



FALCO

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Guest Editorial

Poisons seem to be the issue of concern at the moment. In Mongolia the widespread use of bromdialone to control plagues of Brandt's Vole on the steppe has killed large numbers of Sakers, Upland Buzzards, Steppe Eagles and Cranes, as well as mammalian predators and even some children. The Mongolian Saker surveying team recorded a drop off of 27% of overall Saker population in Mongolia in 2003. This has had more impact than all the illegal trapping and other factors put together. We have provided data and photos and made representations via various routes but it is hard to make much headway. There are no trained biologists in the Ministry of the Environment and with an election coming up in May, all funding and resources have been diverted to campaigning. It is hard not to be cynical.

Meanwhile in the Indian sub-continent, a determined effort by various NGOs has enabled the sampling of a number of dead vultures and trials by Dr Lindsay Oaks have concluded that the culprit is *diclofenac*. This is a non-steroidal anti-inflammatory drug recently introduced for use on farm mammals and humans. The problem is that even in low doses it causes secondary poisoning of vultures through kidney failure. The species affected are the Indian White-backed Vulture *Gyps bengalensis*, the Long-billed Vulture *G. indicus* and the Slender-billed Vulture *G. tenuirostris*. These last two have only recently been recognised as separate species. Over the last four years or so the Peregrine Fund has spent a million dollars investigating the problem and documented a 95% decline in the vulture populations. In early February 2004 a Summit Conference was hosted in Kathmandu by the Nepal Conservation Society. This was attended by delegates from various NGOs, including the Peregrine Fund, Birdlife, the RSPB, the Ornithological Society of Pakistan and the Bombay Natural History Society and from GOs from Nepal, Pakistan, India and ERWDA for the UAE. It was agreed that emergency action is needed to remove remaining vultures from the wild into safe holding pens and then later into breeding programmes pending the environment being cleaned of *diclofenac*. In a subsequent meeting in Abu Dhabi preparations were agreed to capture and transfer vultures from Pakistan to UAE for temporary safe-keeping.

Following the CITES meeting on Sakers in Abu Dhabi last September another, larger, meeting is planned in UAE hosted by ERWDA for the CITES Secretariat. This

will be on The International Trade in Falcons. There have been problems raising the funding for it but at the moment it is scheduled for May. It will deal with issues of monitoring and enforcement of trade in wild falcons from the range countries, and problems in implementing CITES in managing a sustainable trade in captive-bred falcons. At present, the trade in wild birds seems to be almost impossible to control, whereas the captive-bred birds are being over-controlled to the point where CITES regulations are hindering this supply. Unless the wild-bird trade can be effectively controlled (which seems unlikely), the captive-bred birds are the only hope of offsetting the market demand.

Nick Fox



S. Gombobataar

An officer of the Mongolian Ministry of Nature and Environment examines a poisoned Saker Falcon.

Saker Falcon (*Falco cherrug*) in Russia.

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The Saker (*Falco cherrug*) is one of the most endangered falcon species in North Eurasia. In the past three decades its range and numbers have been declining at an alarming rate. The species is a typical representative of arid zone ecosystems and in Russia it occurs at the extremes of its range.

In this paper we review the recent state of the Saker in the central part of Southern Russia (between the Volga and the Yenisey Rivers).

Methods

The region under question occupies the southeast of the Russian plain (all of Zavolzhye, places eastwards from the Volga, and all of the southern Urals), the southern area of western Siberia, and the mountains of southern Siberia (Altay – Sayan Region). The total area of steppe and forest-steppe biome suitable for Sakers to breed covers 1,084,035 km² (Figure 1). This territory was surveyed by the authors in 1994-2003. The total size of the expedition surveys within the areas of possible breeding was 72,721 km². Breeding territories of Sakers were found mostly during surveys of open habitats using cars, but some were located during foot surveys. The search pattern was based on known and recorded hunting birds, and a search for nesting structures in suitable breeding habitats.

Nesting territories are understood in this paper to be places occupied by Sakers with either an active or non-active nest; with fledglings; or with adults that have been recorded giving alarm calls or showing aggressive behaviour towards humans or other raptors. A territory was considered as 'possibly occupied' if adult birds were recorded delivering food several times in one area.

There were several study areas established in the region; all of which were thoroughly surveyed for the presence of all raptor species, with exceptional attention being paid to the Saker. All nest sites were mapped using Arcview GIS 3.2a software (ESRI, Redlands, California, USA) from which we calculated the overall numbers (Karyakin 1996, 2000). On the basis of the mapped nests within the study areas, we modelled typical nesting habitats using satellite imagery (Resurs-MSU-E, Landat7) and vectorised top-maps (1:200,000) and plotted nest-worthy Saker habitats within the region in question. The numbers were then extrapolated using the densities observed within the surveyed study areas.

Historic records of the Saker

The most northerly-located nests sites in Russia were reported in the past in the sub-taiga regions of the Krasnoyarsk District (c. 56°N). Breeding Sakers (with 4 chicks) were reported: close to Krasnoyarsk (Kim 1988); along the Bazaikha river, a tributary of the Yenisey near Divnogorsk within the area of Krasnoyarsk Water Reservoir (Yudin 1952, Polushkin 1988); at the Karaulnaya (a tributary of the Yenisey); on Otdykha Island on the Yenisey close to Krasnoyarsk (in 1976); and finally, close to Dononovo village, 50 km north of Krasnoyarsk (Baranov 1998). In the Krasnoyarsk environs in 1980 the density of Sakers was reported as being 1-2 pairs per 100 km of the survey area; in the Kizir-Tuba (Kuraginskiy region) density was 4-5 pairs per 100; in the Usinskaya depression 2-3 pairs per 100 km; and in the Sharipov region (close to the Bolshoye Lake) 1-2 pairs per 100 km of the survey area (Baranov 1988).

At the beginning of the 20th Century Sakers were recorded at Balkatiskoe village, Achinsk region; at Altayskaya village in the Khakassia steppes; at Salbat Lake, at the Minusinsk depression; and at Bozhye Lake (Sushkin 1914). In the second half of the 20th century they were recorded in the Minusinsk depression, in the foothills of the Eastern Sayan, and in particular, in the territory of the Sayano-Shushenkiy Nature Reserve (Sokolov et al. 1983). In the 1990s Saker breeding within the Reserve was reported as follows: on a 55 km stretch of the Yenisey river, down-

Figure 1 Black lines - Borders of Districts of the Russian Federation. 1- Northern border of the Saker range in Russia. 2 - Historic range of the Saker. 3 - Recent range of the saker. Numbers of the districts are the same as in Table 1.



stream from the Uzunsuk (5 nests); along tributaries of the Yenisey, Ubun and Bolshaya, and Malaya Ura rivers; 2 nest sites were also known on the Khemchik estuary (Stakheev at al. 1999).

The main breeding region of the species north of the western Sayan is at the Minusinsk depression, where in the 1970s the Saker was common at the Maliy Kyzikul lake, and on the Tayezhniy Research Station (Batenevkiy ridge). In the forest-steppes of the western bank of the Yenisey its density reached 5-7 pairs per 100 km² of forests (or 2-3 pairs per 100 km²) of the total area. On the eastern bank of the Yenisey the density was less than 1 bird per 100 km of survey area, or 0.5 pairs per 100 km² of forests (Kustov 1980, 1981, 1982). Prokofiev (1987, 1993) observed Sakers in at least 15 sites in the Khakassia, including the sub-tundra zone of the western Sayan, however the majority of the sites were in the Minusinsk depression.

On the eastern bank of the Yenisey within the Minusinsk depression Saker nests were found in the Shuskenskoe Pine grove in the environs of the former Migninskoe Water Reservoir in the Ermakov region. A pair were recorded near Siniy Kamen' village. Single individuals were reported from Vozneseka village, in the Kobezh river valley, and at the Philaretikha site near Semennikov village (Baranov 1998). In the under-taiga belt Saker nests were found in 1988 at Oykh mountain near Kuragino village, near Pokrovka village at the Kyzir river valley, 7 km downstream from the Kyzir river estuary along the Kazyra river (Kartauz region), and along the Tuba river 10 km downstream from the Kuragino village (Baranov 1988). Single individuals were reported on 3 July 1989 on the eastern bank of the Yenisey river 5 km from the river Kan confluence, and at the rivers Kyzir and Tuba (on islands Taskin, Efer'ev and Kolmakovskiy) on 25 and 26 August 1994 (Valukh 1996).

Sakers were also reported in the Usinskaya depression close to the Aradan town, and in the Kurtusibinsk Mountain Range.

In the western Tuva the Saker is a common breeder in the steppe belt of the mountains (Sushkin 1938). Nests were found in proximity of Torgalyg, Ovuyrskiy region, in the valleys of the Moron and Naryn rivers, and along the southern slopes of the Khorumung-Taiga, near Khadyn Lake (Yanushevich 1952). Between the 1970s and the 1990s breeding was reported on the slopes of the Mongun-Taiga, Tsagan-Shibetu, on the western Tannu-Ola mountain ridges, and on the southern slopes of the Ukok Ridge in the valleys of Ezhimand Demir Sug rivers. Sakers were also seen at the Khemchik river on 7 July and 11 August 1977 and in the basin of the Chazydyr on the northern slopes of the western Tannu-Ola in July 1984. A pair of young was also seen on 9 August 1975 in the alpine belt of the eastern Tannu-Ola ridge at the sources of the Teregtig-Khem river (Baranov 1991).

In the Altay Republic the Saker was most often recorded in the south-eastern Altay mountains, where in 1992 its density reached 12.3 pairs per 100 km². Lower densities occurred in central Altay, and was even less numerous in northern, north-western and north-eastern Altay. The total numbers of Sakers within the Altay Republic was estimated at several hundred pairs (Chupin and Irisova 1996). In the south-eastern Altay the Saker breeds on the Saylugem



Figure 2. Traveling in search of Sakers is sometimes difficult.

mountain ridge where on numerous occasions it was reported at the sources of Chagan-Burgazy, along the Tarkatt and Ulandgryk rivers, and at the Tashanta pass (Sushkin 1938, Stakheev et al. 1985, Loskot 1986, Malkov 1987, Irisova and Irisov 1990). In the Southern-Chuya Range the falcon was regularly sighted on the Chagan-Uzun river and its basin, and along the Irbistu river, in the Kok-Ozek and Elangash valleys, and along the Dzhazator river (Sushkin 1938, Orlova and Ilyashenko 1978, Irisova et al. 1988, Irisova and Irisov 1990). On the Ukok plateau the Saker was recorded along the rivers Kalguta, Ak-Kol, and at the Kaldyan-Kol lake (Sushkin 1938, Irisov and Irisova 1982). There were records from the Chikhacheva and Kuray mountain ranges, at the Dzulukol depression, (Irisov and Irisova 1982, Stakheev et al. 1982, 1985, Maleshin 1987). In the central Altay the Saker was found on the Ulagan Plateau, at the Zhunmaly and Dzasator rivers, in the Katun' river valley, in the Onguday environs, and on the slopes of the Kuray depression (Sushkin 1938, Irisov, Stakheev 1976, Malkov 1979, Livanov et al. 1990). In the Katun' river valley in 1977 the reported density between Inya and Elanda villages was 1 Saker per 100 km of river bank, and between the Inya river and the Kadrin estuary as 1 individual per 100 km² (Malkov and Malkov 1980). In 1988 in the Katun' river valley between Kuyus and Edigan the Saker was reported at a density of 14 individuals per 100 km² and in 1989 between Ingen' and Kupchehen' villages at 9 individuals per 100 km² (Livanov et al. 1990). In the Terektinskiy mountain range



Figure 3. Tree nesting is characteristic for the North-Western part of the range.

