flava* LINNAEUS, 1758 reported by REICHENOW (1918) and KARPIŃSKI (1954) may actually concern this species.

Motacilla alba LINNAEUS, 1758. It occurs not only in rather large clear-cut areas amongst managed stands but single pairs breed also along the edges of the BNP: several times at the main gate to BNP, in 1977 in remote part of the Hwoźna river near the State border, or at the stream approaching the forest edge in the ash-alder stand in comp. 398. So the species may be also a pristine forest inhabitant.

Bombycilla garrulus (LINNAEUS, 1758). Winter bird. Not infrequently the last individuals stay in BNP (feeding on numerous *Viscum album* fruits) till the second decade of May. However, in 1993 a flock of 30 remained in an oak-hornbeam stand (comp. 344) from mid-April till 9 May, whereas two birds were seen there even on 26 May.

Lanius collurio LINNAEUS, 1758. Breeds rarely in young plantations amongst managed stands. Exceptionally settles also among the high-stemmed pristine stands of BNP: in June 1980 a nest with nestlings found by the ride between compartments 370 and 341 in a lime-oak-hornbeam stand (W. WALANKIEWICZ), which is 1.5 km deep in the dense forest complex. The unmated males sporadically stay in the patches of wind-fallen trees inside BNP.

– *Lanius senator* LINNAEUS, 1758. Deleted from the list, as recorded only from the outside of the Forest. Doubts concerning the late (October) date of an extraterritorial record (ZL in TOMIAŁOJĆ 1990) are not justified, because TISCHLER (1943b) stressed its correctness.

Lanius minor LINNAEUS, 1758. Also this species has never been found breeding within the Forest boundaries (see TISCHLER 1943b). Only rare visits recently reported (DACKEVICH ms, Z. LEWARTOWSKI) can be accepted.

Lanius excubitor LINNAEUS, 1758. Breeding of a single pair was proved for the Palace Park of Białowieża on 13 June 1977 (E. RANOSZEK & A. KOŚCIUCZYK). In 1976 presumably and in 1989 certainly a pair nested in poplars in front of the southern edge of BNP.

Sturnus roseus (LINNAEUS, 1758). Between 22 May and 2 June 1995 one to four adult individuals were repeatedly seen in the Teremiski and Białowieża clearings (M. SKAKUJ and others).

Nucifraga caryocatactes (LINNAEUS, 1758). A family with young was seen in the coniferous stands of comp. 318 in 1988, and the species probably bred earlier in 319. Regularly from late March to July 1987, three times in May 1988 and six times in April-May 1990 a single bird (representative of a pair?) was met in unusual habitat: ash-alder and lime-oak-hornbeam stands in the comp. 389, which is several km from the coniferous stands. The species is more widespread in managed (younger) coniferous stands, where two occupied nests were found in the late 1970s (K. WOŁK).

Corvus monedula LINNAEUS, 1758 and *C. frugilegus* LINNAEUS, 1758. Both species breed in the Hajnówka town, outside the Forest, whereas only the Jackdaw sometimes nests also in the Forest-edge zone (E. PUGACEWICZ). Each year long-distance movements of their mixed-species flocks can be observed high above the Forest in April and May, usually along the NW-SE axis. Sporadically birds forage in the Białowieża Glade. It is uncertain if these are non-breeders, or breeding individuals travelling that far (c. 40 km across the Forest) to some feeding areas.

Corvus corone cornix LINNAEUS, 1758. Usually occurs only on the outskirts of the Forest (REICHENOW 1918). In 1975-77 one pair probably bred at the edge of BNP. An occupied nest was found in May 1978 (not 1980 as given by BOROWSKI & OKOŁÓW 1988) in comp. 398 (TOMIAŁOJĆ et al. 1984). There two pairs built nests again in 1992. All the breeding attempts failed probably owing to an action of Ravens or Pine Martens. From the whole Belarusian part only 10-15 pairs were reported (DACKEVICH 1971).

Corvus corax LINNAEUS, 1758. Fairly common breeder. In BNP in 1976-78 c. 5 pairs bred, mostly along the edges, but also in the forest interior in compartments 284, 318 or 319. At that time a non-breeding flock of 18-20 individuals was staying at the BNP edge.

Prunella modularis (LINNAEUS, 1758). This is a widespread and fairly numerous (up to 4 pairs per 10 ha) breeder in most types of forest habitats (PIOTROWSKA & WOŁK 1983, TOMIAŁOJĆ et al. 1984). Over 85 nests were found (Białowieża Nest-record Scheme). This indicates that the species

was overlooked by earlier authors (TISCHLER 1943b, BOROWSKI 1968, DACKEVICH 1971, BOROWSKI & OKOŁÓW 1988).

Locustella luscinioides (SAVI, 1824). Every year a dozen territorial males can be heard in the Hwoźna, Narewka and Leśna valleys. No doubt this is a breeding bird, though we failed to prove this.

Locustella naevia (BODDAERT, 1783). A few regularly occupied territories were recorded in the Hwoźna (in May 1979) and Narewka valleys (in 1980s). Briefly singing migrants were noted inside the high-stemmed forest of BNP: on 12 May 1975 male singing under a tree canopy in the old lime-oak-hornbeam stand in comp. 343 (W. WALANKIEWICZ) and on 12 May 1985 in a small garden at the forester's house at Dziedzinka. Judging from the situation of the Biebrza Marshes (DYRCZ et al. 1984) the species must have been widespread in the former Dikij Nikor fens before their reclamation, though earlier observers were most probably unable to identify it (compare a fairly strange description of its breeding habitat by DACKEVICH 1971).

Acrocephalus dumetorum BLYTH, 1849. Three records of singing males: at night on 10 June 1984 at Białowieża, on 22 June 1985 at the Pogorzelce village and again on 2 June 1990 in the Palace Park of Białowieża (Komisja Faunistyczna 1988, 1992).

Acrocephalus scirpaceus (HERMANN, 1804) and *A. arundinaceus* (LINNAEUS, 1758). Their breeding along the forest rivulets requires proof, though most earlier authors considered this rather certain. For the first species we have only irregular observations of singing males, e.g. at Narewka near the BNP comp. 340. The singing Great Reed Warblers were more persistent and certainly they bred sporadically the Leśna, Narewka and Hwoźna rivers. The firm breeding of the latter species was known (e.g. in 1993) from the pond in the Palace Park of Białowieża. Both species may be newcomers to the river valleys after the 15th-century clearance of the riverine stands (FALIŃSKI 1968), though some pairs might have bred before this in the Narew valley crossing the BF.

Hippolais polyglotta (VIEILLOT, 1817). On 13 May 1986 a singing male was recorded on the outskirts of the Białowieża village (LONTKOWSKI 1988) while another one on 22 June 1991 at the edge of BNP and the Białowieża Glade (T. STAWARCZYK).

Hippolais icterina (VIEILLOT, 1817). The species is not rare in managed stands, though in BNP breeds only along the forest edge and sporadically was heard in the Hwoźna valley. The interior-most forest singing site was that in the ash-alder stand of comp. 254 (TOMIAŁOJĆ et al. 1984) and in 345, over 1 km from the forest edge.

Sylvia atricapilla (LINNAEUS, 1758). The only *Sylvia* warbler breeding throughout high primaeval stands of the BNP. Its latest broods were regularly recorded in July, including the nest with four eggs found on 13 July 1987 in a lime-oak-hornbeam stand.

Sylvia communis LATHAM, 1787. It breeds in the BNP only exceptionally, e.g. in the transitional forest edge zone of an ash-alder stand in comp. 369 and 398 and in willow-birch dwarf stands in comp. 222. Migrants sometimes sing in the middle of BNP, e.g. in comp. 317 on 16 May 1978.

