round (e.g., Sweden, Hungary and Poland). However, in Finland, females with pups are protected in May, June and July, and in Belarus hunting is allowed from 1 October to the end of February. In Japan, hunting/trapping of the species requires a licence or other form of permission and can only occur within the designated hunting season (November 15 to February 15). The raccoon dog on Mukojima island (18.4km^2), Hiroshima prefecture, is designated as a natural monument under the Law for the Protection of Cultural Properties, and permission from the Director-General of the Agency of Cultural Affairs is required for capturing the animals on the island.

Conservation measures taken There have been no conservation measures developed for the raccoon dog to date.

Occurrence in captivity

In Japan, around 40 zoos hold captive animals and successful breeding has been reported (e.g., Kobe Municipal Zoo). Captive raccoon dogs still exist on fur farms in Finland.

Current or planned research projects

In south-east Finland, K. Kauhala (Finnish Game and Fisheries Research Institute) is heading up a radio-tracking study. The aim of the study is to examine the home range size, use and overlap of raccoon dogs, red foxes and badgers, and interactions between individuals of different species in order to build a model of how rabies might be spread in the Finnish environment. Domestic cats are also included in the study.

In Japan, M. Saeki (Wildlife Conservation Research Unit, University of Oxford, UK) recently completed a study on the ecological and conservation issues of the raccoon dog, including habitat ecology, home range, movements, road kills, and agricultural damage in Japan (fieldwork in Chiba Prefecture). Ecological studies on the species and other medium-sized carnivores are continuing in the countryside.

Y. Sonoda (Meiji University, Japan) has undertaken investigations into suburban raccoon dogs in the Kanagawa Prefecture, concerning placement of protected areas for the species, habitat use, and road kills.

M. Kishimoto (Wildlife Management Office, Inc, Japan) has surveyed the distribution of latrines in order to analyse environmental factors used by the raccoon dog and to establish a large-scale survey method (in Hyogo, Tokushima and Kyoto Prefectures).

Gaps in knowledge

Although basic ecological studies on the raccoon dog have been conducted in Japan and in Finland, they were sporadic in several small study areas. There are no data available on the structure or demographic trends of the total population in Japan. Also, little is known about geographical genetic variation. In order to establish long-term conservation plans, extensive and intensive research is crucial. In addition, DNA studies to clarify the taxonomic status of the subspecies *N. p. viverrinus* and *N. p. albus* are needed.

Core literature

Ikeda 1982, 1983; Judin 1977; Kauhala 1992; Kauhala *et al*. 1998a,b,c; Saeki 2001.

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5.5 Corsac *Vulpes corsac* (Linnaeus, 1768)

Least Concern (2004)

A. Poyarkov and N. Ovsyanikov

Other names

English: corsac fox; **French:** renard corsac, corsac; **German:** steppenfuchs, koraskfuchs; **Russian:** corsac; **Indigenous names:** Gobi Mongols: kirassu (Mongolia); Mongolian: kirsa, kiresa (Mongolia); Kalmic: bagata (Russian Federation); Tatarian: khorsic, corsac (Russian Federation); Kazach: karsac (Kazakhstan); Turkmenian: gorsac (Turkmenistan).

Taxonomy

Canis corsac Linnaeus, 1768:223. Type locality: "in campis magi deserti ab Jaco fluvio verus Irtim"; restricted by Ognev (1935) as " USSR, N. Kazakhstan, steppes between Ural and Irtysh rivers, near Petropavlovsk" (in Honacki *et al*. 1982).

It has been suggested that *Canis eckloni* described by Przhevalski (1883) from Northern Tibet is a subspecies of the corsac (Ellerman and Morrison-Scott 1951). However, *Canis eckloni* is in fact a junior synonym for *Vulpes ferrilata* (Geptner *et al.* 1967). This confusion probably originated from earlier work by Przhevalski referring to the latter as "corsac".

Chromosome number: 2n=36, FN=72 (Aristov and Baryshnikov 2001).

Description

The corsac is typically vulpine in appearance. Males slightly bigger than females (Table 5.5.1), but sexual dimorphism not pronounced. Head greyish-ochre or brown, ears banded brown on front side, back of ears ochre-grey or reddish-brown. Breast, belly, and groin white or slightly yellowish. Front of fore legs light yellow, rusty-yellow on sides; hind legs similarly coloured, but paler. Summer fur short and scarce; winter fur dense, soft and silky, straw-

Table 5.5.1. Body measurements for the corsac.