Table 1. Numbers of Sakers in administrative districts of Russia.

¹	Region	Area, km ²	Known breeding territories	Estimated numbers (pairs)	Density (pairs per 1000 km ²)	Trend
1	Saratov District	101258	0	5 (0-10)	0.5	-2
2	Samara District	53579	2	4 (0-6)	0.7	-2
3	Republic of Tatarstan	48056	0	1 (0-2)	0.2	-2
4	Orenburg District	124606	12	26 (20-31)	2.1	-1
5	Bashkortostan Republic	74764	8	10	1.3	1
6	Chelyabinsk District	66015	7	20 (18-22)	3	1
7	Kurgan District	71692	7	65 (56-75)	9.1	0
8	Tumen' District	28064	0	4 (3-5)	1.4	0
9	Omsk District	34616	0	11 (5-16)	3.2	0
10	Novosibirsk District	21706	0	2 (1-3)	0.9	0
11	Altay Krai	140128	38	111 (99-140)	7.9	0
12	Kemerovo District	6928	0	6 (3-9)	8.7	-1
13	Altay Republic	76289	34	465 (310-610)	61	-1
14	Khakassia Republic	44291	21	190 (180-200)	42.9	-1
15	Krasnoyarsk Krai	65201	12	56 (40-70)	8.6	-1
16	Tuva Republic	126841	230	1130 (1070-1216)	89.1	-1
	Total	1084035	371	2106 (1815-2425)	19.4	-1

the Saker was breeding along the Ursul river, at the Seminchkiy range and was noted close to Shebalino village (Kuchin 1976). In the Altay Nature Reserve the Saker was reported at the Kayru river, at the sources of Chulchi river, in the Abakan Range at the sources of Erinat river and at the Shavla river near the sources of Kalbak-Kai creek (Folitarek, Dementiev 1938, Stakheev et al. 1982, Irisova and Irisov 1990). In the northern Altay the Saker was observed at the beginning of the 20th Century between Anos and Miyuta villages (Ruzskiy 1915), however by the end of the 20th Century it was no longer in evidence (Tsibulin 1999). A.P. Kuchin (1976) considered the Saker as a rare species of the central and south-eastern Altay, but noted that the species was more common at the sources of the Ob river, especially at the Biya-Chumish highlands (now a territory of the Altay Krai). In 1965-72 he observed 6 nests in a pine grove near Biysk town, between the Biya and Katun' rivers, at the Subenka and Ursul rivers, and at Elo village.

In the Altay Krai (not be mistaken with the Altay Republic) the majority of Saker sightings during the breeding season were reported from the forest patches and pine forest strips of the Kulunda steppe and the Ob plateau (Petrov et al. 1992, Plotnikov 1992, Kuchin and Kuchina 1995, Petrov 1995, Petrov and Irisov 1995). However some reports from the Altay foothills (Malkov 1998). V. N. Plotnikov (Malkov 1998) expressed the opinion that in the 1990s the total number of Sakers in the Altay Krai was 300 individuals (including 70 breeding pairs). In the Kurgan District the Saker was always considered at the limit of its range, and up to now there were no confirmed breeding observations in this region, although it is considered that it has spread up to the Sverdlovsk and Tumen' regions (Sabaneev 1874, Larionov 1926). On 19 June 2002 a pair of non-breeding Sakers was observed at Gorkoe lake (Ryabitsev et al. 2002) – this is the only published record of

a Saker in the Kurgan District. T.K. Blinova and V.N. Blinov (1997) observed a single Saker in the Tobol valley at Vedenyatsoye Lake, Tumen' District on 22 July 1982, i.e. after the breeding season. This latter observation is the northern-most record of the Saker. Yu. S. Ravkin and co-authors (1988) stated that the numbers of Sakers in the Western-Siberian Plane at the end of 1980s was 1000 individuals.

According to researchers of 19-20th Centuries, the Saker in the Volga-Ural Region was not rare on steppe and forest-steppes with a maximum density on the forest-steppes of the pre-Volga highlands, the High Volga (Na Gorakh) and the southern Urals (Eversmann 1866, Bogdanov 1871, Ruzskiy 1893, Zarudniy 1888, Sushkin 1897, Karamsin 1901, Zhitkov and Buturlin 1906, Kirikov 1952). It appears that the most significant enclave of breeding Sakers was within the territory of the Upper Zavolzhye, where, according to Karamzin (1901) the Saker was at a breeding density of 3-4 pairs per 100 desyatin (=1.09252 km²). The north edge of the range is limited by the Alaty river, the Kama confluence with the Volga, and the Belaya river in the Urals (Grigoriev et al. 1977). However in the beginning of 1980s it was not found to be breeding in Bashkiria or Tataria (Gorshkov et al. 1983, Ilichev and Fomin 1988), and only a few pairs were found in the Orenburg District (Davygora 1988).

Geography of breeding and numbers

As for the year 2003, we have located 371 Saker breeding territories in the region under review. In addition we know of 1 breeding territory in the Burtinskaya Steppe of the Orenburg Nature Reserve (Chibilev et al. 1996), 3 breeding territories at the south of the Saratov District (Zavialov and Ruban 2001), and 5 breeding territories in the Sayano-Shushenskiy Nature Reserve (Stakheev et al. 1999).

Thus for the last decade in a territory of 1,084,035 km² a total of 380 breeding territories have been located.

The most significant enclaves of breeding Sakers in Russia are in the Ubsu-nuur and Tuva depressions, as well as in the Altay Mountains. In 2 monitored areas of the Ubsu-nuur depression totalling 9639 km² (eastern bank of Tes-Khem 5117 km² and southern slope of Tannu-Ola – 4523 km²) we recorded 93 breeding territories. The density here reaches 2.1 pairs per 100 km². This data is representative for the whole of south Tuva and the adjoining Mongolian Territory.

In the Tuva Depression in a monitored study area of 6484 km² we found 20 breeding territories, which gives a density of 0.3 pairs per 100 km². The Saker breeds here on cliffs in un-forested habitat.

In the eastern and western Tuva, as well as in the south-eastern Altay, the Saker breeds in the alpine belt of the mountains. In the study area at the border between Tuva and Altay (3564 km²), we found 15 breeding territories, which give 0.4 pairs per 100 km². In all steppe depressions in the Altay the Saker breeds only at the edges of the depressions, which is very different from the habitat choice in the Tuva. It is possible that this latter distribution is as a result of selective pressure by falcon thieves targeting the most exposed nests. In the study area on the Chuya steppe (4190 km²) we found 18 breeding territories (0.4 pairs/100 km²). This is the largest breeding concentration in the Altay. In the period 1999 to 2002 the occupancy of the territories in this area declined – of 146 territories at least 17 (11.6%) were not occupied. The survey data led us to recalculate the numbers of Saker in the Tuva (126,841 km²) and Altay (76289 km²) for 2003. The Tuva now holds 1070-1220 pairs with 310-610 pairs in the Altay.

North of the Sayan a high density is observed in the Minusinsk depression, with the majority breeding in Khakassia. In Khakassia the core population (16 pairs) breeds in the north of the Minusinsk depression at the edges of the low mountains of the Kuznetskiy Alatau (5923 km²) making up a density of 0.3 pairs per 100 km².

In the central part of the Minusinsk depression the Saker is absent; again falcon thieves are to be blamed, and the species appears only at locations most distant from big towns such as Abakan and Minusinsk.

Our data suggests that in Khakassia (44291 km²) and in the forest-steppe zone of the Krasnoyarsk Kray (65201 km²) there are 180-200 and 40-70 pairs of Sakers respectively.

It is also possible that up to 9 pairs of Sakers breed in the forest-steppes of the north-east of the Kemerovo District (6928 km²) as the habitats there look like the ones in the adjoining areas of the Krasnoyarsk Kray. It is also possible that Sakers breed in the Kuznetsk depression, however this territory has never been surveyed, and there is no data in this decade's literature about Sakers in this area. All that is known is that there was a catastrophic decline of Souseliks (*Citellus sp.*) (Skalon and Gagina 2004), which were the main quarry in the Saker's diet there (Khakhlov 1937).

In the western Altay (the territory of the Altay Kray) the Kolyvan mountain range is at the limit of the Saker's breeding range. Here we found 6 pairs in 2003; five

of which were breeding in one study area (165.2 km²). The nest-worthy territory here is 1449 km². Based in these figures we can estimate the number of Sakers in the Western Altay as 33-44 pairs. This is the western-most border of the Altay-Sayan population.

It is possible that some Sakers are breeding in the Biya-Chumish highlands and in the southern foothills of the Salair range; however there has been no data from there since the 1970s. In addition this territory also experienced a Souselik decline. The most optimistic estimate for this place is no more than 7-10 pairs.

The total numbers of the Altay-Sayan population thus totals 1636-2149 pairs, with 1885 pairs as a midpoint.

In western Siberia the Saker breeds almost exclusively in pine forests surrounded by steppes. In the Altay Kray we located 32 Saker breeding territories. Almost all territories were located at the edges of pine-forest strips. In 1283 km of the forest edges we found 31 of the mentioned breeding pairs. Thus one breeding pair is located on every 41.4 km portion of the forest edge line. The Saker showed a significant association with long matured forests: the nests were much denser (one every 11 km) in mature pine woods (>80 years old), especially if there was unploughed steppe close-by. The total perimeter length of the pine-forest strips is 2417 km, of which 939 km is the perimeter of the mature forest and 437.5 km is the perimeter of mature forest bordering unploughed steppes. Extrapolation of the measured density using the length of borders of the pine-forest strips gives a figure of 58-85 pairs of Sakers. Thus the total figure for the Altay Kray is 99-140 pairs of Sakers or 111 as a median. The forest strips also extend into the Novosibirsk district, where it is possible that 1-3 pairs of Sakers breed.

In the Kurgan District the Saker breeds, as in the Altay Kray, in steppe pine forest patches, which are concentrated along the Tobol river terraces and its main tributaries. The majority of Sakers breed in the southern part of the district. The density of Sakers in the Tobol terrace is 1.6 pairs per 100 km² of forest. We found 7 breeding territories, which were equally distributed in a study area of 2462.3 km². The area of forest in the study area was 425.3 km². The area of the pine-forest patches in the District is 4062.5 km², which gives the estimated density of Sakers here to be 56-75 pairs or 65 pairs as median.

Between the Kurgan District and the Altay Kray the steppe forest patches are distributed along a small area along the terraces of the Tobol, Ishym and Irtish rivers, all within the Tumen' and Omsk Districts. In the territories of these districts it is possible that there are 8-21 Saker pairs (a median of 15).

The Chelyabinsk District is the western-most border of the western Siberian Saker population. There is one nesting enclave at the Ural-Tobol watershed (9 pairs, 6 of which are breeding in the Chelyabinsk District). One pair is known to breed on cliffs of the Ural river in the Orenburg District. The density of Sakers in the Chelyabinsk district is very low, we estimate the total numbers as 18-22 (20 median) pairs.

A small breeding enclave consisting of 6 nesting territories is located in the eastern slope of the southern Urals. Here the Sakers breed on cliffs. Despite the widespread presence of the Imperial eagle (we know of 148 nests

of the Imperials), none of the Sakers occupy Imperial Eagle nests (in contrast to the north-eastern Saker populations).

