Екологія	Беркут	20	Вип. 1-2	2011	81 - 89

ECOLOGY OF SHORT-TOED EAGLE IN BELARUSIAN POOZERIE

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Abstract. We studied the Short-toed Eagle in the territory of northern Belarus in 1981–2010. About 50-70 pairs of this raptor breed on the territory of about 40 thds. km^2 with average density of 1.2–1.7 pairs/1000 km^2. Most of nest sites (n = 24) were found in pine bogs and transitional mires (87.5%). The rest (12.5%) were situated in dry pine forests interspersed with clearings and small sphagnum bogs. The distance between different nests of the same pair varied from 30 m to 1.5 km. Reproduction success was 66.7% (0.6 fledglings per pair) in 1981–1988, and 87.8% (0.87 fledglings per pair) in 1989–2010. Minimal distance between nests of two neighboring breeding pairs was 6 km. Fresh clutches were registered on 27.04.1991, 28.04.1998, and 5.05.1992. Hatching occur during the first decade of June. Fledglings can stay in nest as late as second half of August. 23.09.2009 adult birds still fed their totally grown and well flying young on the nest. Snakes (Adder and Grass Snake) consisted about 88.1% of prey occurrence in the diet of Short-toed Eagle. More than 60% of records of hunting Short-toed Eagles refer to pine bogs, 30% – to dry pine forests and 10% – to clearings, river valleys, forest glades and other open spots.

Key words: Short-toed Eagle, *Circaetus gallicus*, breeding, nest, egg, feeding.

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Экология змееяда в Белорусском Поозерье. - В. Ивановский, Д. Шамович. - Беркут. 20 (1-2). - В 1981–2002 гг. в Белорусском Поозерье (Витебская область Беларуси) выявлено 24 участка постоянного гнездования, прослежено 57 случаев размножения, промерено двадцать кладок, окольцовано 43 птенца, получено два возврата. Численность змееяда в Витебской области составляет 50–70 пар. Гнездовые биотопы в 87,5% представляют собой сфагновые сосняки на верховых и переходных болотах. Кладка происходит в конце апреля – начале мая. Она всегда состоит из одного яйца, размер его в среднем 74,2 × 57,9 мм (n = 20). Вылет молодых около середины августа. Продуктивность 0,82 слетка на пару, приступившую к размножению. Успех размножения, рассчитанный по 56 случаям прослеженным до вылета молодых, составил 82,1%. Питание на 88,1% состоит из змей (гадюка – 33,3%, уж – 27,4%). Популяция стабильна с некоторой тенденцией к росту численности.

The Short-toed Eagle (*Circaetus gallicus*) is one of the least studied raptor species of Europe (Glutz et al., 1971; Cramp, Simmons, 1980; Ivanovsky et al., 1997). In Belarusian Poozerie region it is not numerous, but a widespread species with stable population of 50–70 pairs.

Breeding density in the area is 1.2–1.7 pairs/1000 km^2 and is one of the highest in the north-western part of the former USSR. In the centre of the European part of Russia it totals 0.8 (Galushin, 1971), in Estonia and Latvia – 0.1 (Randla, 1983; Viksne, 1983;). In the south in Belarusian Polesie the population density of the eagle reaches 7 and more pairs/1000 km^2 (Dombrovski et al., 2001; Dombrovski, Ivanovski, 2005).

Material and methods

We studied the Short-toed Eagle in Belarusian Poozerie in 1981–2010. This is the lake area situated in northern part of Belarus. It includes Vitebsk region and several northern districts of Minsk and Grodno regions. Main part of investigations were conducted in Vitebsk region (40.1 ths km^2).

During the period of study 24 nesting territories were identified, 57 breeding cases registered, 20 clutches measured, 43 chicks ringed, two recoveries received (Ivanovsky, 1983, 1990, 1992, 2002).

Out of 24 described nesting habitats of the Short-toed Eagle 87.5% were pine forests in pine bogs and transitional mires while 12.5% were dry pine stands in dry lands alternating with cleared areas and small sphagnum bogs.

All permanent nesting areas where we found inhabited nests four and more times were situated in typical pine bogs of various size and were used as additional study areas for Short-toed eagle monitoring.

Study area No.1 (Gorodok district): a complex-shaped pine bog a part of which is located in Russia's Pskov region. Its area is 1,538 hectares. The Belarusian part of the

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bog has been slightly drained with a network of soil reclamation canals. In total, inhabited nests were found there ten times.

Study area No. 2 (Beshenkovichi district): a system of two small pine bogs bordering mainly meliorated lands, peateries (both operated and abandoned) and parvifoliate woods. The pine bog area is about 520 hectares. Inhabited nests were found there eight times.