Sylvia curruca (LINNAEUS, 1758). Breeds mostly in human settlements, rarely in young stands among managed forests, and quite exceptionally along the forest edge zone between BNP and the fields of the Białowieża Glade. Avoids primaeval stands of BNP.

Phylloscopus trochiloides (SUNDEVALL, 1837). In most years only 1 or 2 nonbreeding males sang in the village parks of Białowieża. In 1978 an influx occurred: between 25 May and 26 July about 18 males were registered, some deep in BNP, while in its comp. 398 fledglings fed by the parents were noticed on 26 July 1978 (M. KUPCZYK and T. WESOŁOWSKI). In 1982 a nest with six nestlings c. 2 days old was found in the Palace Park (L.T. and E. PUGACEWICZ). In later years only single nonbreeding males were reported, including a singing male on 28 April 1977 indicative of an exceptionally early arrival. All records verified by the Avifaunistic Commission.

Phylloscopus fuscatus (BLYTH, 1842). On 3 June 1984 a single foraging individual was watched in a coniferous stand with some hornbeam undergrowth in the forest-interior comp. 318 (KĘDZIERSKI et al. 1987). The record accepted by the Avifaunistic Commission.

Regulus ignicapillus (TEMMINCK, 1820). A scarce though regular breeder (perhaps except 1981) in the BNP. Settles mostly in the forest-edge zone (Fig. 4) and shows marked fluctuations in number, e.g. from none to four breeding pairs in a 33 ha plot in the ash-alder stand (with a spruce admixture), comp. 398 (TOMIAŁOJĆ et al. 1984). In the forest interior nonbreeding and non-statio-

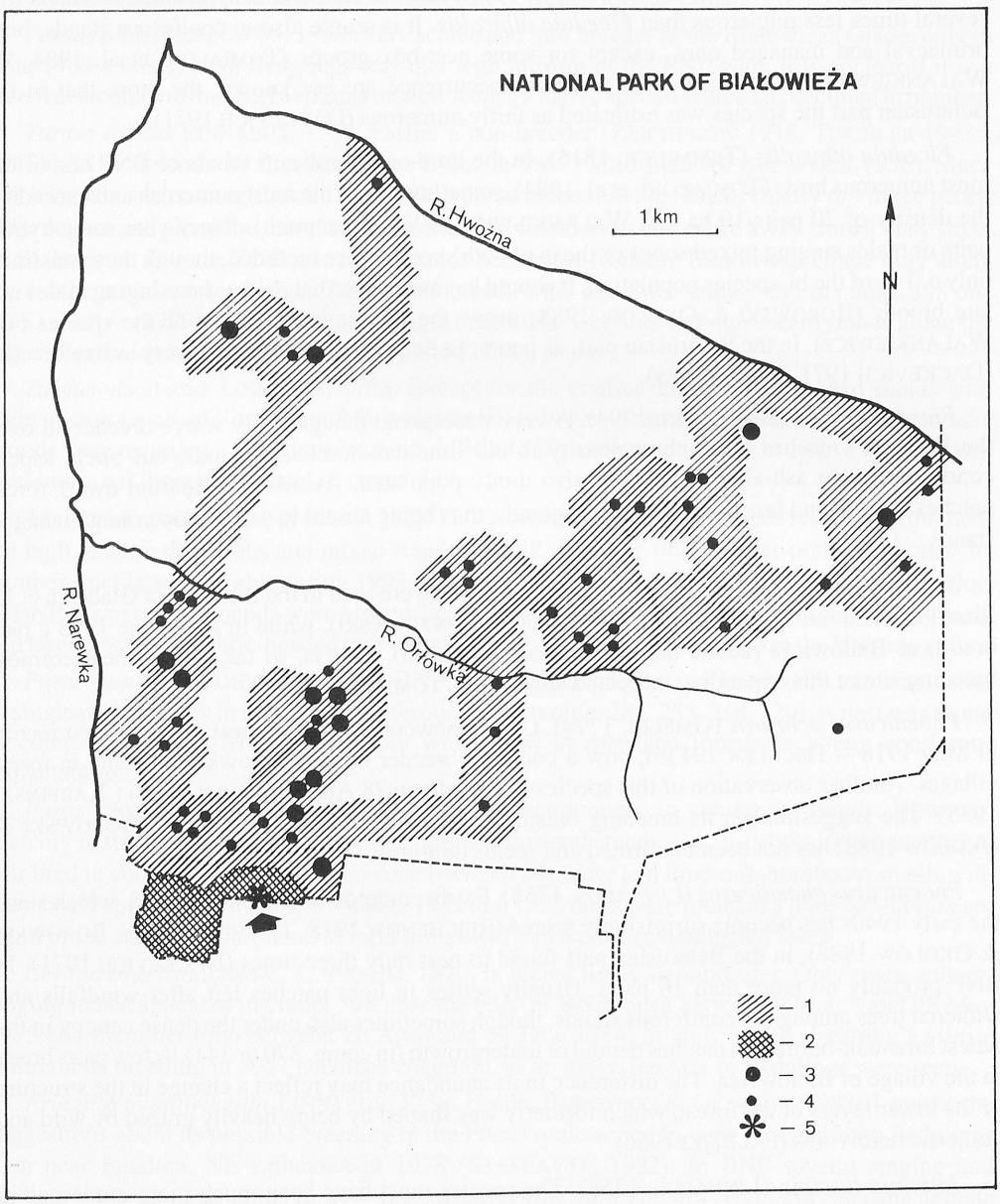

Fig. 4. Sites of observations of the Firecrest *Regulus ignicapillus* in BNP in the years 1975-90. 1 – parts of the forest checked fairly regularly. 2 – area of fairly regular breeding occurrence; 3 – territory held in a single year; 4 – sporadic records of non-stationary males; 5 – nest found.

nary singing males were usually recorded, only sporadically holding permanent territories in comp. 320, 370 or 343. Males singing both-species songs were heard twice though not seen. The first breeding-season record of this species from the Forest was that of a bird collected in June 1922 (not 1928) (KARPIŃSKI 1935) while the first nest was that found in BNP in 1975 (TOMIAŁOJĆ et al. 1984). The identitification of two specimens collected in November (REICHENOW 1918) raises doubts but they were not available for checking as early as to TISCHLER (1943b).

Ficedula hypoleuca (PALLAS, 1764). According to BOROWSKI & OKOŁÓW (1988) a "fairly numerous" species, similarly to the Collared Flycatcher. In fact in mainly deciduous stands it is several times less numerous than *Ficedula albicollis*. It is scarce also in coniferous stands, both primaeval and managed ones, except for some nest-box groups (TOMIAŁOJĆ et al. 1984, W. WALANKIEWICZ). The reasons for so scarce occurrence are not known, the more that in the Belarusian part the species was estimated as fairly numerous (DACKEVICH 1971).

Ficedula albicollis (TEMMINCK, 1815). In the lime-oak-hornbeam stands of BNP one of the most numerous birds (TOMIAŁOJĆ et al. 1984), sometimes even the most numerous and exceeding the density of 20 pairs/10 ha (W. WALANKIEWICZ 1991, and unpubl.). Every year some hybrid pairs or males singing mixed songs or those of both species were recorded, though they constitute only c. 1 % of the bi-species population. It should be made clear that neither late singing males nor late broods (BOROWSKI & OKOŁÓW 1988) prove the double-broodedness of the species (W. WALANKIEWICZ). In the Belarusian part, as poorer in deciduous stands, it is a very scarce breeder (DACKEVICH 1971, N. CHERKAS).

Ficedula parva (BECHSTEIN, 1794). A very widespread though fairly scarce breeder all over the BNP. In reaches the highest density in old lime-oak-hornbeam stands, but birch, aspen, coniferous, even ash-alder stands are also thinly populated. Avoids wet riparian dwarf forest patches in BNP and less than 20-year-old stands, thus being absent in several too young managed stands.