A fairly large breeding enclave is located in the Guberlinskiy hillocks, however only part of these hillocks is located in the Orenburg District, the rest being in Kazakhstan. In the Orenburg part of the hillocks we know of 6 breeding territories.

The numbers of Sakers in the Guberlinskiy hillocks and South-Urals (Bashkiria and Orenburg District) is 15-35 pairs.

We estimate the total number of Sakers in western Siberia to be 150-220 pairs (180 median), including a few pairs in the Bashkiria and Orenburg Districts.

Between the Ural mountains and the Volga river the Saker is scarce. Constant breeding territories are known only in the Syrt highlands bordering the Urals. In the Zavolzhye for 1998-2002 we know of 5 breeding territories. In the forest-steppes of the Upper Zavolzhye we know 2 pairs of Sakers, both bred in the Orenburg district. One pair was breeding for 2 years in a raven's nest on top of a concrete electricity pylon and then disappeared; the second pair bred for one season in a common buzzard's nest at the edge of a pine-forest patch on a river terrace. In the steppes of the Zavolzhye we found 3 Saker breeding territories: one was located in the Ural river valley in the Orenburg District (for one season), two others were in the Siniy Syrt of the Samara District (both unsuccessful). It appears that there is no area in the European part of Russia with regular Saker breeding; however some stray pairs breed in various places. The total number of Sakers between the Volga and the Urals does not exceed 25 pairs. In the areas west from the Volga river breeding is unlikely, as in the past year there were no sightings of this species in the last known breeding locations in the Don basin or in areas westwards from the Volga (Antonchikov and Piskunov 2003, Galushin et al. 2001).

The total number of Sakers in the area under question is 1815-2425 pairs (Table 1).

Isolated enclaves of Sakers are found in the steppes near Baikal Lake. In these areas there are 300-500 pairs (Ryabtsev 1984, 1995, 1997, 1998, Goroshko et al. 2000). With these numbers it is possible to estimate the total current population of Sakers in Russia as being 2115-2925 breeding pairs.

Depending on food availability and weather conditions only 56-95 % of pairs breed in any particular year, and only 24-76% are successful. In the Altay-Sayan region we observed significantly less successful pairs than in western Siberia and the Urals (Table 2). This is, perhaps, caused by the more severe conditions and higher poaching rates. Across all of Russia only 41% of breeding attempts are suc-

cessful (Karyakin 2003). As a result it is possible to conclude that the core of the Russian Saker population consists of 860-1200 successful pairs.

In general there is a negative trend in the number of Sakers across Russia. Nevertheless, in contrast to the almost-disappeared population of the European part of Russia and the declining eastern population, the number of Sakers in the Urals and western Siberia is more or less stable. In some enclaves numbers are even growing (Urals proper and regions adjoining the Urals from the east). Despite the stability in this part of the range (c. 11% of the total numbers in Russia) the overall trend is negative (Table 1).

Nesting habitats and breeding rate

In the Altay-Sayan region most Sakers breed on cliffs, regardless of whether or not forest is present in the immediate vicinity. The Sakers in this region opt for crags or pinnacles. They occupy the nests of upland buzzard, raven, and to a lesser extent, other species. In the southern Urals the Saker also prefers cliffs, and raven nests dominate the list of nest-providers. In the western Siberian and European part of Russia Sakers nest almost exclusively in trees, mostly pines (with Imperial Eagles as the main nest provider) (Table 3).

In the Altay-Sayan region the clutch size was 2.7 ± 0.42 (average \pm SD), range 1-5 (N=15). The brood size in successful nests was 2.5 ± 0.09 , range 1-5, N=139.

In western Siberia the only known clutch had 3 eggs, however, the average clutch size has to be higher, as brood sizes of 4 dominate in the sample. The average brood size in this region was 2.9 ± 0.18 , range 1-4, N=17.

In the Volga-Ural region the only known clutch contained 4 eggs. It also looks as if the majority of clutches contained 4 eggs, as judged from the brood size. The latter in this region was 2.9 ± 0.88 , range 1-4, N=24. Brood size observed after fledging was 2.8 ± 0.80 , range 1-4, N=13.

Egg sizes were $53.1-58.6 \times 40.9 \times 44.5$ mm, average $55.9 \pm 0.56 \times 42.8 \pm 0.19$ (N=22).

Discussion

The data from the literature, as well as data from the surveys mentioned in this study suggest that the numbers of Sakers east from the Urals are stable if somewhat declining, whereas the population in the European part of Russia has ceased to exist. Here we hypothesise on the causes of the rapid decline in the European part of Russia.

The data from the literature given in the review at the beginning of the paper, as well as that given by Bragin (2001), are displayed in the map shown in Figure 6. It is possible to suggest that at the beginning of 20th Century there were the following large enclaves of Sakers: between the

Table 2. Occupancy of Saker nests as seen in surveys.

Year	Territories checked		Occupancy	Number of successful		Successful nests per visited territory	Successful nests of occupied territories	Chicks per successful pair
	Total	Occupied		total	Visited twice			
1999	98	53	54.08	52	3	53.06	98.11	2.25+0.08 (n=51) (1-3)
2000	83	20	24.1	20	1	24.1	100	2.38+0.12 (n=13) (1-3)
2001	61	31	50.82	29	12	47.54	93.55	2.44+0.28 (n=25) (1-4)
2002	102	46	45.1	45	19	44.12	97.83	3.00+0.28 (n=37) (1-5)
2003	77	46	59.74	20	2	25.97	43.48	2.69+0.30 (n=37) (1-4)
Total	421	196	46.56	166	37	39.43	84.69	2.54+0.09 (n=139) (1-5)

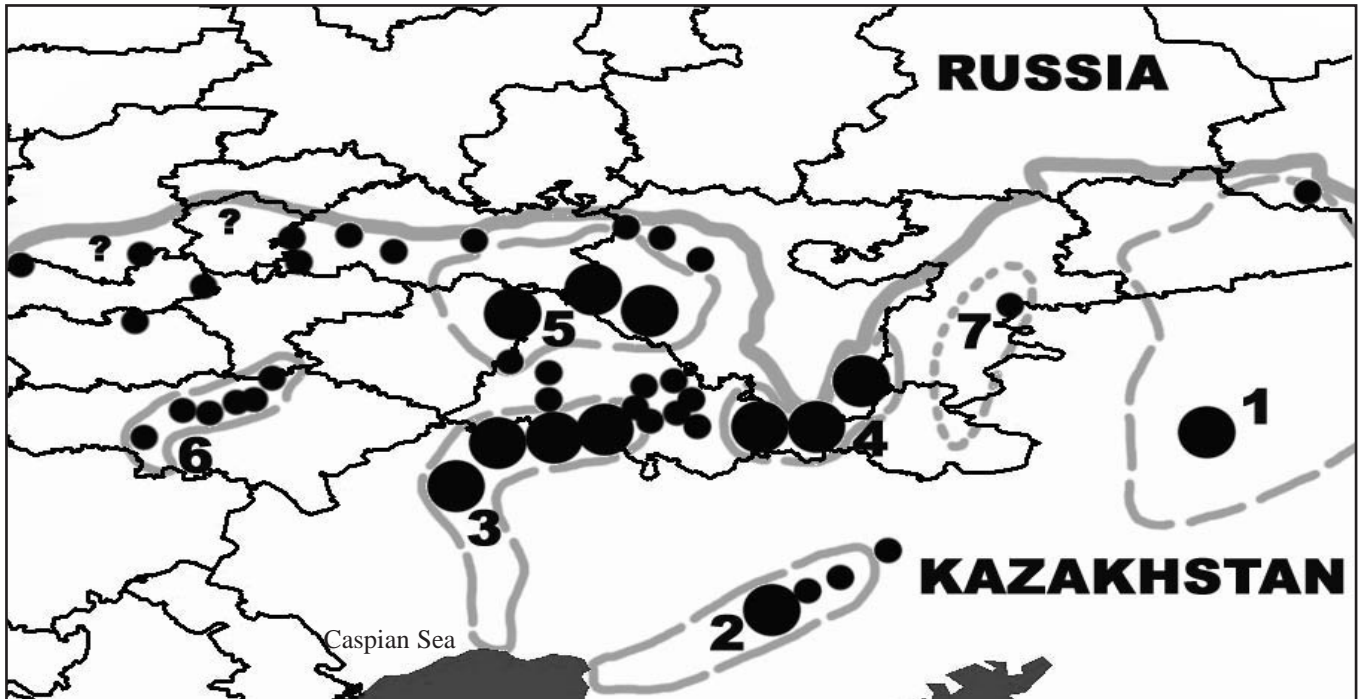


Figure 4. Historical range of the Saker in European part of Russia. Enclaves are marked with numbers and discussed in the text.

Tobol- Ishym rivers (1, Figure 4); at the forest strips along the Emba and Ural rivers (2 and 3, Figure 4); the southern tip of Urals (4, Figure 4); and in the eastern (5, Figure 4) and western (6, Figure 4) Volga Highlands. During the catastrophic decline of the Saker in the 1970s all populations, except that in Tobol-Ishym, ceased to exist. The mentioned areas contained scarce breeding pairs here and there, numbers of which declined steadily up to 1990s.

The Saker population crash coincided with widespread peregrine-DDT contamination well documented elsewhere (e.g. Cade et al. 1988, Ratcliffe 1990), a massive development of pristine steppe, and a sharp decline in quarry species (such as Sausliks), which were severely controlled on arable lands. In contrast to the peregrines, the Saker has not been able to recover because its most productive areas happened to be those under intensive agricultural pressure at the time, and there were no refuges, in which to let the species survive, except those of the Tobol-Ishym region and Mugodzhary (Kazakhstan). It is the latter regions that acted as source populations in the later years. However the slow recovery has been confounded by an intensive wild take by bird traffickers. Slow re-colonisation does take place in the southern Urals and regions east from Urals. In particular we found 2 new nests in Bashkiria at the southern tip of the Urals in 1999 (Karyakin et al. 2001). There were no Sakers recorded here, but the area was densely populated by peregrines. The appearance of the bigger Sakers led some of the peregrines to shift their territories. In 2000-2001 there were two more new nests and three new territories recorded in Chelyabinsk district. The first new pair appeared in 2000 at the Irklinsk Water reservoir of the Orenburg District. In 2002 the Saker was reported in the Chelyabinsk District in two new locations. In 2003 successful breeding was reported in one of the new territories, and a new territory found.

Nevertheless, despite some positive trends, there are also negative trends. It looks as if the Saker has disappeared from the bird list of the Saratov District

(Antonchikov and Piskunov 2003), with some of the breeding territories in the Eastern Volga Uplands having ceased to exist.

It appears that the area of regular Saker breeding is limited by the Ural mountains and the Ural river valley.