Study area No.3 (Vitebsk district): a 2,180 hectares large pine bog surrounded by a narrow (50–1000 m) circle of mixed boggy forests followed by agricultural lands. There is a large peatery. Inhabited nests were identified six times.

Study area No. 4 (Gorodok district): a system of three small pine bogs located 0.5–1.5 km from each other. The central bog where all six inhabited nests were found was meliorated with a network of canals. The bog system area is 380 hectares. The bogs are surrounded by pine forests of various age and cleared areas.

Study area No. 5 (Shumilino district): a large mixed type bog, the area is 2,501 hectares, in the centre of the bog there is Lake Krasomai surrounded by floating vegetation that gradually transforms into a transitional mire in the north and the south and further into a typical pine bog. All four inhabited nests were located in the typical pine bog.

Study area No. 6 (Miory district): the Central Europe's largest pine bog Yelnya (19,984 hectares). Four inhabited nests were identified in this area.

In four pine bogs inhabited nests were found once. In another ten pine bogs of various size we found old uninhabited nests or signs of the Short-toed eagle presence (feathers, typical pellets).

Results and discussion

There are very few descriptions of the Short-toed Eagle nests for the central European region, but nevertheless it was registered in pine bogs of the Baltic states (Kumari, 1955; Taurinsh, 1961; Viksne, 1983). Unfortunately, Zarudny (1910) did not make detailed description of nesting biotopes for the former Pskov province. But on the basis of his scarce published data we can assume that Short-toed Eagles preferred to breed in the close vicinity of wet places. In Belovezhskaya Puscha all the nests were found just near sedge-sphagnum bogs (Datskevich, 1971). In the former Smolensk region breeding habitats of Short-toed Eagles were extensive grassy marshes near forests (Stanchinsky, 1915, 1927). On migration the species also tends to be observed on pine bogs (Mishchenko, Sukhanova, 1983). In general, for the whole breeding area of the Short-toed Eagle it is typical that it occupies more or less open biotopes with scarce and low vegetation which is important for quick searching and easy catching of prey (Zarudny, 1910; Korelov, 1962). Found nests and numerous hunting sites of the Short-toed eagle indicate that optimal biotopes for Belarusian Poozerie are pine bogs and old thinned pine forests.

Short-toed Eagles return to Poozerie in April, when there is no snow on the ground. Once a couple arrives, it occupies a nesting area. We noted the first bird in a permanent nesting area on 5.04.1986 (Ostrovy), and on the same day we saw an active Adder there. The bird was noticed in the nest on 7.04.1983 (forest Puscha Golubitskaya). Once birds return, they mend the old nest or build a new one and perform display flight which we observed on 11 and 20.04.1986 (Glodansky Mokh), 19.04.1986 (Puscha Golubitskaya). Lekking birds would first soar in the nest vicinity and then fly straight with fast shifts from one wing to the other and sharp turns. One bird demonstrated a 'garland flight' hovering in upper points of the curves and keeping its body almost vertically while winnowing frequently. During mating games birds from time to time produce sounds that slightly resemble the buzzard's call but are more melodic and shorter. A displaying male was noticed flying much later, on 27.05.1988 (Puscha Golubitskaya).

Short-toed Eagles are very attached to their nesting areas and can occupy them for decades. There are data that these birds

would nestle in the same nest for three years in a row (Yelnya, Glodansky Mokh).

Architectonics of the Short-toed Eagle's nest is very specific and differs from other raptor nests. Remarkably, the Short-toed Eagle's nests are hard to find. In summer we localized an inhabited nest of the Short-toed Eagle by measuring the flight azimuth of adult birds carrying prey using a binocular or a scope standing on the ground or sitting on top of a tree (Petrinsh, 1991; Ivanovsky, Bashkirov, 2000). However, winter aerial observations in the area where nesting spots were identified in summer proved the most efficient for nest finding (Ivanovsky, 1988).

Photo 1. Short-toed Eagle with nestling. 17.07.2002, Vitebsk district. Photo by S.M. Plytkevich.
Фото 1. Змееяд с птенцом.