Saxicola torquata (LINNAEUS, 1766). Single males were seen in the Białowieża Glade on c. 12 June 1983 and on 28 May 1988 (M. WANAT, J. LONTKOWSKI), while in May-June 1993 a pair bred near Białowieża (adults delivering food were seen). This is, so far, the northeasternmost breeding site of this expanding in Poland species (cf. TOMIAŁOJĆ 1990).

Phoenicurus ochruros (GMELIN, 1774). Once a newcomer to the Forest area (the first record in May 1918 – TISCHLER 1943b), now a common breeder in the Hajnówka town and in forest villages. Another observation of this species was made on 28 Aug. 1922 (not 1928) (KARPIŃSKI 1935). The suggestion on its breeding outside human settlements in the forest (BOROWSKI & OKOŁÓW 1988) has not been confirmed and seems doubtful.

Phoenicurus phoenicurus (LINNAEUS, 1758). Fairly common breeder in 1917-18, which since the early 1940s has become surprisingly scarce (REICHENOW 1918, TISCHLER 1943b, BOROWSKI & OKOŁÓW 1988), in the Belarusian part found to nest only three times (DACKEVICH 1971). In BNP probably no more than 10 pairs. Usually settles in light patches left after windfalls and withered trees among old coniferous stands, though sometimes also under the dense canopy in the oldest lime-oak-hornbeam patches devoid of undergrowth (in comp. 370 or 344). A few pairs breed in the village of Białowieża. The difference in its abundance may reflect a change in the structure of the lower layers of the forest, which formerly was shaped by being heavily grazed by wild and domestic herbivores (FALIŃSKI 1986).

Luscinia luscinia (LINNAEUS, 1758). The species must have been much more numerous in 1942 than at present. According to TISCHLER (1943b), it settled to breed even amongst high forest of the BNP. During the last twenty years it declined in number in our ash-alder forest-edge census plot (comp. 398, BNP) from 5-12.5 territories in the 1970s (TOMIAŁOJĆ et al. 1984) to scarcely 0-1

territory now. Nowadays in BNP only unmated males can sporadically be heard from larger windbreaks.

Luscinia svecica (LINNAEUS, 1758). Also this species has declined markedly. In the early 1940s it was a widespread breeder in most river valleys of the area (GUNDŁACH after TISCHLER 1943b), while during the last decades we have failed to confirm its breeding at least for the Narewka, Hwoźna and part of Leśna valleys in spite of intense observations. Now even migrants appear extremely rarely – only one own April observation in the Narewka valley. It was known to breed in very small numbers also in the Belarusian part (DACKEVICH 1971, ms).

Turdus pilaris LINNAEUS, 1958. Very scarce and rare breeder in the Białowieża Glade: only in June 1989 a family with fledglings was met with in front of the BNP wall. It is unclear if it is a recent newcomer to the local avifauna or, as it seems, a native species which has declined in number.

Turdus iliacus LINNAEUS, 1758. Earlier a non-breeder (REICHENOW 1918, TISCHLER 1943a, 1943b). In Białowieża its first nests were found in 1957 (MRUGASIEWICZ & WOŁK 1958). Since that time it has been a regular and fairly widespread breeder in the Forest, chiefly in village parks, alder copses and along the forest edges. A nest was found even one metre away from a busy street of Białowieża. Into the BNP primaeval stands penetrates from the Białowieża Glade only along the southern and western edges. Most pairs breed in the ash-alder stands, e.g. in comp. 398 one (1981) to five (1979) pairs, while only single ones in the wet lime-oak-hornbeam stands along the edge. Clearly less numerous in a recent period of dry years.

Turdus viscivorus LINNAEUS, 1758. Except for the conifer-dominated managed stands with their numerous clearfells (where it is widespread) it is very scarce as breeder. In BNP sporadic broods were recorded a few times in comp. 318 and 320, and exceptionally in 1993 a territory was held in the oak-hornbeam stand of comp. 344.

Aegithalos caudatus (LINNAEUS, 1758). This inconspicuous species breeds scarcely throughout the high, mature deciduous and mixed stands of BNP, avoiding only conifer-dominated ones. Its number fluctuates strongly: during 1995 we failed to record a single territory in our census plots in BNP. Its nests (11 found) were always located high in trees (17-30 m). An exceptionally early and large flock of 46 white-headed individuals was met with on 25 June 1985 in the Hwoźna valley.

Parus montanus CONRAD, 1827. In BNP a very scarce breeder; we know only a few nest sites of single pairs, mostly in immature coniferous stands (comp. 284, 255, 318, 320). A nest was found in comp. 318 on 15 May 1983. More widespread in managed forests in young coniferous replantations.

Parus cristatus LINNAEUS, 1758. Breeds fairy commonly in coniferous stands. However, scarcely nests also in predominantly deciduous primaeval stands. E.g. in 1988, 1989 and 1995 a pair bred in comp. 398 in a transition zone between ash-alder and lime-oak-hornbeam stands with only single spruces and no pines, while in 1991 and 1992 nests were found in a lime-oak-hornbeam stand of the same compartment, several km away from a conifer-dominated forest.

Certhia brachydactyla C. L. BREHM, 1820. In recent times a nonbreeder. Only twice solitary singing males appeared in comp. 398 near the edge of BNP: once between 9 March and 28 May 1975 and the other time between 26 April and 24 June 1984. In view of this, FISCHER's (1961) claim on its breeding in 1957 becomes uncertain, as no nests, females or fledglings were seen.

Fringilla montifringilla LINNAEUS, 1758. Unlike BOROWSKI & OKOŁÓW (1988) I regard the suggestions about its possible breeding in the Forest quite sound in view of a pair with fledglings seen near Ignalina, NE Lithuania in 1978 (STASHAYTIS 1982). In BNP several singing and stationary males were noticed: a) – one in the spring of 1977 in comp. 254, chasing female Chaffinches *Fringilla coelebs*; b) – in 1978 and 1979 another in a transition zone between ash-alder and lime-oak-hornbeam stands in comp. 320; c) – one staying at least on 24-25 May 1988 but not later in comp. 271 (R. FULLER, Great Britain); d) – during the whole May of 1992 a male in 398

lime-oak-hornbeam stand was attempting to mate with a female Chaffinch already mated with a conspecific male and having her nest with eggs.

Serinus serinus (LINNAEUS, 1766). Singing and apparently breeding individuals of this newcomer were first reported from Białowieża and Kamieniuki in 1950, their first nesting being observed 1952 (DACKEVICH 1971, BOROWSKI & OKOŁÓW 1988). Till now the species remains restricted to human settlements and their surroundings.

Carduelis chloris (LINNAEUS, 1758) and *C. carduelis* LINNAEUS, 1758. Both species breed mainly in human-made habitats on the Forest outskirts and clearings, though they penetrate deep into the complex following river valleys. Single pairs of the Greenfinch settle to breed in old lime-oak-hornbeam stands of BNP up to a distance of 500 m from the edge, while the Goldfinches stay strictly within a 100-metre-wide zone on the edge. Sporadically both species were seen in the forest interior, e.g. in the high coniferous stand of comp. 318: a Greenfinch singing on 21 May 1993 and a Goldfinch feeding on spruce seeds on 17 April 1993. Although these species are synantrophic to a large extent, yet they probably were able to penetrate into the interior of extensive forest complexes along the larger river valleys also in pristine times.

Carduelis spinus (LINNAEUS, 1758). As a breeder was common in 1977 in the coniferous stands of comp. 318-320, but also occurred scarcely in the lime-oak-hornbeam stands (341, 370, 399) and the ash-alder ones (254, 255, 398) even when with only a small admixture of spruces. Its breeding was proved by a capture of a female with the brood-patch in comp. 341 on 23 April 1977 (T. WESOŁOWSKI), an adult seen while feeding the fledglings in comp. 255 on 15 May 1977 and a nest under construction found there on 1 May 1995. Starting from the late 1980 it was becoming rarer untill 1994-95 when it reappeared in several places of BNP.