	Northern Kazakhstan (Kadyrbaev and Sludskii 1981)	Turkmenistan (Scherbina 1995)
SK male	113mm (105–119) n=22	106mm (99–115) n=6
SK female	106mm (101–109) n=10	105mm (102–112) n=3
BL male	500mm (450–560) n=22	562mm (499–595) n=9
BL female	490mm (450–500) n=10	
T male	270mm (250–300) n=22	224mm (190–245) n=9
T female	265mm (250–300) n=10	
E male	68mm (60–75) n=22	(50–65)mm n=9
E female	68mm (60–75) n=10	
WT male	2.75kg (2.5–3.2) n=22	1.92kg (1.6–2.8) n=9
WT female	2.1kg (1.9–2.4) n=10	

greyish with ochre, brownish along the backbone line. Awn hairs tipped silver-white. Tail about half body length or slightly more, greyish-brown, covered with dense bushy hair, tipped in dark often even black. Skull similar to that of red fox (*Vulpes vulpes*), but smaller, shorter and wider, and with canine teeth more robust. The dental formula is 3/3-1/1-4/4-2/3=42.

Subspecies There is marked geographical variation. The following subspecies are defined within the former USSR (Geptner *et al.* 1967):

— *V. c. corsac* (northern part of range to PredAltai steppe, not expanding further southward than the latitude of the northern end of Aral Sea)
— *V. c. turcmenica* (plains of Middle Asia and Kazakhstan, northern Afghanistan and north-eastern Iran). There is supposedly a wide area of overlap with *V. c. kalmykorum.*
— *V. c. scorodumovi* (Russia's Transbaikalye, Mongolia and China)
— *V. c. kalmykorum* (Volgo-Ural steppes and right side of Volga basin).

Similar species Red fox (*Vulpes vulpes*): almost twice as large; lips and front of lower jaw white, back of ears darkly brown or even black; legs with dark brown or black markings; tail-tip white.

Tibetan fox (*V. ferrilata*): slightly larger; usually with two dark stripes on both sides of neck; flanks greyish, contrasting with belly; tail-tip white.

Indian fox (*V. bengalensis*): back of ears light sandy-greyish; legs uniform colour, lacking any black markings; black tail-tip.

This species may also possibly be confused with Blanford's fox (*V. cana*) and Rüeppell's fox (*V. rueppellii*), although the latter two species share little of their range. The former is noticeably smaller, with a conspicuous dark marking under the eye, and tail exceeds body length by more than half (and has dark tip); the latter is rather similar to *V. bengalensis*, but with longer tail with white tip, back of broad ears and back of head light grey, and legs without black markings.

Distribution

Historical distribution The species range was much vaster during the Quaternary. During the early Pleistocene an ancestor species *V. praecorsac* inhabited the territory of Austria and Hungary. At the end of the Pleistocene the corsac spread from Switzerland to northern China. From the end of the Pleistocene–early Holocene, the range was reduced from the west due to climate change.

Current distribution Narrower than the historical range and includes two parts. The first covers the Middle Asian republics of Turkmenistan, Uzbekistan, Tajikistan and

Chris and Tilde Stuart

Corsac, age and sex not noted. Duisburg Zoo, Germany, 1995.

Figure 5.5.1. Current distribution of the corsac.

Kazakhstan, as well as steppe and forest-steppe areas of Russia, including the southern region of Western Siberia. In Europe its range reaches the Samara Region, Tatarstan to the North and northern Caucasia to the South (Figure 5.5.1). The second, much smaller area lies in southern Transbaikalye representing the northern periphery of the Mongolian and Manchurian section of the species area. Outside Russia the species area includes the steppe part of north-eastern China, including Manchuria, Inner Mongolia, and the region between Argun and Big Khingan, the entire Mongolian republic except for its forested and mountain regions, Dgungaria, Kashgaria, Afghanistan (probably only northern) and north-eastern Iran. Southern limit of distribution is unknown, but possibly it reaches to the mountain ridges separating the Tibet Highland from the North. Thus, the two ranges (western and eastern) are connected by a relatively narrow neck in the Dgungar Gate and Zaisan Basin region. In recent years a westward area expansion has been recorded, particularly into the Voronezh region following active recovery of baibak (*Marmota bobac*) populations. Occasionally, the species is recorded from the Ukrainian steppe (as far as Pavlodar to the West), eastern Transcaucasia (Azerbaijan) and, probably, western Kyrgyzstan.