The Short-toed Eagle's nests can be of three types. The first one is 'classical', this is a kind of nest birds can occupy for several years in a row. Such nests are located on the very top of a pine tree with a bowl-shaped leader. The nest is absolutely open from above (Photo 1) but its sides are closed as the branches of the nesting tree rise 30 to 50 cm above the nest upper edge thus camouflaging it very well. Often it is hard to see such nests from the ground. Nests of this type most often occur in other territories of the European Short-toed Eagle sub-species range (Loudon, 1907; Shereshevsky, 1931; Glutz et al., 1971; Kuznetsov, 1985; Petrinsh, Bergmanis, 1986). Nests of the Turkestan Short-toed Eagle sub-species are also situated openly on top of bushes and trees (Potapov, 1960; Atayev, 1974). Obviously, the Short-toed Eagle faces a lack of flat-headed trees. Perhaps, that is why we have seen other types of nest of the Short-toed Eagle. For building this sort of nests, birds choose trees with dried leader and build a nest on the uppermost live lateral branches close to the trunk or at a certain distance from the trunk. One of such nests was found on a high pine tree growing on the edge of a small pine bog in a pine forest (Babinovichi). A nest of this type was found in the 1960s in the Oksky Nature Reserve (Galushin, 1959). We found only two more pairs having nests of this type.

Seven nests belonging to one pair were found at a 100 × 200 meters nesting spot near the edge of a pine bog in a sphagnum pine forest with 6 to 10 meters high trees. All the nests (except one 'classical') were situated close to the trunk near the top (a 1 to 1.5 meter high leader rose above the nest) were very small sized and in a way resembled the Hooded Crow (*Corvus cornix*) nest. Many twigs above those nests were bitten by the Short-toed Eagles; birds must have tried to break them as they troubled a nesting female. The pairs we observed had one to seven nests.

There is a fourth type of the Short-toed Eagle nest occurring in the south of forest and wooded steppe areas where birds nest in old pine forests. Nests of this types are built

Table 1

Architectonics of the Short-toed Eagle nest locations, 1981–2002 (n = 48)
Архитектоника размещения гнезд змееяда в 1981–2002 гг. (n = 48)

Types of nest location	%
In the upper branch cluster of a flat-headed tree	62.5
On lateral branches close to the trunk 1–1.5 m below the top	16.7
On a horizontally bent tip	10.4
In an outer part of the head on lateral branches 0.7–1.0 m from the trunk	6.2
On the first live branches of a tree with a dry or broken leader	4.2
Total:	100

in a lateral part of the tree head on the ends of thick branches, often on "witches' brooms" (Barabash-Nikiforov, Pavlovsky, 1948; Zubarovsky, 1977; Lesnichiy, Vetrov, 1983; Fedyushin, Dolbik, 1967; I.S. Mitiay, pers. comm.). All non-top nests face the south or southeast. There are data that in the Western Europe the Short-toed Eagle takes old raptor and Corvidae nests (Glutz et al., 1971).

In Belarusian Poozerie all the nests without exceptions were build on pine trees by the Short-toed Eagles, the birds did not occupy other species' nests. The architectonics of nest location is presented in Table 1. It is clear that 'classical' nests are those located in the upper branch cluster of pine tree (62.5% of all nests), when a nest somewhat lies in a bowl formed by the cluster branches that rise 20 to 50 cm above the nest. According to our observations, in most cases birds build nests of other types if there are no pine trees with optimal head architectonics in their nesting area. This is all the more evident as the second and the fifth nest types are, in principle, sub-types of the first type. Then the share of 'classical' nests reaches 77.1%. As mentioned earlier, the Short-toed Eagle does not occupy other species' nests while the Common Buzzard (*Buteo buteo*) and the Merlin (*Falco columbarius*) were noticed nesting in the Short-toed Eagle's nests (Ivanovsky, 1999).

A typical feature for the majority of nest types is that almost all day long including the hottest hours they are lit with sun rays. Small size and location, with rare exceptions, on a tree top are the distinctive characteristics of the Short-toed Eagle nests. The diameter of measured nests varies between 40 and 100 cm with an average of 65 cm. The average width is 34 cm (20–80 cm). The nesting cup diameter is 24 cm on average, the depth is 4–5 cm. Nests that were repeatedly occupied by birds are normally of larger size. Zarudny (1910) for the former Pskov province cites the sizes of three exceptionally large nests: from 1.19 to 1.36 m in diameter and 0.77 to 1.13 meters thick. Nests are built from dry pine, birch and other trees branches up to 3 cm thick.

When chicks grow up, the nesting cup is normally flat and cannot be measured. The nesting cup is always covered with green pine, birch and spruce tree twigs in various combinations. The breakdown of the 'green' bed by tree sort is as follows: pine – 61.0%, birch – 31.0%, spruce – 8.0%. Shortly before a chick leaves the nest the nesting cup can be covered with a layer of dried scattered pellets that a chick throws down to its legs. Within the reported period we registered seven cases of the Short-toed Eagle nesting in the same nest for two years in a row, and two cases of nesting in the same nest for three years in a row. Yet another interesting specific feature is that nest that we found when being built (n = 5) were made in the hatching period in May and, most probably, were built by the male. Notably, all those new nests would be occupied a year after. Our experiments revealed that the Short-toed Eagle eagerly occupied artificial nests (Ivanovski, 2000; Ivanovsky, 2008). All

the nests were situated on pine trees at a height of 5 to 18 meters (on average – 10 m).