Carduelis flammea (LINNAEUS, 1758). Usually only a very scarce migrant. During April 1987, however, huge flocks stayed in the alder and ash-alder stands to feed on alder seeds occurring in masses. E.g. on 6 April 1987 in comp. 398 an aggregation of c.500 individuals together with 150 *C. spinus* foraged on the forest floor. Large numbers remained there till 15 April, whereas the last bird was met with in BF on 5 May.

Loxia curvirostra LINNAEUS, 1758. In most years only nonbreeding flocks roam around. During the last twenty years more common occurrence and breeding was recorded only in April-May 1977, when territorial pairs were present in coniferous and lime-oak-hornbeam stands with an admixture of spruce in comp. 370, 398, 399. On 12 May 1988 about four territorial pairs and a nest-building one (c. 30 m up in the crown of a pine) were recorded in comp. 318. In April-May 1993 a territory was occupied (a female collecting nest material and then an alarmed pair seen) in the ash-alder stand of comp. 398.

– *Loxia pytyopsittacus* BORKHAUSEN, 1793. No firm evidence of its occurrence in the Forest. This species was claimed to have been reported a few times: on 29 Apr. 1917 a fairly large flock seen and one specimen collected by Dr RUBNER (REICHENOW 1918), four birds collected by J. GUNDŁACH & J. TRUSEWICZ on 13 Dec. 1921(two) and 18 Nov.1930 (two) in the Palace Park of Białowieża. The 1921 date of their collecting was later erroneously quoted by KARPIŃSKI (1935) as 1928. Finally, a female was collected on the Belarusian side on 29 Sept. 1950 by GAVRIN in Kamieniuki (DACKEVICH 1971). A problem is, however, presentetd by the fact that all the old identifications of this species may be erroneous. At least two specimens (dated 13 Dec. 1921 and 18 Nov. 1930) exposed in the Białowieża museum under the label of this species till now have appeared to be a male and female of *L. curvirostra* with fairly strong bills (11.5 and 11.8 mm high, acc. to the measurements taken by B. JAROSZEWICZ). In view of this, the only evidence of its occurrence in BF remains an unprovable (non-existing) specimen collected in 1917 and the Belarusian specimen from 29 Sept. 1950 (if correctly identified). So far I doubt the occurrence of this species in BF at all, not only its breeding wrongly suggested by BOROWSKI & OKOŁÓW (1988).

Pyrrhula pyrrhula (LINNAEUS, 1758). A very scarce though widespread breeder in coniferous and mixed stands. Several nests were found. Now it seems less numerous than during the 1970s, when e.g. in 1978, five simultaneously occupied sites were recorded in BNP. They were again more numerous in 1995.

Emberiza hortulana LINNAEUS, 1758. The species once fairly common in the Białowieża Glade (REICHENOW 1918, TISCHLER 1943b, MRUGASIEWICZ & WOŁK 1958, BOROWSKI & OKOŁÓW 1988) but recently declining in number. In part of the Białowieża Glade only 1-2 males were observed in the 1970s, a single male in the 1980s and none at all in the 1990s. The 19 March 1973 record (BOROWSKI & OKOŁÓW 1988) is striking as the species usually comes back in May.

Emberiza citrinella LINNAEUS, 1758. Though this species colonizes clear-felled areas throughout the managed forest, yet the observation on 12 May 1993 of a singing male deep in the National Park (comp. 318) in a natural clearing, only 50 × 50 m in size, shows how deep these birds can penetrate into the high forest in search for early-succession sites suitable for nesting.

Calcarius lapponicus LINNAEUS, 1758. Only one firm record: the observation ot two birds by Z. LEWARTOWSKI and others in the Białowieża Glade on 10 Oct. 1990 (Komisja Faunistyczna 1992).

Passerina cyanea (LINNAEUS, 1766). During a few days, among them on 26 April 1982, an adult male stayed and sang in the Białowieża Palace Park. It is of interest that another adult male was caught in the same spring on the Courland/Couron spit on the Baltic coast (V.A. PAYEVSKI, pers. comm.). The British Rarity Committee suggests that these birds may have escaped from captivity, though their arrival in Europe from North America on ships cannot be excluded, either.

IV. SPRING ARRIVAL DATA

Day after day intensive field work carried out in spring for a twenty-year period (1975-94) allowed us to collect numerous data on the spring arrival of first individuals of some migrant species. Because our observations were not started till early April, the data for the species arriving in March or early April have been omitted here as being too scarce.

Ciconia nigra n = 9 years, average date: 2 April, span: earliest record 19 March 1991, latest first observation 16 April 1978.

Pernis apivorus 9, aver. from 8 records 14/15 May, span: 6 May1984 – 20 May 1977, plus exceptionally early observation on 13 April 1989.

Aquila pomarina n = 10 years, average date: 8 April, span: 3 April 1990 – latest first observation on 12 April 1979 and 1982.

Crex crex 12, aver. 5 May, span: 28 April 1983 and 1989 – 12 May 1986.

Streptopelia turtur 13, aver. 2 May, span: 27 April 1989 and 1993 – 6 May 1983 and 1984.

Cuculus canorus 15, aver. 20 April, span: well seen a silent bird on 3 April 1990 – 30 April 1981.

Apus apus 12, aver. 13 May, span: 7 May 1990 – 18 May 1978.

Upupa epops 9, aver. 17 April, span: 9 April 1988 – 25 April 1993.

Jynx torquilla 17, aver. 21 April, span: 10 April 1975 – 2 May 1982.

Anthus trivialis 18, aver. 14 April, span: 7 April 1975 – 24 April 1991.

Lanius collurio 11, aver. 9 May, span: 28 April 1989 – 18 May 1984.

Oriolus oriolus 17, aver. 4 May, span: 28 April 1989 – 10 May 1981 and 1982. REICHENOW (1918) reported arrival on 21 April 1917, which would be the earliest if the record was not based on a call alone (which can be imitated by other species).

Locustella fluviatilis 11, aver. 11 May, span: 26 April 1979 – 22 May 1984.

L. naevia 9, aver. 7 May, span: 3 May 1983 – 12 May 1979

Acrocephalus palustris 10, aver. 14 May, span: 10 May 1977 – 22 May 1984.

Hippolais icterina 14, aver. 10 May, span: 4 May 1983 – 15 May 1984.

Sylvia atricapilla 14, aver. 26 April, span: 14 April 1989 – 4 May 1978.

S. curruca 16, aver. 28 April, span: 19 April 1990 – 9 May 1982.

S. communis 13, aver. 5 May, span: 26 April 1993 – 15 May 1975.

S. borin 16, aver. 7 May, span: 1 May 1989 – 12 May 1979.

S. nisoria 7, aver. 11 May, span: 3 May 1977 – 16 May 1979.

Phylloscopus collybita first individuals usually arrive late in March, hence the observation of two silent individuals probably of this species on 16 March 1975 deserves attention.

Ph. sibilatrix 18, aver. 18 April, span: 5 April 1992 – 25 April 1981.

Ph. trochilus 14, aver. 19 April, span: 11 April 1989 – 29 April 1982.

Ph. trochiloides 13, aver. from 12 records 23 May, span: 9 May 1993 – 31 May 1990, plus an exceptionally early record of a singing male on 28 April 1977.

Regulus ignicapillus 17 years, aver. 13 April, span: 3 April 1989 – 24 April 1984.

Ficedula albicollis 16, aver. 16 April, span: 8 April 1975 – 24 April 1979.