There is one feature that unites the recent distribution of Sakers in northern Eurasia: all stable populations are located within the ranges of small and medium size rodents and lagomorphs of the steppes such as Little Sauslik group (Daurian Sausliks (*Spermophilus S. dauricus*)), Daurian Pika (*Ochotona daurica*), Steppe Lemming (*Lagurus lagurus*) and Brandt's vole (*Microtus brandti*). The northern limits of these species' ranges predetermine the northern limits of the Saker populations. The Saker populations which ceased to exist or which severely declined were those located within the ranges of other species of medium-size rodents – a group of so-called Large Sausliks (Speckled Sauslik *S. suslicus*, Russet Sauslik *S. major* and Red-cheeked Sauslik *S. erythrogenys*). At the moment the numbers of these Sausliks is more or less stable, and which sustains the populations of the Imperial Eagle in the Volga and

Figure 5. Sauslik -the basis of Saker diet in northern and eastern parts of the range



E. Potapov

Year	Number of nests	Substrates					Nest provider							
		Cliff	Tree	Electric line	Other	Flat ground	<i>Buteo lagopus</i> , <i>B. rufinus</i>	Raven	Golden Eagle	Imperial Eagle	Kite, Buzzard	Others	Not identified	Scrape
Altay-Sayan														
1999	88	88					81	4	1		1	1		
2000	72	66	6				42	20	1	2	4	2		1
2001	51	38		13			35	10	1		1	1	3	
2002	52	39	3	7	2	1	38	7			1	3	3	
2003	23	21	1	1			16	5	1					1
1999-2003	286	252	10	21	2	1	212	46	4	2	7	7	6	2
Western Sibeira														
2000-2003	38	1	37					1	1	32	2	2		
Southern Urals														
1994-2003	12	8	4				6	6						
Eastern Volga and Western Urals														
1998-2000	4		3	1				1		1	1			
Total for Russia														
1994-2003	340	261	54	22	2	1	218	54	5	35	10	9	6	2

Table 3. Substrates of Saker nests in Russia and the original builders of nests.

Ural regions, however the Saker is almost non-existent here. This is rather mysterious. It is possible though, that these large Sousliks are not optimal quarry for the Sakers, and for optimal foraging the falcons need small and medium-size objects similar to Little Sousliks, Steppe Lemming and Brandt's vole. It is worth noting that within the breeding territories of Sakers in Bashkiria and the Chelyabinsk District, which are located north of the ranges of the Little Sousliks, the habitat always has a large pasture and a pond, and in the diet (apart from Large Sousliks) Water Vole (*Arvicola terrestris*), ducks (*Anas spp.*), pigeons (*Columba livia*) and corvids (*Corvus frugilegus*, *C. monedula*) are well represented. Similar species composition was found in the diet of the Sakers in the Lower Kama (Ushakova 1968). Bogdanov (1871) was convinced that waterfowl are the main diet of Sakers in the Volga districts. Sakers that specialize on large birds and Water Voles have a naturally different foraging strategy from those that feed on small and medium size rodents, and passerines. This latter is not applicable in areas outside the range of small and medium size rodents, so the falcons have had to adapt themselves to consumption of non-traditional quarry, which, in turn, limits their recovery within the former range.

Acknowledgments

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Editorial note

In this paper the authors use authentic terminology which refers to the administration division of Russia. Here an explanation of the terms. *District*- in this paper means current 'subject of federation' (Oblast'), i.e. area large enough to have representation in the Russian Parliament. Before 1917 these units were called "Gubernia". *Kray* – means a larger administrative division with more administrative powers. *Kray* and *Districts* have 'regions' "*Rayon*" which are smaller provinces within the 'subjects of federation'. Before 1917 they were known as '*uezd*'. *Nature Reserve* in this paper means "*Zapovednik*" or strict Nature Reserve, i.e. a territory which is set aside for the purpose of Nature conservation and has limited access to general public.

The Reference list for this paper you can find at the Falco electronic supplement together with the full text of the paper in Russian at our web site <http://www.falcons.co.uk/mefrg/karyakin.htm>



The highlander: the highest breeding Saker in the world.

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The continuing survey of the Asian Saker population is run by the Falcon Research Institute which is itself an initiative of ERWDA. Results of previous Saker surveys in China (Ming 2003, Xiaodi and Fox 2003) carried out in Xinjiang and Inner Mongolia returned exceptionally poor results. It can thus be reported that the Sakers in these regions are at extremely low densities, mostly resulting from routine contamination of land with pesticides over the past 30 years, as well as continued direct persecution of all wildlife as food source. The records of Przhevalskiy and Kozlova showed that Sakers were breeding in the highlands of Xijiang and Xizang. We also knew that Mongolian Sakers were wintering in these highlands on a regular basis. However there was no data on the current status of the Saker within the region, except for some reports from birdwatchers and professional ornithologists who occasionally visited the area.

Our field team had to work at heights exceeding 4000 m above sea level and faced administrative restrictions in travel across China caused by SARS (Severe Acute Respiratory Syndrome). Add to this the existing restrictions on entering the Xizang (Tibet) administrative region, the daily snowfalls, oxygen deficiency, icy or non-existent roads, and a widespread lack of ability by any hired driver to drive off-road, and you will see the problems faced in an otherwise comfortable China. Despite these difficulties we
Figure 1. Some Sakers in Tibet are not afraid of people.

were amazed to find a healthy population of Sakers. The elevation profile of our survey track with nests marked is given in Figure 2.

The Sakers in this elevated part of Asia depend a good deal on Pikas - a small-to-medium size lagomorph - as a food source. In the Tibetan Plateau there are a number of species available, however, out of the total 9 species of Pikas living in the highlands (Shaller 1998), the most important is the Tibetan (or Moupin) Pika (*Ochotona tibetana*) and Black-lipped (or Plateau) Pika (*Ochotona curzoniae*). These Pikas are believed to be a key species for both raptors and borrow-nesting birds in these elevated steppes (Lai and Smith 2003). Schaller (1998) determined that 90% of pellets under the nest of a Saker falcon (*Falco cherrug*) contained pikas. The Pikas prefer a very special type of habitat: rich grassland on top of peat underlain with permafrost. It is this peat that provides the Pikas with enough insulation in winter enabling them to survive freezing temperatures in this elevated terrain. The sandy soil of other habitats is not good for wintering Pikas as it frozen to the state of rock in winter, and therefore is avoided. It also appears that the peat land cannot be populated by Pikas every year: they might abandon a particular place for a number of years only to subsequently return in huge numbers. The local herdsmen consider Pikas to be pests and in some locations they are combated using various pesticides, which are sometimes spread from the air. In high altitudes the Pikas are not persecuted in the same manner mainly due to a lack of infrastructure in contrast to some areas at low-altitudes. The grassland habitat in these elevated steppes is dominated by *Centroides compacta* and *Carex moorcroftii*



Photo: Ma Ming and E. Potapov (incert)



Figure 2. The plateau, or Black-lipped Pika (*Ochotona curzoniae*).

grasses with a lot of un-vegetated surfaces. Amongst other mammals, we recorded Tibetan Hare, the den of Tibetan Bear, Argali (*Ovis ammon*), Blue Sheep (*O. pseudois nayaur*) and lot of Wild Ass (*Equus kiang*). Gazelles (*Procarpa picticaudata*), and Kiangs were seen almost everywhere, with occasional sightings of Tibetan Antelope (*Pantholops hodgsonii*).

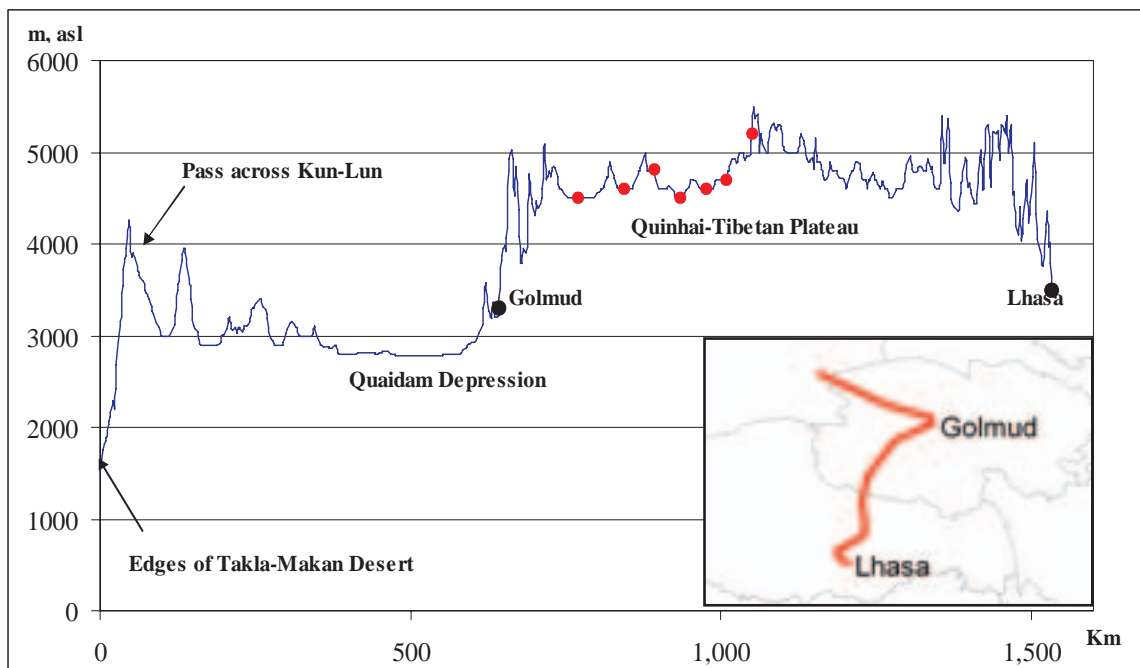
Almost without exception Saker nests were found in areas with a high density of Pikas, in all cases in the proximity of the peat-turf covered terrain. In most of the cases the Sakers used nests originally built by Ravens or Upland Buzzards. However, in contrast to the populations in Mongolia and Russia, there is a severe shortage of nesting material. Almost all our survey area was well above the upper limit of bush-like vegetation. Hence every item suitable for nest building was utilized including the bones of livestock, old cloth, parts of sheepskin and the wool of Yaks, pieces of wood picked up from roads, old footwear, and even car parts. Saker nests were placed most commonly on cliffs, followed by artificial structures such as bridges. The laying date showed

extreme variability: we recorded first day of lay on 15 May, whereas in some nests there were chicks hatching on 14 May. This suggests the span for breeding period as at least 29-32 days. The breeding density in some places is of sufficient quantity: in a study area of 1811 km² we found 5 active Saker nests thus giving the density of 2.3 pairs per 1000 km². Our allocated study area was not far from Wuolang village, on the road between Golmud and Lhasa. This is within the Chang Tang Nature Reserve where all animals, Sakers included, enjoy a high level of protection. The altitudes of the nest locations of Sakers across Tibet spread from 3900 m above sea level, with the highest being at 5200 m: this latter being the southern-most located nest of the Saker known to date – 32° 58' N.

It appears that on the Quinhai-Tibet plateau we have the most elevated population of Sakers in the world. The nesting habitat can be defined as elevated steppe with gentle (not more than 45° slopes) at an elevation of between 3900 and 5300 m with *Carex/Ceratoides* and *Stipa/Carex* complexes that form turf. This turf structure is important winter habitat for 9 species of Pikas living in Tibet, with the Pikas being of prime importance for the Sakers. On the basis of some primitive GIS calculations, I estimate that the area occupied by the terrain, within the limits of 3900-5300 m with slopes less than 45°, is 1070955 km². (In these calculations we used Digital Elevation Model, USGS with the resolution 1km per pixel.) Provided that only a third of the terrain is covered with the turf-underlain vegetation, and the estimated density of Sakers in one study area is 2.3 Sakers per 1000 km² of which 2/5 are breeding, the overall figure of the potential breeding population in the Quinhai-Tibet plateau is 985 breeding pairs. However this figure needs verification, as it is based on only one study area. We also do not have any information on the distribution and biology of the Saker in the most remote parts of the plateau.