The Short-toed Eagle nest architectonics is closest to that of Osprey (*Pandion haliaetus*) who occurs in the same biotopes. However, the Short-toed Eagle, unlike the Osprey, never builds nests on stand-alone trees; and while the Osprey nest always rises 2–3 meters above the neighboring trees, the Short-toed Eagle nest, even if made on the very top, is not situated higher than the surrounding trees' heads and its sides are always covered with the nesting tree branches; finally, the Osprey nest is significantly larger than that of the Short-toed Eagle, is made from thick (up to 5 cm) and long dry branches and always crowns the nesting tree top like a hat. The Osprey nesting cup is laid with plants, moss or crop tussock.

In the Pskov province Zarudny (1910) found the Short-toed nests mainly on pine trees and rarer on birch trees. There is information that in the south of forest and forest-steppe zones the Short-toed Eagle mainly nests on pine trees and much rarer on oaks and alders (Charlemagne, 1915; Gavrilenko, 1929; Orlov, 1948; Zubarovsky, 1977). The Short-toed Eagle is also known to build nests in forests very low, at a height of 2 meters (Zarudny, 1910) and even on the ground, on a mound amidst three young alder trees (Gavrilenko, 1929). In the Western Europe the Short-toed Eagle is rarely seen nesting on the ground (Makatsch, 1974). Some researchers believe that nesting on trees is secondary and is caused by the species spreading to the north in the forest area (Dolgushin, 1947). This seems unlikely as even in hilly deforested biotopes the Short-toed Eagle prefers to nest on stand-alone trees and bushes.

The distances between nests of the same pair varied from 30 m to 1.5 km. Each pair has 1–4 perching points on dry or branchy crowned pines and spruces not far than 50 m from a nest. Molted feathers and pellets are gathering under them.

In conditions of Poozerie area birds start to lay eggs at the end of April – beginning of May. We inspected empty nest with green twigs in a cup on April 28, 1985 on large pine bog Yelnya. Next day a bird was sitting on empty nest. On 2.05.1986 the bird incubated a clutch. Fresh clutches were also reported at 27.04.1991, 28.04.1998 and 5.05.1992. Similar clutch starting dates are known for Pskov province (Zarudny, 1910) and East Europe (Becsy, 1975). Birds of Turkestan subspecies lay eggs earlier in old nests than in newly built ones with a delay of 10–12 days (Sukhinin, 1957), that well corresponds with our findings. Zinov'ev and Belyakov (1979) showed that for forest zone as a whole clutch starting date was 27.05 that was obviously a mistake. Because with incubation of 42–47 days a chick cannot hatch in the middle of June. In Belarusian Poozerie area ready to hatch clutches were registered in the third decade of May (23.05.1984, Babinovichy area). Hatching takes place in the first decade of June. A ready to hatch egg was found in the nest on June 1985 (Glodansky Mokh area); a chick was heard cheeping inside the egg on June 3, 1983 (Puscha Golubitskaya area).

In the conditions of Belarusian Poozerie incubation lasts for 46–48 days. Some fundamental papers on birds of prey of the world show 47 days (Brown, Amadon, 1968; Cramp, Simmons, 1980). Short-toed Eagle has large eggs, resembling somehow eggs of White-tailed Eagle (*Haliaeetus albicilla*). Coloration is white or dirty-white (during the last stage of incubation). Below is the size (mm) of twenty eggs from Vitebsk region (74.2 × 57.9 mm, in average):

74.6 × 61.9	73.6 × 57.4	76.0 × 57.0
76.1 × 58.4	75.2 × 59.2	73.3 × 56.7
75.0 × 57.6	76.0 × 58.2	77.4 × 58.3
73.1 × 57.0	71.2 × 57.4	75.3 × 56.8
76.2 × 58.3	74.5 × 59.3	71.1 × 56.9
76.6 × 58.8	72.0 × 55.7	71.6 × 57.0
70.5 × 56.5	74.3 × 59.3	

Twenty measured eggs belonged to twenty clutches, that is every clutch consisted from a single egg. There is only one confirmed registration of a clutch of the Short-toed Eagle with two eggs for the territory of the CIS (Mambet-

Photo 2. Nestling with paralyzed Grass Snake in a nest. 7.07.1997, Beshenkovichi district. Photo by V.V. Ivanovsky.
Фото 2. Птенец змееяда с парализованным ужом в гнезде.

zhumayev, 1968), but one egg was unfertile. We do not have data on repeated clutches. But we examined downy chick in the nest in Ostrovy area on 21.07.1991 which had just newly opened tips on primaries and tail feathers. This chick was nearly one month younger than a chick from another nest which was fully feathered on 19.07.1999. It is possible that repeated clutch took place in that occasion.