F. hypoleuca 14, aver. 19 April, span: 12 April 1991 – 26 April 1984,

F. parva 17, aver. 7 May, span: 2 May 1989 – 11 May 1987. Exceptionally early arrival published by REICHENOW (1918): between 20 and 24 April 1917.

Muscicapa striata 16, aver. 5 May, span: 28 April 1983 – 11 May 1979. Unusually early date was given by REICHENOW (1918): 17 April 1917.

Luscinia luscinia 16, aver. 1 May, span: 22 April 1989 – 6 May 1982.

Carpodacus erythrinus 14, aver. 13/14 May, span: 9 May 1985 and 1993 – 19 May 1978.

During this study a clear tendency to delayed spring arrivals in the 1970s and early 1980s, and much earlier arrivals in the period of 1989-93 became very conspicuous. E.g. out of the 31 species listed above twenty (62 %) had the earliest arrival dates recorded during the last five-year period, chiefly in the unusually early spring of 1989. And vice versa, 12 species (39 %) arrived latest in 1975-79, whereas in 1975-84 no less than 26 species (84 %) showed the latest dates of arrival. A continuation of this work might help to decide whether we observe temporary fluctuations or a consequence of the climate amelioration.

V. DISCUSSION

1. Weaknesses in the knowledge.

The unique character of the Białowieża Forest triggered easy acceptance of unproven guesses concerning the possible occurrence of unusual species of birds and mammals. This atmosphere of mystery made also the uncritical repetition of even imprecise or unchecked reports possible, in spite of the fact that they had been collected by untrained administrative staff of the forest and national park guard. Now, after a quarter of a century of intensive field studies by a few groups of ornithologists, our knowledge is much more precise.

Most controversial is the value of the past ornithological information given in papers by J.J. KARPIŃSKI (1935, 1949, 1954). BOROWSKI & OKOŁÓW (1988) quoted these papers selectively,

though still not always critically enough, by extracting some data and ignoring the other ones. It is necessary, however, to explain the reasons for such a treatment. Chiefly the last two of KARPIŃSKI's papers, after a careful analysis and confrontation with the results of recent intensive studies (PIOTROWSKA & WOŁK 1983, TOMIAŁOJĆ et al. 1984, TOMIAŁOJĆ & WESOŁOWSKI 1990, etc.), appear to be rather a presentation of theoretical views on ecological relationships than a reliable source of empirical data collected by trained observers. In those papers the data on bird occurrence usually contain no hints about the author, time, place, method or character of observation. There are also some serious contradictions between particular fragments of the text in the 1954-year paper: on page 6 it is said that own observations were carried out exclusively in the BNP, while the table in the Results section (page 81 and the following) uncritically lists all the species ever mentioned in literature for the whole Forest and its wide surroundings. The table presents second-hand reports extracted, with horrible errors, from the literature. This can be exemplified by pointing to the statements of breeding of *Eremophila alpestris*, *Mergus albellus*, *Aythya marila*, *Anas penelope*, *Circus macrourus*, *Falco vespertinus*, *Carduelis flammea* etc. in the Białowieża Forest.

Precise data can actually be found in the earlier of KARPIŃSKI's papers (1935), though even this publication should be used highly selectively. Alongside the doubtless data (confirmed by specimens in the museum collections) it contains also some uncritical hints (e.g. own deceptive observations of an alleged *Pyrrhocorax pyrrhocorax* in the Forest, later reported also by TISCHLER 1943b, which should rather have been referred to as concerning a displaying *Dryocopus martius*) or clearly erroneous information. Some errors may have resulted from careless proof-reading of the text unless they were repeated uncorrected in later papers! In the 1935-year paper the following species names were mentioned in the table without asterisks (which according to the explanation provided mean they certainly bred in the Forest): *Buteo lagopus*, *Circus macrourus*, *Calidris temminckii*, *Larus canus*, *Nyctea scandiaca*, *Surnia ulula*! Unconvincing also remains a hint on the supposed winter records of the Yellow Wagtail *Motacilla flava*.

Some quotations of earlier authors given by BOROWSKI & OKOŁÓW (1988) also contain errors. E.g. MATTHES & NEUBAUR (1976) never claimed they had found *Aquila clanga*, nor REICHENOW (1918) reported on the presence of *Porzana parva* and *Gallinago media*, nor on "many observations" of *Anas querquedula*. Other cases have been cleared up above.

The imprecision of older data is most conspicuously revealed in the uncertain determinations of the breeding or non-breeding status of several species. The characteristics once offered usually lacked precise indications of the localities of rare bird observations. For the purpose of future investigations in BF it is necessary to stress the still uncertain breeding status of some species, chiefly their status in the Polish or Belarusian part of the Forest when treated separately. Thus, we do not know if such species as: *Botaurus stellaris*, *Podiceps cristatus*, *Strix nebulosa*, *Coracias garrulus*, even *Acrocephalus scirpaceus*, *Falco tinnunculus* and *Tringa hypoleucos* breed in the Polish part.

Finally, also the suggestions concerning the double-brooding of some species (thrushes, Chaffinch, flycatchers) offered by BOROWSKI & OKOŁÓW (1988) appear erroneous. According to our detailed studies, the thrushes and the Chaffinches attempt to breed two ot three times in the Białowieża Forest; hence their breeding in July, though infrequent, should by no means be regarded as unusual. *Ficedula* flycatchers, contrarily, rear only one brood and their sporadic late breeding attempts are in fact re-nestings after failure; so far no firm cases of double-broodedness have been found during studies of their breeding ecology (W. WALANKIEWICZ, unpubl.).

Another and quite recent problem emerges in connection with some quantitative estimates of the total population size offered for the whole Polish part of the Forest. In this paper several estimates of population sizes shown on a map published by The North Podlassian Society for Bird Protection (PTOP 1993) and repeated by GROMADZKI et al. (1994) have largely been omitted. The

reason for such a reservation is that, so far, there has nothing been published on the methodology of those estimates. Some of these figures seem either to be overestimates (in the case of the species better known to our group, like *Dendrocopos leucotos*, *Pernis apivorus*, *Tringa ochropus*), or raise doubt when given for very difficult species such as *Scolopax rusticola*, *Apus apus*, *Nucifraga caryocatactes*. E.g. a recent study by BIJLSMA (1993) shows how complicated a proper estimate of the Honey Buzzard numbers may be. Here I should like to suggest that " scientifically" accurate data (obtained with the help of precisely defined and empirically checked methods of bird censuses) should be distinctly separated from ad hoc produced rough estimates of the population sizes necessary for current nature conservation activities.

2. Avifauna composition of the Białowieża Forest

At least 250 bird species have been recorded in the area of BF (including Belarusian part and its former fens Dikij Nikor), i.e. 1250 km^2 of mostly forested lowland tract (TISCHLER 1943a, 1943b; DACKEVICH 1971; BOROWSKI & OKOŁÓW 1988; new data). Ignoring the above indicated cases of inaccuracy in some past data we can show how our knowledge accumulated with time: only c. 130 breeding species were known to TISCHLER (1943a, 1943b), already 166 to BOROWSKI & OKOŁÓW (1988), whereas at least 177 (perhaps 180) species which have ever bred in the area are known now (see Appendix, p. 391-397). In spite of scarce and vague information about the past avifauna, some comparisons can be made with the estimates of old authors.

To the list of 226 bird species once firmly recorded in the whole Białowieża Forest and its edges (BOROWSKI & OKOŁÓW 1988) the present paper adds or quotes the reports on 12 new ones. These are: *Egretta alba*, *Cygnus columbianus bewickii*, *Gyps fulvus*, *Sterna albifrons*, *Dendrocopos syriacus*, *Merops apiaster*, *Motacilla cinerea*, *Acrocephalus dumetorum*, *Hippolais polyglotta*, *Phylloscopus fuscatus*, *Saxicola torquata*, *Sturnus roseus*, even if one ignores *Passerina cyanea* as a possible escapee from captivity. On the other hand, some species (*Gavia immer*, *Pyrrhocorax pyrrhocorax*, *Loxia pytyopsittacus*) have been deleted from the list as most probably misidentified.