The surveys of 2003 were carried out by the authors with tremendous help and support from the Institute

Figure 3. The altitude profile of the trip marked on the map in the insert. Light dots indicate Saker nests. On horizontal axis the odometer given as by GPS, vertical axis altitudes taken from Digital Elevation Map of the Globe, NOAA, National Geophysical Data Center <http://www.ngdc.noaa.gov/seg/topo/globeget.shtml>



of Zoology and Ecology, Chinese Academy of Sciences, Urumqi and from the Museum of the Quinhai-Tibetan Plateau, Xinin. We also thank Mr. Barturkhan of the Urumqi Institute of Zoology and Ecology for his help in the field and for his enthusiasm.

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Illegal trapping of falcons still continues in the Baikal region.

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Pribaikalsky National Park, Irkutsk, Russia

Russian conservation legislation and its enforcement is still not a sufficiently serious barrier to prevent illegal trapping of raptors. We hoped that the “Law on Protected Species” (see *Falco* 21) which was adapted in UAE might somewhat affect the illegal trapping in the area. However, despite the positive news, there is no decrease in cases involving Syrian trappers. The problem caused by these trappers has already been addressed (Ryabtsev 2001, *Falco* 20, 21).

On 11 September 2003 I found a dead Saker in the Pribaykaskiy National Park. Its feet were entrapped in nooses of the ‘pigeon jacket’. It had been dead for at least 2 weeks. A local herdsman told me that from August onwards he regularly sees a dark Niva” 4WD exploring the steppe. We also saw this car, but failed to catch it. On 21 September in the same region we found a pigeon with ‘jacket’ – i.e. with a frame fitted with nooses. The pigeon was flying well, and it was not possible to catch it. In order to prevent possible death of raptors we had to shoot the pigeon. Some time later we found the dark “Niva” 4WD and searched it under our license. There were two Syrian trappers in the car, at least 20 ‘pigeon jackets’, 12 pigeons, hoods, strings, and



Left: Pigeon with nooses. Right: dead Saker entangled in pigeon noose trap.

special sacks to pack falcons. Both men in the car were booked at the local Militia (Police) station.

In the autumn of 2003 I rarely visited the steppe area of the Pribaikalskiy National Park, but nevertheless I saw signs of illegal trapping in almost every trip. During one trip we found another ‘pigeon jacket’, already being used. Frequently we saw a pigeons with nooses on in the flocks of pigeons, that usually live at every herdsman camp.

It looks as if the illegal trapping, which by 2000 caused the 10-fold decline in the Baikal Saker population, still continues. In October-December in the National Park wintering gyrfalcons also get trapped. 🦅

Nesting conservatism in Peregrines at the Pechora Delta.

Glotov A.S., “Nenetskiy” State Nature Reserve.

The “Nenestkiy” State Nature Reserve has carried out a Peregrine Falcon monitoring programme since 1996. The search for nests has been done using a motorboat along rivers in the beginning of July, mostly at night when the majority of birds sit on their nests. In 1996 we surveyed 287 km of river banks within the reserve. In total we have found 6 Peregrine nests. The average inter-nest distance ranged from 15 to 18 km. The shortest distance between a nest and a settlement was 20-25 km. All recorded nests were located on river bends, on precipices from 7 - 22 m high, and some 30 to 60 cm below the upper edge of the precipices. All were scrapes within tussocks. Clutch size varied from 2-3 eggs. All nest-sites found in 1996 were re-visited in 2003 and were confirmed as active. In 1998 there were two additional pairs of Peregrines found within the same area, one of which was breeding. By 1999 both new pairs were breeding. In 2000 we found an additional 2 pairs and one single individual.

Between 1999-2000 only one of the 6 traditional pairs disappeared, and in 2001 that site was reoccupied.

The data from Peregrine Monitoring in the

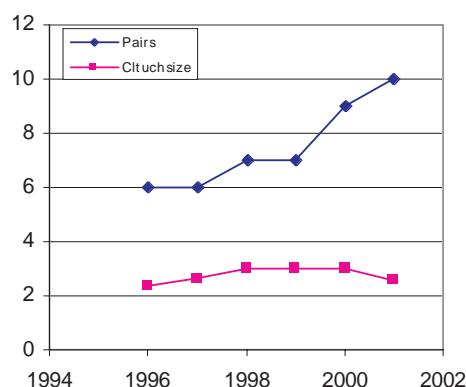


Figure 1. Numbers and clutch size trends.

Nenetskiy Nature Reserve shows once again that the peregrine nest sites are as conservative as they are elsewhere in the range. Numbers in the past years certainly show an increasing trend, and the average clutch size demonstrated a more or less stable trend with overall average 2.8 eggs per clutch (N=45). 🦅

Rapid Peregrine decline caused by hydroelectric dam.

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The Peregrine Falcon (*Falco peregrinus*) is listed in the Red Data Book of the Russian Federation (Danilov-Danielyan 2001) and of the Bashkortostan Republic (Kucherov 1987). The Southern Urals was a refuge territory where the species survived during the DDT era and perhaps has acted as a source population in the re-colonizing of the former part of the range in Eastern Europe and western Siberia. The examples of recent negative trends are rarely reported in scientific literature.

The numbers of Peregrines in Europe was estimated as 7600-11000 pairs, out of which some 1000 pairs were breeding in the European part of Russia. Out of these 1,000 pairs about 260 pairs breed in Bashkortostan Republic (Karyakin, 1998b; Heath et al., 2000). In 2002 the total numbers of Peregrines in Bashkortostan is estimated as 470-480 pairs, which is about 5% of the European Population and 34% of the European portion of the Russian population (Karyakin 2003). The major stronghold of the Baskir population of Peregrines is located in the Belaya

river valley, where we located 59 breeding territories (Figure 1) which are regularly occupied (Karyakin 1998a, 1998b).

The Belaya river valley is protected by several high ranking protected territories: The State Nature Reserve “Shul’gan Tash”; National Park “Bashkiria” and complex landscape Nature Reserve (zakaznik) “Altyn-Solok”. Within the territory under the question there is one Key Ornithological territory of international importance named “Bel’sko-Nugushkoe Confluence” (BC-008) (Heath et al., 2000). The territory has been nominated as a World Heritage Site (UNESCO). Nevertheless the high rank of protection status of the territory did not help. In 1999, breaking 20 laws and legislative documents of both Russia and the Bashkorstan Republic, it was decided to go ahead with the construction of the Yumaguskie water reservoir in the Belaya river valley. The construction work is ongoing at the time of writing.

During the construction work in 1999 a part of the river valley at the place where the river emerges from the mountain into the Russian Plain has been developed. As a result two nest sites with inter-nest distance of 870 m have disappeared. In 2000 the work has continued and by 2003 the valley of the river 50 km upstream had been cleared of

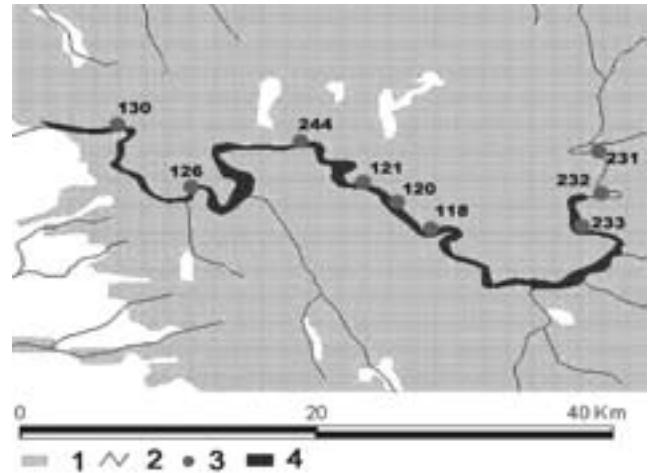
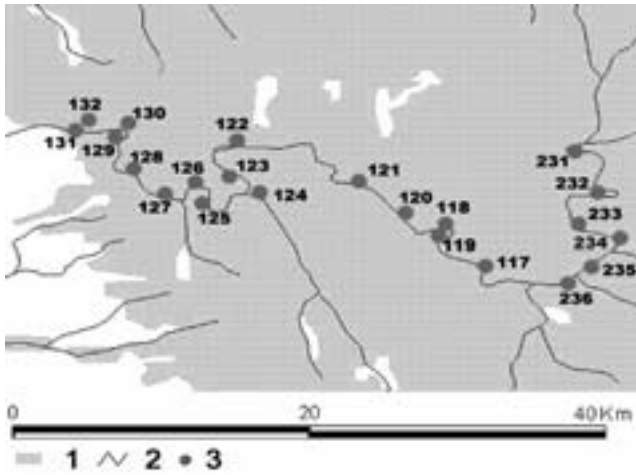


Figure 1. Left: Map of Peregrine nests distribution before flooding the reservoir. Right: Map of Peregrine nest distribution during the flooding of the reservoir in 2003. Legend: 1 - Forested areas; 2 - Rivers; 3 - Nest sites. *Editorial note:* We are not afraid to publish these locations as the population no longer exists after flooding of the valley.

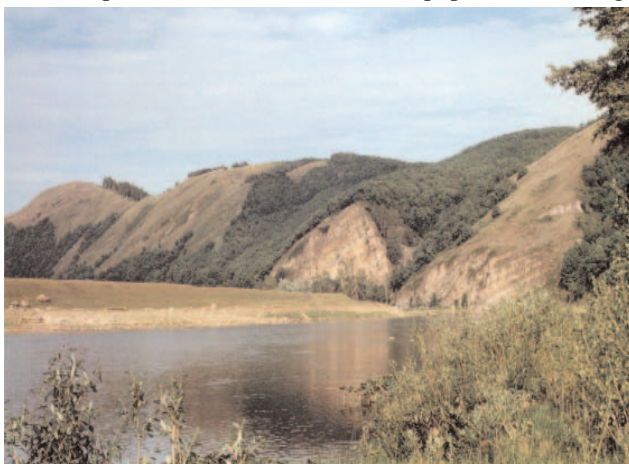


Figure 2a. Left: A peregrine site at the Belaya river before hydroelectric dam works started. Right: The same place (in the frame) during excavations in 2003 .

forests, as it will become the reservoir bed. The total area of forest clear-cuts, as estimated by the Landsat7 imagery and GIS processing was 18.04 km². The valley slopes had been cleared up to 60 m above the riverbed, both sides have new roads carved in for heavy construction vehicles. As a result a total of 20 breeding territories of Peregrines have ceased to exist.

In 1996 breeding occurred in 18 out of 20 pairs (only two pairs did not breed due to disturbance caused by construction). Breeding by 2 pairs of the remaining 18 was not successful, but a total of 34 fledglings left the nests of 16 pairs. After construction work 2003 a total of 14 breeding territories ceased to exist, one new breeding territory upstream of the reservoir site has been established, and only 6 pairs were breeding on their old territories (most of them in niches). Breeding by 5 pairs has been successful: they produced 10 fledglings. So the total toll of the construction is a decrease more than 3 times with a similar reduction in the breeding rate per total territory.

We noticed that the disappearance of 14 pairs of Peregrines from the Belaya did not lead to an increase in the numbers in the upper part of the river. Here only one new breeding territory was found. We believe that the limiting factor for Peregrines in the upper Belaya river is a high density of Eagle Owls (*Bubo bubo*) as well as a high density of Peregrines. It appears that the Peregrines uprooted by the reservoir construction had no place to go nearby.