Nestling hatch in the first days of June: on 1.06. 1991 an egg was broken and cheep was heard; on 3.06.1989 a chick was 2–3 days old. Young nestlings in downy feathers were examined on 11.06.1999, 13.06.1991 and 17.06.1989. Potapov (1960) noted that at the end of incubation Short-toed Eagle even allowed to touch it.

It is noteworthy that in more southern regions nestlings of Short-toed Eagles hatch nearly at the same time: on June 5–6 in the Crimea (Shereshevsky, 1931), on June 5 in Cherkasy region (Orlov, 1948), on June 6–8 in Hungary (Bècsy, 1975). Shnitnikov (1913) found broken ready to hatch egg in Pinsk district on June 3. Fedushin and Dolbik (1967) found downy nestling in Hoiniki district on June 6. On the end of June youngs are in secondary plumage, first coverts and tips of primaries start to appear (28.06.1981, Puscha Golubitskaya). At this time young birds have light-yellow eyes, light-bluish beak, light foots and black claws.

Nestlings behave differently. Galushin (1959) wrote that young Short-toed Eagle was very passive and failed to show any defending reaction. During ringing young bird was very aggressive on 18.06.1981. But on the next year a nestling of this pair and a pair from Babinovichy area showed very passive behavior. It is obvious that defending reaction is individual and probably depends on the sex of a nestling.

At the end of the first decade of July young Short-toed Eagles are half-feathered but still sit on their hocks. At the end of July fully feathered nestling was still in the nest (31.07.1981, Puscha Golubitskaya). We do not have exact data on when nestlings leave their nests. Young calling bird followed an adult one on 15.08.1981 (Obol area). Other authors state that young birds leave nests at the first decade of August (Kharuzin, 1926; Gavrilenko, 1929; Bècsy, 1975). On 4.08.1957 nestling was still in the nest (Galushin, 1959). We registered full families of eagles at their breeding areas on 28.08.1984 (Zhernosekovo), 1.09.1984 and 3.09.1983 (Obol). The adult still was feeding youngs. The latest record of Short-toed Eagle at the breeding area was made on 6.10.1974 (Osveya).

We examined three active breeding territories in 2010 and found three nests. Breeding success was 100% – each pair raised one

chick. Breeding phenology that year was as follows: 9.05 female was incubating a clutch, 16.06 we heard a cheep of a newly born bird in another nest, 21.06 a chick had coverts on its shoulders and opened tips of primaries and tail feathers, 5.07 a chick started to fledge, 15.08 (Velikoe Boloto) fully grown bird jumped from the nest and landed in 60 m from it (this bird was ringed and brought back to the nest). It is interesting that 23.09.2009 a young bird able to fly was still fed by parents of the latter pair in the close vicinity of the nest and even at the nest itself.

That is to say, young birds stay in their nests and are fed by parents for about two months. Fledglings leave nests in the first decade of August. Young eagles stay close to the breeding area till migration time and parents feed them from time to time. In conditions of Belarusian Poozerie Short-toed Eagles start to move south from the mid September – first decade of October.

Breeding success of the Short-toed Eagle in Belarusian Poozerie (n = 56) was 82.1% in 1981–2002, which was higher than in Central Asia (70%) with more dense populations of reptiles (Sukhinin, 1971). Productivity comprised 0.82 fledglings. In 1989–2010 breeding success in Poozerie was 87.8% and productivity – 0.87 fledgling per pair. These figures are much higher than in 1981–1988: 0.6 fledglings per pair with 66.7% of breeding success (Ivanovsky, 1992). We can just assume that this was due to global warming and food availability increase.

We've never registered any unfertile egg in the Short-toed Eagle clutches.

Adult birds are very shy during breeding period. When approaching a nest at first stages of incubation a bird flies away from the distance of 30–50 m. It then disappears or circles high in the sky at 100–200 from a nest, calling from time to time. In the end of incubation female sits very toughly on a clutch and allows to approach nesting tree.

The Short-toed Eagle is tolerant towards other birds of prey. We found active nest of Osprey in 700 m from the Short-toed Eagle nest. A nest of Black Stork (*Ciconia nigra*) was found in 1.6 km, of Golden Eagle (*Aquila chrysaetos*) and Hen Harrier (*Circus cyaneus*) in about one kilometer, of Sparrowhawk (*Accipiter nisus*) in 300 m, and of Common Buzzard in 350 m.