Among 177 breeding species which bred in the area at least once (DACKEVICH 1971; BOROWSKI & OKOŁOW 1988; new data), evidence for the breeding of the following species: *Accipiter nisus*, *Glaucidium passerinum*, *Chlidonias leucopterus*, *Saxicola torquata*, *Regulus ignicapillus*, *Phylloscopus trochiloides*, *Loxia curvirostra*, *Carduelis spinus*, and suggestions of possible breeding of *Fringilla montifringilla* have been presented in this paper. There exist also unpublished data indicating the recent breeding of *Haliaeetus albicilla*, *Porzana parva*, *Bucephala clangula* and *Emberiza calandra* in the Belarusian or Polish parts (N. CHERKAS & E. PUGACEWICZ). Moreover, another four species may sooner or later start breeding, so far being rare visitors: *Podiceps grisegena*, *Dendrocopos syriacus*, *Acrocephalus dumetorum*, *Certhia brachydactyla*. This would increase the total to some 180 breeding species. Contrarily, some species earlier included in the list have appeared to be extraterritorial as they bred only outside the Forest boundaries (*Circus cyaneus*, *Burhinus oedicnemus*, *Corvus frugilegus*, *Lanius senator*, *Lanius minor*).

Both figures, the number of species recorded (over 250) and chiefly the number of breeding species (177, maybe 180), appear to be among the highest values of the local species richness in Europe, notably when confronted with the equivalent west-European forest data (TOMIAŁOJĆ & WESOŁOWSKI 1990). Even more important is that a majority of the BF breeders consists of species native to the Forest and to the Forest-intruding fens, which means those (c.133-134 species) believed to have occured here also in the distant past. These are remarkable figures which reflect among others a well-preserved state of the avifauna of the local forest and wetland, which has been additionally enriched by the arrival of some newcomers.

The BF avifauna shows a great similarity to that in the Berezinskiy Biosfernyi Zapovednik, NE Belarus. Also in that forest complex among the 217 bird species recorded 171 were found to breed, and as in the BF, most of the breeders are species native to the forest or the forest edges (BYSHNEV 1991).

Some groups of birds are particularly rich in breeding species in BF, chiefly those native to the Forest. No less than 17 species of raptors have ever bred in the area (one is a recent colonizer). Of the nine species of owls known to breed in the area only two are man-followers. All the nine European species of woodpeckers have been recorded here and 8 being native, breed. Impressive is the list of 18 breeding *Sylvinae* warblers, which constitute almost exclusively a native faunistic element, and finally four of five European flycatchers breed here commonly.

The overview presented above rests on the distinction of two groups of birds: the group of native birds (or "the truly forest ones") and that of introduced (or "anthropogenic") ones. The high species richness and diversity of the BF avifauna is still largely due to the great richness/diversity of natives and not to the large proportion of secondarily distributed human-followers, as it is usual in most regions of western and central Europe.

3. Native species extirpated or declining in number.

Of the 177 species which have ever bred in the area some are considered to have recently (during the last 40 years) been lost from the region. These are: *Aquila clanga*, *Falco peregrinus*, *Asio flammeus*, *Philomachus pugnax*, *Galerida cristata*, probably *Numenius arquata*, *Acrocephalus paludicola*, *Coracias garrulus*. They constitute c. 3-5 % of all the breeding species. Only one of lost species, *Galerida cristata*, belongs to the 17th-19th century colonizers, the remaining ones being a native element. Such a low number of species extirpated or endangered by local extinction reflects a relatively good state of the BF area, in spite of several instances of human interference. Among them the loss or transformation of local habitats probably contributed most to the bird losses. For example, there appears to be a clear coincidence between the disappearance of some bird species and the total reclamation during the 1950s of the Dikij Nikor fens, once wedging into the eastern part of the Forest. The following birds ceased to breed or declined dramatically in the region exactly at that time: *Aquila clanga*, *Asio flammeus*, *Numenius arquata*, *Philomachus pugnax*, *Acrocephalus paludicola*, *Luscinia svecica*. The presence of stuffed specimens or eggs in the local museum collections proves that once they certainly bred in the area. The causal relation between wetland reclamation and species disappearance, however, can hardly be anything but a supposition.

A new factor, the high intensity of timber exploitation, chiefly in the Polish part of the complex, however, brings about an increasing threat also to several other species, mainly such as two rare gallinaceous birds, two woodpeckers dependent on dead timber, as well as to the Collared Flycatcher *Ficedula albicollis*, which becomes rare outside the National Park area.

Also the birds relying on big insects as their main food show a continuous decline, chiefly the Roller *Coracias garrulus* and the Hoopoe *Upupa epops*. To this category probably belongs also the Kestrel *Falco tinnunculus*, which has almost completely vanished locally.

Considering the whole forest complex, about 21 bird species are represented by less than 20 breeding pairs, thus being highly vulnerable to further disturbances. Suitable countermeasures to the above mentioned negative processes should be undertaken as soon as possible at the same time in both parts of the Forest to preserve that extraordinarily high diversity of native species in this unique forest avifauna for the future human generations.

4. Additions to the avifauna.

The species added to the native avifauna of the Forest fall mostly under two categories:

a) o l d c o l o n i z e r s, which most arrived probably several centuries ago and inhabited the then created meadows, fields and human settlements, and

b) r e c e n t c o l o n i z e r s, which have settled here in recent times, chiefly during the last century, and for which there is firm documentation.

Totally, about 38-43 species have joined the pristine local avifauna, mostly during the last century. Among obvious colonizers of older times there were mostly the birds of the forest meadows (existing since the 15th century – FALIŃSKI 1968), of fields and human settlements (appeared in the 17th century), such as: *Perdix perdix*, *Athene noctua*, *Tyto alba*, *Picus viridis*, *Hirundo rustica*, *Delichon urbica*, *Galerida cristata*, *Passer domesticus*, *Passer montanus*, *Emberiza hortulana*. However, some species today considered to be typical of fields and meadows (*Ciconia ciconia*, *Coturnix coturnix*, *Crex crex*, *Alauda arvensis*) originally used to occur also in fens and marshes of the Forest area (TISCHLER 1943b) and so they are rather a native element, which has later strongly expanded under human impact. Similarly, we include such birds as some finches (*Carduelis chloris*, *C. carduelis*) and *Motacilla alba*, *Sturnus vulgaris*, *Emberiza citrinella*, *Anas querquedula* in the native species, though they expanded locally and increased in number owing to their penetration of the mid-forest meadows and fields. During the last century the newcomers have been recruited from the species spontaneously expanding in Europe, such as (in chronological order): *Phoenicurus ochruros*, *Serinus serinus*, *Carpodacus erythrinus*, *Turdus iliacus*, *Streptopelia decaocto*, *Chlidonias leucopterus*, *Saxicola torquata*. During the last fifty years among the newcomers to BF the water birds have started to prevail (c. 12-13 species: two grebes, *Haliaeetus albicilla*, *Cygnus olor*, additional five ducks, *Fulica atra*, *Larus ridibundus* and three tern species). They have been attracted to the area by man-made water bodies, chiefly by the largest (350 ha) Lyatskiye complex established in the 1950s in the forest interior.

Some allocations to one of the above mentioned categories are highly tentative. E.g. earlier breeding of a few rare and inconspicuous species (*Hieraaetus pennatus*, *Riparia riparia*, *Remiz pendulinus*), though not reported in older literature, cannot be excluded.