In 2004 it is planned to fill up the newly constructed reservoir with water. This undoubtedly means that the remaining 6 pairs will be flooded. It is possible that after their the situation will settle. The Peregrines might re-occupy the cliffs above the newly formed reservoir, but the density will never be the same. We have indirect evidence in a similar situation, that has been developed at the Nugush Water Reservoir, which is located 7 km north of the Belaya River. We have surveyed old nest sites on the cliffs and compared this with the numbers after the reservoir had been filled up. The number of historic sites around the reservoir were twice as high than the numbers in 1996-98.

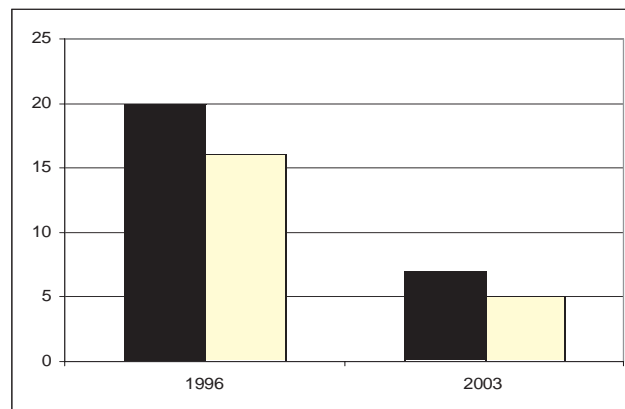


Figure 5. Number of Occupied (black columns) territories and number of breeding pairs before flooding (1996) and after flooding of the reservoir in 2003.

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Amyloidosis in Captive Falcons in the United Arab Emirates

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Introduction

During the last five years there has been an increasing number of falcons presented with advanced amyloidosis. The scale of the problem is difficult to quantify as there is a massive movement in falcons throughout the region resulting in a lack of clinical monitoring.

Many chronically ill cases are treated using traditional medicines and may not be presented to a veterinary facility. Most falcons that die in the Middle East are not presented for post-mortem examination. Amyloidosis cases are usually diagnosed after the moulting season when birds are presented for a pre-training veterinary examination.

Amyloidosis describes the extracellular deposition of a protein termed amyloid –AA in various organs as a result of chronic antigenic stimulation. The primary target organs in falcons are the liver, spleen and kidneys (Cowan 1968)

Methods

Twenty one advanced amyloid cases submitted to the Al Safa Clinic were investigated over a three year period.

Site of amyloid deposition

The majority of cases have amyloid deposits in the liver, spleen and kidney. The spleen and liver can be affected, but the kidney may be normal (Table 1). Falcons with renal amyloidosis tend to become ill and die suddenly compared to falcons where the amyloid is restricted to the liver. Many cases are found dead in the moulting room. Post-mortem examination often shows pericardial gout with renal, hepatic and splenic amyloidosis. A period of three to six months can be sufficient for the development of advanced amyloidosis. If there is no renal involvement the falcon tends to live for a longer period.

Table 1. Amyloid distribution in tissues from falcons. N = the number of falcon cases. Total N=21.

Organs affected	N
Spleen only	2
Liver, spleen and kidney	11
Liver and spleen. Kidney normal	6
Spleen and kidney. Liver normal	1
Liver only. Spleen and kidney normal	1

Table 2. Species distribution of falcons cases diagnosed with amyloidosis.

Species	%
Gyrfalcon	28.5
Gyr –hybrid	24
Saker	28.5
Peregrine	19

Species

Most cases are seen in large female gyrfalcons (*Falco rusticolis*) and gyr-hybrid falcons which are highly popular in falconry circles in the UAE (Table 2). Amyloidosis has been seen in peregrines (*F. peregrinus*) and saker falcons (*F. cherrug*), but gyrfalcons seem to be much more susceptible to the condition, possibly because they are more susceptible to pododermatitis and aspergillosis. Wild-caught gyrfalcons have a higher incidence of amyloidosis compared to captive- bred gyrfalcons (McKinney, 2002).

Age

Amyloidosis is usually seen in falcons which have been placed in a moulting chamber after their first flying season. Most cases develop within 3-6 months of the primary inflammatory process.

Predisposing disease

A history of chronic inflammatory disease is often associated with the onset of amyloidosis. The most common conditions are pododermatitis (bumblefoot), aspergillosis, and chronic trichomoniasis (Table 3). In a small proportion of cases no history of an inflammatory process is seen and the predisposing cause of amyloidosis is unknown. Reports of splenic amyloidosis in seagulls within one month of entering captivity suggests that maladaptation stress may also play a role in the pathogenesis of amyloidosis (Hoffman, 1985). Amyloidosis in ducks has been reported in association with *Escherichia coli* endotoxin (Ling et al., 1991) and further research is required in falcons.

Figure 1. Advanced amyloidosis and gout in a falcon.



Ante-mortem diagnosis

Falcons with advanced amyloidosis exhibit irregular or arrested feather moult and poor haemostasis following damage to growing feathers. This is usually seen when the falcon is in the molting chamber. Advanced cases tend to exhibit a rapid loss of body condition with severe anaemia, and raised levels of aspartate transaminase (AST), gamma glutamyl transferase (GGT) and bile acid (BA) levels. In 30% of amyloid cases the BA and AST levels are within normal ranges. High plasma iron and total protein levels are often seen in terminal amyloid cases when the liver is grossly enlarged (Figure 3). In less advanced cases blood biochemistries can be within the normal range, so diagnosis using organ biopsy and histopathology is essential.

Endoscopy

Care must be taken to avoid inadvertent liver puncture when performing endoscopy. The liver can be so swollen that the volume of the caudal thoracic airsac is greatly reduced. Definitive diagnosis is based on histopathological examination of H&E or Congo Red stained sections of liver or spleen or kidney tissue (Brassard 1965).

Figure 2. Radiograph showing advanced hepatic amyloidosis in a gyrfalcon.



Table 3. Diseases associated with amyloidosis in falcons. N = the number of falcon cases. Total N=21.

Primary inflammatory disease	N
Aspergillosis	9
Pododermatitis	3
Bacterial airsacculitis	3
Gout	2
No obvious disease found	3
Severe trichomoniasis	1

Treatment

The primary objective is to treat the underlying inflammatory condition. In man treatment with dimethyl sulfoxide-DMSO (Friman et al., 1996), colchicine (Garrido-Serrano et al., 2001). Low-molecular-weight heparins (Zhu et al., 2001) and dexamethazone (Palladini et al., 2001) has been reported with varying degrees of success. Some of these may have potential in treating falcons with amyloidosis.

DMSO given at a dose recommended for dogs of 80mg/kg s.c 3 times /week (Tennant, 2002) has been used in falcons at the Al Safa Clinic with disappointing results. All falcons with advanced amyloidosis died within six months of diagnosis. The lipid lowering agent fenofibrate has been shown to inhibit experimental amyloidosis in mice (Murai et al., 2002), but in a trial conducted at the Al Safa Clinic, no clinical improvement was noted in advanced amyloid cases.

Prevention

Prevention of the main diseases associated with amyloidosis i.e. aspergillosis and pododermatitis will directly reduce the incidence of amyloidosis. The role of stress in the development of amyloidosis is unclear. Maladaptation-stress of wild-caught falcons requires further research.

Early diagnosis and veterinary treatment of infections is essential to prevent the onset of amyloidosis. In gyrfalcons severely affected chronic aspergillosis cases which survive often develop amyloidosis within six months. Veterinarians expected to treat neglected cases should first check for amyloidosis before entering a protracted and stressful treatment regime.

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How do falcons contract a herpesvirus infection: preliminary findings?

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Falcon herpesvirus (FHV) causes a fatal disease in falcons, which is characterised by multifocal necroses of the liver and spleen. Microscopic lesions reveal characteristic milary necroses with intranuclear inclusion bodies (Wernery et al., 1999). Gyrfalcons and Gyr hybrids are highly susceptible to herpesvirus, whereas Peregrine falcons appear to be resistant (Redig, 1992). It is believed that pigeons, which are a major food source for falcons transmit the disease (Ritchie, 1995). However, the route by which the FHV is transmitted naturally has not been confirmed. There are doubts that falcons contract the disease orally. Heidenreich (1997) reported that feeding falcons herpesvirus-containing liver and spleen did not provoke the disease. Wernery et al. (1999) fed 2 Common Kestrels one quail each into which 1ml of a pathogenic falcon herpesvirus strain with a titre of $10^{4.75}$ TCID₅₀/ml was inoculated into leg and chest muscles. The 2

Kestrels did not develop any clinical signs and did not seroconvert, indicating that other routes of transmission exist. Further investigations by the same authors revealed that when Kestrels were infected ocularly and nasally they developed inclusion body hepatitis.

A new experiment was conducted with four Gyr hybrids. Three Gyr hybrids with chronic non-fatal aspergillosis were infected with the same herpesvirus and with the same titre through eyes and nares. All 3 falcons died in April 2003, 6 and 8 days after infection with typical inclusion body hepatitis. The 4th healthy Gyr hybrid was fed a quail into which 1ml of herpesvirus was injected and it did not show any clinical signs. Ideally this experiment should be repeated with a larger number of healthy falcons and use control birds. However, despite these limitations this preliminary trial suggests that falcons do not contract the disease orally, but most probably become infected through the nasal and/or ocular routes. One can imagine that during feeding on a prey contaminated droplets may spread to eyes and nares. This interesting finding may also indicate that a nasal or ocular vaccination with the attenuated her-

pesvirus vaccine DuFaHe might be possible (Wernery et al., 2003).

During the last experiment on falcons we also infected a Lesser Spotted Eagle subcutaneously with a pathogenic herpesvirus using the same virus concentration, which has killed the falcons. The eagle did not show any clinical signs and did not seroconvert. It seems that eagles may be refractory to the FHV, but trials on more animals would be needed to confirm this observation.

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Recent data on Saker smuggling in China

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Between 2nd and 27th October 2003, a group of illegal Saker trappers sneaked into Gansu Province, China. It was reported that there were three men in the group. They came from Peshawar, Pakistan. It is known there is a major falcon market in Peshawar, whereas Karachi is the hub for their eventual export from Pakistan (Mukhtar Ahmed 2003). Other group of 3 Pakistani men with 3 Sakers were caught by policeman in Kunjerab Pass, as reported by the of Xinjiang Radio Station in 30 November 2003.

On 27th Oct., the local police arrested one man on the Turpan to Korla highway (the other two men escaped). The arrested man was transporting 7 Saker falcons by taxi. All were wrapped in plain white cloths and their eyes had been sewn up. The police approached the Xinjiang Institute of Ecology and Geography CAS to positively identify the species and to help in filing the incident. It was suggested that the falcons be released back into the wild. The arrested person (and his colleagues) had trapped the Sakers in the Jiu-quan Area (39°50'N, 98°20'E; altitude c. 1500 m), Gansu Province, which is an important area on the migrating route between Mongolia and Tibet (Potapov and Fox, 2002).

Four of the confiscated Sakers had bright yellow or orange/yellow feet and three had grey blue feet. We know that colour variation in the feet of the Mongolian population is huge. Blue feet can be found in very young Sakers where-



Year	1993	1994	1995	1997	1998	1999	2000	2001	2002	2003
Cases	5	8	1	4	3	6	5	1	2	3
Numbers	50	105	8	71	41	114	128	42	11	9

Table 1. Number of cases of illegal trapping of Sakers during 1993 to 2003 in China

as yellow feet are a sign of Sakers of one year or more. If the feet are very yellow, it is as a result of a very good and well-balanced diet (or depends on the level of karatinoids pigment).