Table 2

Diet of the Short-toed Eagle in Belarusian Poozerie area in 1981–2002 (n = 51)
Питание змееяда в Белорусском Поозерье в 1981–2002 гг. (n = 51)

Prey item	%
Rana sp.	2.0
Bufo bufo	2.0
Anguis fragilis	2.0
Vipera berus	33.3
Natrix natrix	27.4
Serpentes sp.	27.4
Lylurus tetrix (juv.)	1.9
Erinaceus europaeus	2.0
Talpa europaea	2.0
Total:	100

One of the Short-toed Eagle's nests was located just in the centre of large Capercaillie (*Tetrao urogallus*) lek. By the way, all breeding biotopes of the eagle were typical places of Capercaillie lekking sites.

According to our data minimal distances between centers of neighboring breeding areas comprised 6 km. A fight between Short-toed Eagle and Black Stork for a nest was observed in Estonia (Mank, 1963). Gavrilenko (1929) recorded a fight between Short-toed Eagle and Great Spotted Eagle.

We revealed 51 prey items when investigating Short-toed Eagle's nests in 1981–2002 (Table 2). Snakes comprised the largest part of the diet – 88.1% of occurrence, while other preys were just of secondary importance and could be regarded as substitutional or occasional.

Alive but paralyzed by a neck bite Grass Snakes (*Natrix natrix*) were found several times in nests of Short-toed Eagles (Photo 2). At the same time we've never registered alive Adders in eagle's nests. Paralyzed Grass

Snakes probably played a role of "alive conserve".

The population density of Adder (*Vipera berus*) which was the main prey species of the eagle, comprised up to 9 individuals per hectare on pine bogs of Belarusian Poozerie area (Pikulik et al., 1988).

According to Gavrin (Bannikov, Belova, 1956) there were 84.5% of reptiles and 15.5% of frogs in the diet of the Short-toed Eagle in Belovezhskaya Puscha. Adult Hedgehog (*Erinaceus europaeus*) and two small rodents were also recorded in the diet there (Golodushko, pers. comm.). Reptiles were shown as main prey for this eagles in former Pskov province while small rodents, young birds and frogs were rarely taken (Zarudny, 1910). Gavrilenko (1929) noted that small rodents and young birds were registered in the diet of Short-toed Eagles mainly during cold and wet summer. For the Oksky Nature Reserve only snakes were recorded as preys (Galushin, 1959). Very rare Short-toed Eagle took Squirrels (*Sciurus vulgaris*) and fishes (Potapov, 1960; Bècsy, 1975; Popov, 1977).

Thus, the Short-toed Eagle is a predator with high level of trophic specialization with reptiles as main prey. The rest preys are temporary (taken during unfavorable weather conditions) or occasional. It is noteworthy that Short-toed Eagles have very intensive digestion – we found no bone remains in its pellets. Pellets are oval and about 55 × 30 mm in size. Most of pellets consisted of scales and ventral scutes of snakes and lizards. Fur of small mammals was found just several times (Ivanovsky, 1983).

More than 60% of hunting Short-toed Eagles were observed on pine bogs, 30% in dry pine forests and the rest 10% on clearings, river valleys, forest glades and other open places. They usually hunt on places without dense tree canopy. The main hunting technique is a flight at a small height and looking for prey from air with consequent hovering "kestrel-like" stops. Short-toed Eagles are seldom seen on the ground. Sometimes it waits for prey when perching motionless on telegraph poles, on hay stocks, on trees near old forest roads and lines, at the edges of bogs, meadows and forest boundaries. Despite its large size Short-toed Eagle is very secretive bird and is observed more often when hunting in open spaces such as large pine bogs or forest glades. Maximum distance of Short-toed Eagle registration in Poozerie was 6 km from its nest. Radius of its hunting area in the Ukraine was 3–4 km (Zubarovsky, 1977), and 13 km in Belovezhskaya Puscha (Golodushko, 1965).

REFERENCES

Atayev K. (1974): [Some data about ecology of Turkestan Short-toed Eagle in East Kara Kum]. - Mater. of VI Al-Union ornithol. confer. M. 2: 19-20. (In Russian).

Bannikov A.G., Belova Z.V. (1956): [Materials to study of amphibia and reptilia of Belovezhskaya Puscha]. - Uch. zap. In-ta im. V.L. Potemkina. 61 (4–5): 385-402. (In Russian).

Barabash-Nikiforov I.I., Pavlovsky N.K. (1948): [Fauna of terrestrial vertebrates of the Voronezh Nature Reserve]. - Tr. Voronezh. zap-ka. 2: 7-128. (In Russian).

Bècsy L. (1975): Meine Beobachtungen an Schlangenadler. - Falke. 22 (4): 114-119.

Brown L., Amadon D. (1968): Eagles, Hawks and Falkons of the world. - Feltham: "Country Life Books", 1: 1-429.