In the past two species, *Phasianus colchicus* and *Cygnus olor*, were repeatedly introduced to the area, chiefly on the Belarusian side (REICHENOW 1918, KURSKOVA 1960, DACKEVICH 1971). In the case of former species the attempts, fortunately, were unsuccessful, while the feral swans have later been replaced by a naturally re-expanding wild population (TOMIAŁOJĆ 1990).

To sum up, in view of the local extinction of only a few species the gains to the BF breeding avifauna have clearly prevailed so far. The number of man-followers introduced indirectly or spontaneously colonizing the Forest complex approaches 21-24 % of all breeders; the number of lost species among pristine breeders is still only 6-9, though some other 21 species are already seriously endangered. The future of this unique pristine avifauna depends entirely on the type and scale of the conservation measures undertaken by the Belarusian/Polish governments, and necessarily supported by the other European countries. One of the urgent tasks is also the intensification of field observations focussed on the accurate estimating of the current population sizes of several rare and endangered species.

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APPENDIX

The list of birds of the Białowieża Forest summarizing all the published information (see references) together with some unpublished records made by N. CHERKAS, Z. LEWARTOWSKI and E. PUGACEWICZ. Explanations: B – present breeding species (after 1970), FB – formerly breeding species (before 1970), P – passage migrant, A – accidental visitor, N – breeding species native to the area, I – species once invading/introduced to total breeding fauna

	Species	Character of the occurrence		Breeding character (origin, N or I) or/and comments
		the whole BF	the Polish (W) part	
1	2	3	4	5
	Gavia immer	A?	–	(One specimen, 8 Oct. 1972 in part E, identification to be verified)
1	*Gavia stellata*	A	A	
2	*Gavia arctica*	P	P	
3	*Tachybaptus ruficollis*	B	B?	N
4	*Podiceps cristatus*	B	P	I
5	*Podiceps grisegena*	P/B?	P	I
6	*Podiceps auritus*	A	A	
7	*Podiceps nigricollis*	P	P	
8	*Phalacrocorax carbo*	P	P	
9	*Botaurus stellaris*	B	P	I
10	*Ixobrychus minutus*	FB	FB	I
11	*Nycticorax nycticorax*	A	–	(9 June 1983 specimen, precisely from where)
12	*Egretta alba*	A	–	
13	*Ardea cinerea*	B	FB	I(?)
14	*Ardea purpurea*	A	A	
15	*Ciconia nigra*	B	B	N
16	*Ciconia ciconia*	B	B	N
17	*Plegadis falcinellus*	A	–	(One specimen, 5 June 1983)
18	*Cygnus olor*	B	B	I
19	*Cygnus columbianus*	A	A	
20	*Cygnus cygnus*	A	A	
21	*Anser fabalis*	P	P	
22	*Anser albifrons*	P	P	
23	*Anser erythropus*	A?	–	(One specimen, 11 Oct.. 1984 identification ?)
24	*Anser anser*	B	A	I
25	*Branta bernicla*	A	A	
26	*Anas penelope*	P	P	
27	*Anas strepera*	B	A	I
28	*Anas crecca*	B	B	N

1	2	3	4	5
29	*Anas platyrhynchos*	B	B	N
30	*Anas acuta*	P	P	
31	*Anas querquedula*	B	B	N
32	*Anas clypeata*	B	P	N
33	*Netta rufina*	A	–	(Obs. 12 May 1983)
34	*Aythya ferina*	B	B	I
35	*Aythya nyroca*	B	A	I
36	*Aythya fuligula*	B	P	I
37	*Aythya marila*	A	A	
38	*Melanitta fusca*	A	–	
39	*Bucephala clangula*	B	B	I
40	*Mergus albellus*	A	A	
	Mergus serrator	A?	–	(Two records, from where?)
41	*Mergus merganser*	P	A	
42	*Pernis apivorus*	B	B	N
43	*Milvus migrans*	B	B	N
44	*Milvus milvus*	B	B	I(?)
45	*Haliaeetus albicilla*	B	P	I
46	*Gyps fulvus*	A	A	
47	*Circaetus gallicus*	B	B	N
48	*Circus aeruginosus*	B	B	N
49	*Circus cyaneus*	P/FB?	P	N
50	*Circus macrourus*	A	A	
51	*Circus pygargus*	B	B	N
52	*Accipiter gentilis*	B	B	N
53	*Accipiter nisus*	B	B	N
54	*Buteo buteo*	B	B	N
55	*Buteo lagopus*	P	P	
56	*Aquila pomarina*	B	B	N
57	*Aquila clanga*	FB	A	N
58	*Aquila chrysaetos*	B	P	N
59	*Hieraaetus pennatus*	B	B	N
60	*Pandion haliaetus*	P	P	
61	*Falco tinnunculus*	B	FB	N
62	*Falco vespertinus*	A	A	
63	*Falco columbarius*	P	P	
64	*Falco subbuteo*	B	B	N
65	*Falco peregrinus*	FB	FB	(Breeding till 1952)
66	*Bonasa bonasia*	B	B	N
67	*Tetrao tetrix*	B	B	N
68	*Tetrao urogallus*	B	B	N
69	*Perdix perdix*	B	B	I

1	2	3	4	5
70	*Coturnix coturnix*	B	B	N(?)
71	*Rallus aquaticus*	B	B	N
72	*Porzana porzana*	B	B	N
73	*Porzana parva*	B	B	N
74	*Crex crex*	B	B	N
75	*Gallinula chloropus*	B	B	N
76	*Fulica atra*	B	B	I
77	*Grus grus*	B	B	N
78	*Otis tarda*	A	–	
79	*Burhinus oedicnemus*	A	–	(Obs. 4 May 1950, where?)
80	*Glareola pratincola*	A	A	
81	*Charadrius dubius*	B	B	I
82	*Charadrius morinellus*	A	A	(Once obs. near Białowieża)
83	*Pluvialis apricaria*	P	P	
84	*Pluvialis squatarola*	A	A	
85	*Vanellus vanellus*	B	B	N
86	*Calidris temminckii*	A	A	
87	*Calidris alpina*	A	A	
88	*Philomachus pugnax*	B	P	N
89	*Lymnocryptes minimus*	A	A	
90	*Gallinago gallinago*	B	B	N
91	*Gallinago media*	B	B	N
92	*Scolopax rusticola*	B	B	N
93	*Limosa limosa*	B	P	N
94	*Numenius phaeopus*	P	P	
95	*Numenius arquata*	B	P	N
96	*Tringa erythropus*	A	A	
97	*Tringa totanus*	B	B	N
98	*Tringa nebularia*	P	P	
99	*Tringa ochropus*	B	B	N
100	*Tringa glareola*	P	P	
101	*Actitis hypoleucos*	B	P	N
102	*Stercor. parasiticus*	A	A	
103	*Larus minutus*	A	–	(Several obs. May-July 1981-83, Lyatskiye)
104	*Larus ridibundus*	B	P	I (Broods 1977-79, Lyatskiye)
105	*Larus canus*	P	P	
106	*Larus fuscus*	P	P	
107	*Larus argentatus*	A	A	(At least 3 records)
108	*Sterna caspia*	A	A	
109	*Sterna hirundo*	B	P/B?	I
110	*Sterna albifrons*	A	A	
111	*Chlidonias niger*	B	P	I