Table 1 gives the numbers of cases of illegally caught Sakers in China (Ma 1999, 2003; Wan 2001,2003). There is a decrease in the number of recorded incidents since 2001 that may be explained by the following reasons:

A change in the means of transport. Foreign trappers and smugglers no longer use airplanes or trains to cross the Chinese borders: they go by taxi, and always alone. It is difficult to detect them nowadays.

A change in the trapping area and smuggling route. Recently groups have come not only to trap in Xinjiang, western China, but they have also penetrated other Muslim ranges in the centre of China, e.g. Qinghai, Gansu, Ningxia etc., from border areas moving inland along the bird migration routes.

Punishments imposed by China today are stricter than other countries, and several poachers and smugglers have been sentenced to many years or life imprisonment, and even to death.

A total of 8 Sakers were set free near Urumqi by the local police station on 29th October, 2003. But some birds were not able to fly any great distance. If people continue trapping Saker falcons in the Central Asia, the population will face a serious crisis.

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A Review of Neurology in Birds of Prey

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Introduction

The main features of the bird's neuroanatomy are:

Meninges: pia mater, arachnoid and dura mater.

Lissencephalic brain: Olfactory bulbs and cerebral cortex are underdeveloped. Corpus striatum is well developed, therefore instincts dominate animal behaviour. Pineal body is located in the diencephalons and is involved reproduction, migration and circadian rhythms.

Optic lobes very well developed and located in the midbrain.

Cerebellum: coordinates movement

Pons: underdeveloped.

Cranial nerves correspond to those found in mammals.

Spinal nerves: brachial, lumbar, ischiatic and pudendal plexus.

Neurological Examination

The objectives of a neurological examination are to find out whether the neuropathy is focal or diffuse and to localize any focal lesions. The bird should first be observed from a distance and subdued lighting should be used during the clinical examination using a towel or falconer's hood as appropriate.

The evaluation of the nervous system should be performed consistently and logically:

Anamnesis: a complete history that includes questions pertaining to the nervous system.

Mentation, posture and movement assessment: the owner or keeper reports the mental status and level of consciousness during the anamnesis. Neurological signs include: disorientation, depression, restlessness, tremors, head tilt, ataxia, limb deficit or abnormal posture of the limbs, circling, abnormal trunk posture, falling off the perch, paresis and paralysis. Seizures may suggest an intracranial lesion. Postural evaluation includes the placing and postural reactions. Motion evaluation includes assessing if the bird walks or flies into objects, is incoordinated and is unable to use its limbs.

Cranial nerves: I olfactory system is very difficult to evaluate.

II, III, IV, VI: visual system. An ophthalmologic examination is essential to detect neurological abnormalities. The pupillary light respond evaluates II and III, but the pupillary constriction and dilatation is voluntary in birds. Anisocoria may indicate a lesion of III.

II, V, VII: menace reflex, the lack of reflex does not necessarily indicate dysfunction. V: facial sensation, movement of the mandible and blinking of the eyelids. Diminished beak strength may indicate dysfunction.

VIII: vestibulocochlear. Dysfunction causes deafness, head tilt, nystagmus, circling and loss of balance.

IX, X: pharynx and larynx sensation and movement. Dysphagia may indicate a lesion.

XII: tongue movement.

Spinal reflexes: including wing withdrawal, pedal withdrawal, crossed extension and cloacal reflexes.

Muscle tone: lesions of UMN system cause increase muscle tone. The muscle tone can be decreased with both UMN and LMN lesions.

Sensory system: flexor reflex of the limb to a painful stimulus. Severe spinal cord disease is associated with a loss of deep pain reflexes. Pricking stimulus along the trunk is helpful to localize the lesion along the spinal cord.

Diagnostic tests include: haematology, biochemistry, microbiology, serology, parasitology, toxicology, radiography, electroencephalopathy, electromyography, electroretinography, CT and MRI.

CNS neuropathies

Metabolic diseases: Hepatic encephalopathy and renal disease. Treatment is symptomatic.

Nutritional diseases:

Hypoglycaemia: common in small birds with a high metabolic rate or in birds with impaired hepatic function. Glucose can be given orally or IV, IO, SC, IP, also IV using a 10% dextrose solution 1ml/kg (Beynon et al. 1996). Hyperglycaemia also can occur during the initial stages of training.

Thiamine deficiency: common in fish-eating birds of prey. Opisthotonos may result from paralysis of the anterior muscles of the neck. Thiamine can be administered IV or IM 0.25-0.5mg/kg (Ward 1971) followed by a continuing oral dose of 25-50mg/kg daily (Forbes 1981).

Hypocalcaemia: following nutritional osteodystrophy and hyperparathyroidism. Start treatment with IV 10% calcium 1-5ml/kg, followed by correcting Ca:P:D3 ratio in the diet.

Infectious diseases:

Bacteria producing bacteraemia, septicaemia or toxæmia and bacterial sinusitis. Treatment: systemic antibiotics and fluid therapy.

Paramyxovirus: raptors are considered low to moderately susceptible. The diagnosis can be confirmed by serology or virus isolation from the bird or its prey. Symptomatic treatment. A PMV vaccine is available.

Trichomonas: common in owls when ears, nasal cavity and brain involved. Diagnosis detection of flagellates in fresh, wet preparations or stained smears. Treatment: metronidazole 50mg/kg orally once a day for 5 days and topical treatment and debridement of the oral lesions (Samour et al. 1995).

Sarcocystis sp.: reported in a goshawk (*Accipiter gentilis*). Difficult to diagnose in live birds, (Post mortem and immunohistochemistry are needed) (Aguilar et al. 1991).

Toxicoses:

Lead: the most common poisoning seen in raptors, first signs include leg weakness, the bird rests on its hocks with medial rotation of the feet. Treatment: sodium calcium edetate 10-40mg/kg twice a day for 5 to 10 days, gastric lavage if necessary and supportive treatment. Other heavy metals associated with raptor poisoning include zinc, cadmium, and mercury.

Pesticide poisoning: strychnine, alphachloralose, organochlorines, organophosphates and acetyl cholinesterase. Post mortem toxicology gives the definitive diagnosis in these cases. Treatment is symptomatic, for acetyl cholinesterase atropine 0.1mg/kg IV or IM every 3-4 hours have been proven to be effective.

Trauma: clinical signs may include head tilt, tremors, seizures, ataxia, paresis or paralysis and may depend on the severity of the traumatic incident. Treatment is supportive. Corticosteroids (dexamethasone 1mg/Kg IM or SC, prednisolone 2-4mg/kg IM) on a very short-term basis due to side effects. The use of diuretics may be beneficial for head trauma cases.

Supportive treatment for birds presenting CNS neuropathy involves maintaining the bird in a dark, quiet and cool room, if seizures are present use benzodiazepine (midazolam 0.5-1mg/kg IV or IM is preferred to diazepam 0.5mg/kg IV or IM), fluid replacement therapy, empirical course of antibiotics and B vitamin complex may also be administered.

PNS neuropathies

Nutritional diseases:

Vitamin E and Selenium deficiency: straddle legs, weakness and limbs paralysis observed. Treatment is vitamin E 3.4 iu/bird and selenium 0.05mg/bird.

Riboflavin (vitamin B2) deficiency: curled toe paralysis and atrophy of musculature of the legs. Treatment is B vitamin supplementation in the food, sometimes confused with hypovitaminosis E, consequently treat for both conditions.

Thiamine (vitamin B1) deficiency: causes partial or complete paralysis of the legs. Treatment is vitamin complex supplementation in the food.

Infectious diseases:

Marek's disease: commonly the sciatic nerve is affected and appears enlarged, oedematous and grey colour. MDV infection causes a lymphocytic infiltration and proliferation of the peripheral nerves resulting in paresis or paralysis.

Aspergillus sp.: *Aspergillus fumigatus*. Lesions involving the PNS include pyogranulomatous inflammation and necrosis of the vertebrae, sacral plexus and soft tissues including the sciatic nerve. Mycotoxins have been reported to affect the nervous system. Appropriate antifungal treatment should be given.

Toxicoses: dysmetria and ataxia observed. See CNS toxicoses.

Trauma

Brachial plexus avulsion: Paralysis of the wing affected and muscle atrophy. No specific treatment, amputation of the affected wing may be an option.

Spinal cord injuries.

Posterior paresis due to pressure: result of adrenal, renal or gonadal enlargement or neoplasia. Other space occupying lesions such as egg binding may result in a peripheral neuropathy.

Iatrogenic: damage of the brachial or sciatic nerve following surgery and injections.

Post-Mortem examination

A high proportion of bird with neuropathies will die or will have to be euthanased. It is important that a post-mortem examination and full laboratory investigations are performed. Because of quick autolytic changes in the nervous system, it is essential to take the samples immediately after death.

Brain material should be taken for histopathology, microbiology and toxicology.

Portion from cervical and lumbar vertebral column.

Peripheral nerves should also be taken: sciatic or brachial nerve. If thiamine deficiency is suspected the vagus nerve should be taken.

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What's new in the literature

Love, O.P., Bird, D.M. and Shutt, L.J. (2003) Corticosterone levels during post-natal development in captive American kestrels (*Falco sparverius*). General Comp Endocrinol. 130(2):135-41.

We investigated post-natal development of the adrenocortical stress-response system in captive American kestrels (*Falco sparverius*) by measurements of baseline and stress-induced levels of corticosterone at ages 10, 16, 22, and 28 days post-hatching. Baseline levels of corticosterone increased significantly during post-natal development and although chicks aged 10- and 16-days old exhibited comparable baseline corticosterone levels, those of 22-day-old chicks were significantly higher and those of 28-day-old chicks close to fledging were higher than all younger groups. Chicks in this study exhibited low levels of stress-induced corticosterone early in development and did not exhibit adult-type stress-induced levels of corticosterone until 22 days of age post-hatching. Finally, although baseline and stress-induced levels of 28-day-old birds were significantly higher than one-year-old adults, there was no relationship between baseline corticosterone concentrations and time to nest departure. The fact that baseline levels of corticosterone are low during early development and then increase during later development may be an adaptation to the negative effects of chronically elevated corticosterone levels and as previously noted in other studies may minimize these negative effects on rapid growth and development in young birds, potentially maximizing normal growth. The ability of even young kestrel chicks to elevate corticosterone levels in response to stress suggests that they may be able to physiologically cope with food shortages associated with unpredictable food resources which wild kestrels often face.

Horowitz, I, Lublin, A, Mechani, S, Banet-Noach, C, Green, M and Sobel, A 2003. Migratory Raptors as Disease Vectors. Proceedings of the 6th Raptor World Conference in Budapest, Hungary

Raptors migrating from country to country and across continents may carry various pathogens in their bodies which may influence the health of wildlife, agriculturally important domestic animals and even humans. Establishment of baseline information on the health of raptors migrating over Israel is an important tool for good medical diagnosis. Since 2002 we collected samples from 136 birds from 25 species of raptors. The samples were collected from ill or injured raptors brought into the Israeli wildlife hospitals (Safari Ramat Gan and Abu-Cabir Tel Aviv) for medical treatment and birds of prey captured in the field

during wild bird surveys. Cloacal and tracheal swabs were sampled for bacteriology, virology and mycology; blood samples were taken for chemistry and blood parasites. The main goals of this project were to establish: baseline information on the health of wild birds migrating over Israel; protocols for collection of information which can be accumulated on computer to form an accessible data base; an early warning system using migrating raptors for sudden potential epidemiological problems; an international communication network among clinics located along the migratory path to collect and disseminate information on epidemiology; tissue bank for collecting and freezing biological samples such as serum, feather parts, ectoparasites and other body parts (from dead animals). Such an accessible database will enable us to identify and diagnose epidemiological problems and processes of disease transmission along the migratory path.