Charlemagne E.V. (1915): [Observations of birds of coniferous forests in environs of Kyiv]. - Ptitseved. i ptitsevodstvo. 6 (2-3): 97-188. (In Russian).

Cramp S., Simmons K.E.L. (1980): Handbook of the birds of Europe, the Middle East and North Africa. Oxford: Oxford Univ. Press. 1980. 2: 1-695.

Datskevich V.A. (1971): [Ornithofauna of Belovezhskaya Puscha and its environs]. - Belovezhskaya Puscha. Minsk. 5: 184-222. (In Russian).

Dolgushin I.A. (1947): [Materials on the fauna of birds of the Northern Balkhash area and Kazakh Plateau]. - Izv. Kazakhstan. filiala AN SSSR. Ser. zool. 2: 50-87. (In Russian).

Dombrovski V.S., Ivanovski V.V. (2005): New data on numbers and distribution of birds of prey breeding in Belarus. - Acta Zool. Lit. 15 (3): 218-227.

Dombrovski V.S., Zhuravlev D.V., Demongin L. (2001): [Rare birds of prey of Belorussian Polesie]. - Subbuteo. 4 (1): 11-24. (In Russian).

Fedyushin A.V., Dolbik M.S. (1967): [Birds of Belorussia]. Minsk: Nauka i tekhnika. 1-520. (In Russian).

Galushin V.M. (1959): [Some data about breeding of the Short-toed Eagle in Ryazan region]. - Ornitologiya. 2: 153-156. (In Russian).

Galushin V.M. (1971): [Number and territorial distribution of birds of prey of the European Centre of USSR]. - Tr. of the Oksky Nature Reserve. 8: 5-132. (In Russian).

Gavrilenko N.I. (1929): [Birds of Poltava region]. Poltava. 1-133. (In Russian).

Glutz von Blotzheim U.N., Bauer K.M., Bezzel E. (1971): Handbuch der Vögel Mitteleuropas. Frankfurt am Main: Akad. Verlag. 4: 1-943.

Golodushko B.Z. (1965): [Birds of prey and their role in game farming of Belovezhskaya Puscha]. - Avtoref. ... cand. biol. sci. Minsk. 1-22. (In Russian).

Ivanovski V.V. (2000): Construction of artificial nests as conservation measure for rare birds of prey. - Buteo, 11: 131-138.

Ivanovsky V.V. (1983): [Short-toed Eagle in Belarussian Poozerie]. - Tez. dokl. 11 Pribalt. ornitol. confer. Tallinn. 95-98. (In Russian).

Ivanovsky V.V. (1988): [Experience of winter aircraft count of nests of birds of prey in forest zone]. - Tez. dokl. 12 Pribalt. ornitol. confer. Vilnius. 84-85. (In Russian).

Ivanovsky V.V. (1990): [Status of the Short-toed Eagle (*Circaetus gallicus*) in Belorussia]. - Okhraniayemiye zhivotniye Belorussii. Minsk. 42-49. (In Russian).

Ivanovsky V.V. (1992): [Breeding ecology of the Short-toed Eagle in Belarussian Poozerie]. - Sovrem. ornitologiya. M. 69-77. (In Russian).

Ivanovsky V.V. (2002): [Short-toed Eagle in Northern Belarus: present and future]. - Berkut. 11 (2): 158-164. (In Russian).

Ivanovsky V.V. (2008): [Results of long-term experience of attracting of birds of prey in artificial nests]. - Nov. doslidzhennya sokolopod. ta sov. Kriviy Rig. 134-138. (In Russian).

Ivanovsky V.V., Bashkirov I.V. (2000): [Breeding ecology of the Buzzard in conditions of Northern Belarus]. - Fauna i ecologiya ptits bass. reki Zap. Dvina. Vitebsk. 38-41. (In Russian).

Ivanovsky V.V., Bashkirov I.V., Shamovich D.I. (1999): [Productivity and breeding success of birds of prey in 1998]. - Structurno-functsion. sost. biol. raznoobr. zhivotn. mira Belarusi. Minsk. 127-128. (In Russian).

Ivanowsky V., Onofre N., Rocamora G. (1997): Short-toed Eagle (*Circaetus gallicus*). - The EBCC Atlas of European Breeding Birds: Their Distribution and Abundance. London: T. & A.D. Poyser. 144-145.

Kharuzin O.A. (1926): [Results of ornithological observations and collectings in Novosilsky district of Tula province]. - Bull. MOIP. Otd. biol. 35 (3/4): 314-388. (In Russian).

Korelov M.N. (1962): [Ordo Birds of Prey – Falconiformes]. - Ptitsy Kazakhstana. Alma-Ata. 2: 488-707. (In Russian).