1	2	3	4	5
112	*Chlidonias leucopterus*	B	A	I (Broods 1979, 1982, Lyatskiye)
113	*Columba livia* f. *domestica*	B	B	I
114	*Columba oenas*	B	B	N
115	*Columba palumbus*	B	B	N
116	*Streptopelia decaocto*	B	B	I
117	*Streptopelia turtur*	B	B	N
118	*Cuculus canorus*	B	B	N
119	*Tyto alba*	B	B	I
120	*Bubo bubo*	B	B	N
121	*Nyctea scandiaca*	A	A	
122	*Surnia ulula*	A	A	(Only past records in part W)
123	*Glaucidium passerinum*	B	B	N
124	*Athene noctua*	B	B	I
125	*Strix aluco*	B	B	N
126	*Strix nebulosa*	B/FB	A	N
127	*Asio otus*	B	B	N
128	*Asio flammeus*	FB	A	N
129	*Aegolius funereus*	B	B	N
130	*Caprimulgus europaeus*	B	B	N
131	*Apus apus*	B	B	N
132	*Alcedo atthis*	B	B	N
133	*Merops apiaster*	A	A	(Two sight records in part W)
134	*Coracias garrulus*	B	B	N (Last brood in part W in 1977)
135	*Upupa epops*	B	B	N
136	*Jynx torquilla*	B	B	N
137	*Picus canus*	B	B	N
138	*Picus viridis*	B	B	N
139	*Dryocopus martius*	B	B	N
140	*Dendrocopos major*	B	B	N
141	*Dendrocopos syriacus*	A	A	(Two sight records in part W)
142	*Dendrocopos medius*	B	B	N
143	*Dendrocopos leucotos*	B	B	N
144	*Dendrocopos minor*	B	B	N
145	*Picoides tridactylus*	B	B	N
146	*Galerida cristata*	FB	FB	I
147	*Lullula arborea*	B	B	N
148	*Alauda arvensis*	B	B	N
149	*Eremophila alpestris*	P	P	
150	*Riparia riparia*	B	B	I(?)
151	*Hirundo rustica*	B	B	I
152	*Delichon urbica*	B	B	I
153	*Anthus campestris*	B	B	I

1	2	3	4	5
154	*Anthus trivialis*	B	B	N
155	*Anthus pratensis*	B	B	N
156	*Anthus petrosus*	A	A	(Obs. 27 Apr. 1984 at Białowieża)
157	*Motacilla flava*	B	B	I
158	*Motacilla cinerea*	A	A	
159	*Motacilla alba*	B	B	N
160	*Bombycilla garrulus*	P	P	
161	*Cinclus cinclus*	A	A	
162	*Troglodytes troglodytes*	B	B	N
163	*Prunella modularis*	B	B	N
164	*Erithacus rubecula*	B	B	N
165	*Luscinia luscinia*	B	B	N
166	*Luscinia svecica*	B	B	N
167	*Phoenicurus ochruros*	B	B	I (Since c.1918)
168	*Phoenicurus phoenicurus*	B	B	N
169	*Saxicola rubetra*	B	B	N
170	*Saxicola torquata*	B	B	(Brood in 1993 near Białowieża)
171	*Oenanthe oenanthe*	B	B	N
172	*Turdus merula*	B	B	N
173	*Turdus pilaris*	B	B	N
174	*Turdus philomelos*	B	B	N
175	*Turdus iliacus*	B	B	I
176	*Turdus viscivorus*	B	B	N
177	*Locustella naevia*	B	B	N
178	*Locustella fluviatilis*	B	B	N
179	*Locustella luscinioides*	B	B	N
180	*Acrocephalus paludicola*	B/FB	P	N (Still breeding in part E?)
181	*Acrocephalus schoenobaenus*	B	B	N
182	*Acrocephalus dumetorum*	A	A	
183	*Acrocephalus scirpaceus*	B	B	N
184	*Acrocephalus palustris*	B	B	N
185	*Acrocephalus arundinaceus*	B	B	N
186	*Hippolais icterina*	B	B	N
187	*Hippolais polyglotta*	A	A	(Two sight records in part W)
188	*Sylvia nisoria*	B	B	N
189	*Sylvia curruca*	B	B	N
190	*Sylvia communis*	B	B	N
191	*Sylvia borin*	B	B	N
192	*Sylvia atricapilla*	B	B	N
193	*Phylloscopus trochiloides*	B	B	I (Broods 1978, 1982 in part W)
194	*Phylloscopus fuscatus*	A	A	(One obs. in part W)
195	*Phylloscopus sibilatrix*	B	B	N

1	2	3	4	5
196	*Phylloscopus collybita*	B	B	N
197	*Phylloscopus trochilus*	B	B	N
198	*Regulus regulus*	B	B	N
199	*Regulus ignicapillus*	B	B	N
200	*Muscicapa striata*	B	B	N
201	*Ficedula parva*	B	B	N
202	*Ficedula hypoleuca*	B	B	N
203	*Ficedula albicollis*	B	B	N
204	*Aegithalos caudatus*	B	B	N
205	*Parus palustris*	B	B	N
206	*Parus montanus*	B	B	N
207	*Parus cristatus*	B	B	N
208	*Parus ater*	B	B	N
209	*Parus caeruleus*	B	B	N
210	*Parus major*	B	B	N
211	*Sitta europaea*	B	B	N
212	*Certhia familiaris*	B	B	N
213	*Certhia brachydactyla*	A/FB?	A/FB?	I (Past breeding uncertain)
214	*Remiz pendulinus*	B	B	I(?)
215	*Oriolus oriolus*	B	B	N
216	*Lanius collurio*	B	B	N
217	*Lanius minor*	A	A	(Only obs. 31 May 1977 near Białowieża)
218	*Lanius excubitor*	B	B	N
219	*Garrulus glandarius*	B	B	N
220	*Pica pica*	B	B	N
221	*Nucifraga caryocatactes*	B	B	N
222	*Corvus monedula*	B	B	I
223	*Corvus frugilegus*	P	P	
224	*Corvus corone*	B	B	N
225	*Corvus corax*	B	B	N
226	*Sturnus vulgaris*	B	B	N
227	*Sturnus roseus*	A	A	(A few obs. in May-June 1995 in part W)
228	*Passer domesticus*	B	B	I
229	*Passer montanus*	B	B	I(?)
230	*Fringilla coelebs*	B	B	N
231	*Fringilla montifringilla*	P	P	(A possibility of sporadic broods)
232	*Serinus serinus*	B	B	I (Breeding sine c. 1952)
233	*Carduelis chloris*	B	B	N
234	*Carduelis carduelis*	B	B	N
235	*Carduelis spinus*	B	B	N
236	*Carduelis cannabina*	B	B	N
237	*Carduelis flavirostris*	A	A	

1	2	3	4	5
238	*Carduelis flammea*	P	P	
239	*Loxia curvirostra*	B	B	N
	Loxia pytyopsittacus	A	A	(29 IX 50 Female at Kamieniuki, identification?)
240	*Carpodacus erythrinus*	B	B	I (Breeding since 1950s)
241	*Pinicola enucleator*	A	A	
242	*Pyrrhula pyrrhula*	B	B	N
243	*Coc. coccothraustes*	B	B	N
244	*Calcarius lapponicus*	A	A	(Obs. 4.X.90 near Białowieża)
245	*Plectrophenax nivalis*	P	P	
246	*Emberiza citrinella*	B	B	N
247	*Emberiza hortulana*	B	B	I
248	*Emberiza schoeniclus*	B	B	N
249	*Miliaria calandra*	B	B?	I
250	*Passerina cyanea*	A	A	(Obs. June 1982, Białowieża).
	Phasianus colchicus	–	–	(Unsuccessful past introductions)

Totals:

Species firmly recorded – 250 + 3 possibly recorded in the area (*Gavia immer*, *Mergus serrator*, *Loxia pytyopsittacus*)

Species breeding (ever) in the area – 177 + 4 possibly (*Podiceps grisegena*, *Acroc. dumetorum*, *Certhia brachydactyla*, *Fringilla montifringilla*)

Species native to the area – 133 + *Coturnix coturnix* (?)

Species arrived later – 38 + 5 possible (*Ardea cinerea*, *Milvus milvus*, *Riparia riparia*, *Remiz pendulinus*, *Passer montanus*).