Paperna, I and Igal Horowitz, I. 2003. Blood Parasites of Birds of Prey treated in the Wildlife Clinics in Israel. Proceedings of the 6th Raptor World Conference of WWGBOP in Budapest, Hungary

A long term study of blood parasites of birds of prey began in Israel in 2002, with the following objectives: (i) to identify (to specific level) the haemosporidian parasites (avian malaria) infecting both resident and migrant species; (ii) to examine the relationship between the parasitofauna of resident and migrant birds, and (iii) to examine the relationship between bird condition and infection burden. To obtain meaningful conclusions on host – parasite relationships, in the context of bird migration, it is essential to perform a precise taxonomic analysis, as in the present study, since the definition of species and the limits of host specificity of haemosporidians is still controversial. The birds in the study were brought to the clinics because of traumatic injuries or sickness. So far we have examined blood smears prepared from 73 raptors of 23 species, of these 12 (16.5%) was found positive.

Leshem, Y. and Atrash, I. 2003. Birds of Prey as a Bridge between People in Conflict Areas: the Great Rift Valley and Middle East Test Case. Proceedings of the 6th Raptor World Conference of the WWGBOP in Budapest, Hungary.

The Middle East, located in junction of three continents, Europe, Asia and Africa, and the Great Rift Valley are bottlenecks of a global for the study of the migration of birds of prey. The authors developed a personal conservation and educational programme "Migrating Birds Know

No Boundaries” which became a great success, even in these days of conflict and aggression. A Website was developed - www.birds.org.il - and about 260 schools from Israel, Jordan and the Palestine Authority follow migrating birds of prey, storks and cranes with satellite transmitters and on-line radar data, and the students use a curriculum to learn about conservation problem of migrating birds. The six years project was sponsored by US-AID, MERC. With the help of the UNESCO World Heritage Centre, UN Foundations, UNEF and other global organizations we are trying to initiate a new concept to get together 22 countries along the entire Great Rift Valley, and to develop the same concept from a regional to a global level, including more important issues to protect the world’s nature and culture heritage.

Horowitz, I., Bellaiche, M. and Shlosberg, A. 2003. Safety of Atropine and 2-PAM in Birds. Proceedings of the 6th Raptor World Conference in Budapest, Hungary.

Organophosphorus and carbamate insecticides are commonly used in Israel and over much of the world. Raptors at the top of the food chain are especially susceptible. In birds, these life-threatening anticholinesterase toxicants present clinical signs that can resemble other bird diseases, in contrast to mammals where the symptoms are clear and often diagnostic. Precise and rapid diagnosis and the correct antidote can save the intoxicated bird. However when wild birds are found with a suspicion of intoxication, there is often a prolonged timelag until they can be brought to a hospital or rehabilitation center for laboratory tests and treatment. When potentially fatal intoxication is suspected in the field, it would be useful to have immediate first aid treatment with a safe antidote. This study investigates the safety of very high dosages (compared to mammals) of the antidotes atropine and 2-PAM. Non-poisoned raptors, which were designated for euthanasia for various health reasons, were injected with high levels of the antidotes with no clinical signs manifested. The significance of this for first aid treatment in the field is paramount. It means that when a suspected intoxicated bird is found, the antidotes can be administered safely with no additional harm to the bird, even before receiving the toxicology diagnosis. Verification of the impact of atropine and 2-PAM on various organs of the bird, was examined in three domestic bird species. The analysis consisted of measuring blood enzyme changes after the treatment. There were no significant changes that could show organs’ damage.

Risebrough, R.W. 2003. Population Collapses of Three Species of Gyps Vultures in the Indian Subcontinent: An Overview. Proceedings of the 6th Raptor World Conference in Budapest, Hungary.

Only a disease factor new to the host populations, or a genetic modification of a previously benign factor, can adequately explain the pattern of mortalities and population collapses of three species of Gyps vultures in the Indian Subcontinent. Circumstantial evidence suggests a beginning as early as the late 1980s. A western movement into Pakistan has been documented since 2000 and the decline appears to have occurred later in north-eastern India than in

northern and central India. The local eradication of host populations by newly-arrived disease factors is a rare event, but extinction must be considered as a possible outcome of the present endemic. The information obtained in current research programs and from observations of vultures throughout the Subcontinent might therefore be carefully evaluated for evidence that small healthy populations of each of the three species have survived and are no longer subject to high mortality rates. In the absence of such information, artificial incubation of eggs laid in the wild in two or more facilities appears now to be the fallback position among conservation priorities, in spite of the possibility that the eggs may not be free of the disease factor. Young birds produced at such facilities might then be distributed among other institutions for captive breeding.

Gilbert, M., Virani, M.Z, Watson, R., Oaks, J.L., Ahmed, S., Chaudhary, J. Arshad, M. Mahmood, S., Ali, M. and Khan, A.A. 2003. The decline of the Oriental White-backed Vulture, *Gyps bengalensis* in Punjab Province, Pakistan: a three-year update. Proceedings of the 6th Raptor World Conference in Budapest, Hungary.

Declines in the populations of the Gyps vultures of the Indian subcontinent have been widely documented; however, little data has been presented on the rates and patterns of mortality at vulture breeding sites over time. This long-term study aims to address this deficit by providing data on the mortality rates and patterns through the continuous monitoring of three large colonies of Oriental White-backed Vultures *Gyps bengalensis* (n=758, 413, 445 breeding pairs in 2000) within the Punjab Province, Pakistan, over consecutive breeding seasons. The activity and productivity of nests within fixed study sites was determined over three breeding seasons. All dead vultures were collected and removed from transects during the breeding and non-breeding seasons. Mortality of adult vultures at each site has continued at a rate indicative of a population in decline. Numbers of active nests at the three study colonies have declined by 33%, 88% and 97% from the 2000/01 – 2002/03 nesting seasons.

Prakash, V., Pain, D.J. and Cunningham, A.A. 2003. The “Vulture Rescue” Team’s Conservation Programme. Proceedings of the 6th Raptor World Conference in Budapest, Hungary.

Monitoring of White-backed (*Gyps bengalensis*) and Long-billed (*Gyps indicus*) vultures at the Keoladeo National Park World Heritage Site by the BNHS throughout the 1980s and early 1990s showed a >95% decline (Prakash 1999). At the request of BNHS, RSPB sponsored scientists from ZSL to visit India in 1999 & 2000 to evaluate the situation. Repeat nationwide surveys by BNHS supported by RSPB in 2000 showed a similar situation to be present throughout India (Prakash et al. 2003). RSPB-supported surveys by Bird Conservation Nepal indicate that the same problem has occurred in Nepal. Results from studies by the BNHS suggest the declines in India do not result from food shortage, habitat loss or persecution. In 2001, a consortium consisting of BNHS and the Poultry Diagnostic & Research Centre in India, and the RSPB, ZSL (IoZ) and the NBPC in the UK, obtained British Government funding to (i)

investigate the causes of decline through setting up a Vulture Care Centre and diagnostic laboratories in India, (ii) conduct annual nation-wide surveys and colony monitoring, and (iii) produce a recovery plan. The CSIRO Australian Animal Health Laboratory is collaborating with the diagnostic work. Since the project's inception, nation-wide monitoring (so far up to 2002) has demonstrated that *Gyps* vultures are continuing to decline at an alarming rate; the declines have been shown to be due to abnormally low reproductive success and abnormally high mortality rates of all age classes; very fresh carcasses have been collected throughout the country and systematically examined; epidemiological and pathological observations indicate the declines to be due to an infectious disease. A Vulture Care Centre, incorporating a diagnostic laboratory, has been built and was inaugurated in February 2003. Preliminary results from sick vultures housed at this centre appear to endorse the infectious disease hypothesis. In recent years, unprecedentedly large numbers of migratory Eurasian Griffons (*Gyps fulvus*) have been found overwintering in northwest India. This has led to concerns that these birds may act as a conduit for the rapid spread of the agent outside South Asia. We are currently satellite-tracking both *Gyps fulvus* and *Gyps himalayensis* (another migrant) to investigate potential routes of spread. To address the scale of this problem both within and outside India, a formal collaboration, "Vulture Rescue", has been established between the RSPB, ZSL and BNHS. This is not an exclusive collaboration and we hope that through this venture, awareness and funds will be raised to help address conservation priorities, and that many other organisations will be stimulated to participate. Over the next three years, we plan to investigate routes and rates of spread within India and across *Gyps* range States in Central Asia, the Middle East, Europe and Africa in collaboration with 15 national NGOs and Governmental organisations. In addition, we recognise that in-country captive breeding is an important component of a recovery programme, and plans are underway to establish a series of captive breeding centres throughout South Asia.

Lindsay Oaks, J., Rideout, B. and Meteyer, C.U., Gilbert, M., Virani, M. and Khan, A. 2003. Diagnostic Investigation of Vulture Mortality: Punjab Province, Pakistan, 2000-2002. Proceedings of the 6th Raptor World Conference in Budapest, Hungary.

Excessive mortality rates in White-Backed Vultures (*Gyps bengalensis*) in the Punjab Province of Pakistan have been documented, and the majority of these deaths (~ 80%) have been associated with the clinical syndrome of renal failure (visceral gout). Veterinary diagnostic investigation into the causes of death was initiated in November, 2000. The results of this investigation will be presented, and will summarize the data for 56 cases for which complete necropsies have been performed. Among the 21 cases that did not have renal failure, the cause of death could be documented in 16 (76%) of the birds and included trauma, gunshot, lead poisoning, intestinal foreign bodies, and organophosphate poisoning. Among the 35 cases with renal failure, the cause of death could be documented in only 2 (6%) of the birds despite extensive testing including histopathology, toxicology, bacteriology, virology, and electron microscopy. These data, in conjunction with anecdotal reports that renal failure is not a common disease in *Gyps* vultures, suggests that the

renal failure syndrome is most likely due to a single, as yet unidentified, etiology. With the exclusion of the typical recognized causes of renal failure in wild birds, the approach to searching for non-conventional etiologies will also be discussed.

Eden, P. (2002) Haematological Changes with Disease in Red Kites (*Milvus milvus*) with Particular Reference to Lead Poisoning. Unpublished MSc project, Royal Veterinary College and Zoological Society of London.

Haematological parameters and blood lead concentrations were investigated in a group of Red Kites involved in the Red Kite Reintroduction Program in the United Kingdom. Fresh blood samples were obtained from red kites selected for release in 2002 as part of their routine health examination prior to release. Samples were analysed for the standard haematological parameters using various techniques. Existing data from Red Kites previously involved in the release program was also utilised. The resulting data was found to have non-Gaussian distribution on frequency histograms, resulting in non parametric methods being used in the analysis. Reference ranges were established for the various haematological parameters across all data as well as for different age and gender classes. All parameters except for leukocytes were similar to other references, with leukocyte parameters being greater than those from other sources. Comparisons were made for the parameters between the different age and gender classes to investigate for significant differences, with the main significance found being a difference in the erythrocyte parameters between young and adult Red Kites. Haematological changes to various diseases were discussed in relation to the reference range established in this study. Investigation was also made into the background level of exposure to lead by examining blood lead concentrations. The median lead level was 0.62µmol/l, similar to that previously found in other species. Examination of the relationship of blood lead concentrations to haematological parameters through examination of scatter plots suggests a negative relationship between blood lead concentrations greater than 2-3µmol/l and erythrocyte parameters.