Kumari E.V. (1955): [Bird fauna of natural landscapes of South-West Estonia]. - Tr. zool. in-ta AN SSSR. 17: 266-294. (In Russian).

Kuznetsov A.V. (1985): [Breeding of the Short-toed Eagle in interfluve of Unzha and Vetluga]. - Ornitologiya. M. 20: 129-132. (In Russian).

Lesnichiy V.V., Vetrov V.V. (1983): [To the distribution of some species of birds of prey in the North and the South-East of Ukraine]. - Ekologiya khishchn. ptits. M. 124-125. (In Russian).

Loudon H. (1907): Zur Ornis der russischen Ostseeprovinzen. I. - Ornith. Jb. 18 (5/6): 203-206.

Makatsch W. (1974): Die Eier der Vögel Europas. Leipzig: Neumann Verlag. 1: 1-468.

Mambetzhumayev A.M. (1968): [To breeding and feeding of some birds of the tugai landscape of middle and lower stream of Amu-Daria river]. - Vesti of Karakalp. fil. AN UzbSSR. 1 (31): 11-20. (In Russian).

Mank A.Y. (1963): [Distribution of the Black Stork in Estonian SSR]. - Tez. dokl. V Pribalt. ornitol. confer. Tartu. 120-122. (In Russian).

Mishchenko A.L., Sukhanova O.V. (1983): [Distribution and number of rare species of birds of prey in Moscow region]. - Okhrana khishchn. ptits. M. 59-61. (In Russian).

Orlov P.P. (1948): [Ornithofauna of Cherkasy district]. - Uch. zap. Cherk. ped. in-ta. 2 (2): 7-117. (In Ukrainian).

Petrinsh A. (1991): [Discovery of breeding territory of some species of birds of prey (Falconiformes) from heights]. - Problemy i puti izucheniya khishchn. ptits. Vilnius. 43-49. (In Russian).

Petrinsh A.Y., Bergmanis U.A. (1986): [About the Short-toed Eagle (*Circaetus gallicus* Gm.) in Latvia]. - Okhrana, ecologiya i etologiya zhivotnikh. Riga. 57-72. (In Russian).

Pikulik M.M., Bakharev V.A., Kosov S.V. (1988): [Reptiles of Belorussia]. Minsk: Nauka i tekhnika. 1-166. (In Russian).

Popov V.A. (ed.) (1977): [Birds of Volga-Kama area. Non-Passeriformes]. M.: Nauka. 1-296. (In Russian).

Potapov R.L. (1960): [To the biology of Short-toed Eagle in Southern Tajikistan]. - Izv. AN Taj.SSR. Otd. sel. khoz. i biol. nauk. 1: 135-137. (In Russian).

Randla T.E. (1983): [State of rare birds of prey of Estonia]. - Okhrana khishchn. ptits. M. 154-155. (In Russian).

Shereshevsky E.I. (1931): [To the biology of Short-toed Eagle in the Crimean Nature Reserve]. - Sb. rabot po izuch. fauny Krym. gos. zap-ka. M.-L. 88-89. (In Russian).

Shnitnikov V.N. (1913): [Birds of Minsk province]. - Mat. k poznan. fauny i flory Ros. Imp. Otd. zool. 12: 1-475. (In Russian).

Stanchinsky V.V. (1915): [Checklist of the birds of Smolensk province]. - Tr. Ob-va izuch. Smolensk. gub. 2: 31-74. (In Russian).

Stanchinsky V.V. (1927): [Birds of Smolensk province]. Smolensk. 1-217. (In Russian).

Sukhinin A.N. (1957): [Materials on ecology of Turkestan Short-toed Eagle in Badkhyz]. - Izv. AN TSSR. 5: 132-135. (In Russian).

Sukhinin A.N. (1971): [Ecology of owls and birds of prey of Badkhyz (south-eastern Turkmenia)]. Ashkhabad: Ylym. 1-102. (In Russian).

Taurinsh E.Y. (1961): [Ornithofauna of high bogs of Latvian SSR]. - Ekologiya i migratsii ptits Pribaltiki. Riga. 311-315. (In Russian).

Viksne J. (ed.) (1983): [Birds of Latvia: territorial distribution and number]. Riga: Zinatne. 1-224. (In Russian).

Zarudny N.A. (1910): [Birds of Pskov province]. - Zap. Akad. Nauk po fiz-mat. otd. Ser. 8. 25 (2): 1-181. (In Russian).

Zubarovsky V.M. (1977): [Birds of prey]. - Fauna Ukrainy. Kyiv: Nauk. dumka. 5 (2): 1-332. (In Ukrainian).