Range countries Afghanistan, Azerbaijan?, China, Iran, Kazakhstan, Kyrgyzstan?, Mongolia, Russia, Tajikistan, Turkmenistan, Ukraine?, Uzbekistan (Ognev 1931, Geptner *et al*. 1967, Scherbina 1995).

Relative abundance

In Russia the corsac is rare in most regions, but common in West Siberia and Transbaikalie. It sometimes occurs in northern parts of West Siberia's forested steppes, but in low numbers. The species is common everywhere between the Volga and Ural rivers. In Turkmenistan, Kazakhstan, Mongolia and northern China, the corsac is common or abundant, although in Tajikistan and Uzbekistan the species is usually rare. Population status in Afghanistan and Iran is unknown.

Corsac populations fluctuate significantly. Population decreases are dramatic, caused by catastrophic climatic events, and numbers can drop tenfold within the space of a single year. On the other hand, in favourable years numbers can increase by the same margin and more within a three to four year period. Dramatic population changes were reported during the last century in PredKavkazie, between Kuma and Terek rivers and in Kuma-Manich Channel region. A drastic population decline was reported at the beginning of the last century (Dinnik 1914). Numbers had recovered by 1924 to 1925; one hunter during that time could take up to 15–30 corsacs in one season (Ognev 1931). By 1931 numbers decreased again with a subsequent increase in 1951 (Verezhagin 1959). In the Ural region during particular years up to 5,500 animals were taken by trappers, and up to 1,700 in the Gurievskaya region. To the south, in Mangishlak and Ustyurt, the corsac is widespread and in some years abundant.

Estimated populations/relative abundance and population trends: The following population densities have been recorded: in Kalmykia (Russian Federation), 16–29 per 10km² (Blyznuk 1979); in Omsk region, 0.8–6.8 per 10km² during the summer period (Sidorov and Poleschuk 2002); in Kazakhstan, during population peaks, four to six animals per 10km² during the autumn-winter season (Chirkova 1952); in Eastern Transbaikalia, 1.0–6.8 per 10km², in Tuva, 3.5 per 10km², and in south-east Altai, 2.7 per 10km² (Sidorov and Botvinkin 1987).

In Turkmenistan the average population density varies in different parts of the country. In north-western and western Turkmenistan average population density is 0.4 per 10km². In the south-west corsac density is higher, and during years with high numbers of prey, such as Libyan jird (*Meriones libycus*) and great gerbil (*Rhombomys opimus*), can reach 23 per 10km². In the south-west (Karabil region) density is 8.4 per 10km² on average. In Badkhiz Nature Reserve, corsac population density during favourable years can reach very high levels, and as many as nine breeding dens per 15km² have been recorded (Sludskyi and Lazarev 1966).

Corsac population trends were studied in south-eastern Transbaikalia from 1952 to 1983 (Sidorov and Botvinkin 1987), showing populations peaking in eight general and two local populations. Peaks were repeated within a period of three to six years. Corsac fluctuations are correlated with population trends of the main prey species (Daurian pikas (*Ochotona daurica*), narrow-headed vole (*Microtus gregalis*), and Brandt's vole (*M. branti*)). Current information on population trends in different countries is not available due to lack of centralised information on pelt harvest and research projects. However, in Orenburg (Russia) it has been estimated that there are approximately 1,500 foxes, with numbers declining (Rudi 1996). Similarly, populations are thought to be declining in Turkmenistan (Scherbina 1995) and Uzbekistan (Ishunin 1987).

During years with low prey abundance, wide migrations and animal dispersion occur. Migrations are typical for corsac populations in Western Siberia, Kazakhstan, Transbaikalia and, probably, Mongolia and China, but are not reported in Middle-Asian countries (Turkmenistan, Uzbekistan, Tajikistan, Afghanistan and Iran).

Habitat

The corsac typically inhabits steppes, semi-deserts and deserts, avoiding mountains, forested areas and dense bush. In the western part of the range they occur in low-grass steppe, avoiding dense and tall grass steppes. In Kaspyi Sea region the steppes and tarragon-cereal semi-deserts are favoured. It also occurs in fixed-sand habitats (Nogaiskaya Steppe). In Volgo-Ural watershed the corsac inhabits most usual habitats, but prefers semi-deserts. To the east of the Ural Mountains, the species inhabits steppes and in favourable years occurs even in forested steppes. In Kazakhstan typical habitats are low grass steppes and semi-deserts, often inhabiting low hills, but avoiding low mountains. In Middle-Asia it inhabits semi-deserts and ephemeral-deserts, avoiding drifting sands. One limiting factor is snow height in winter, and this species avoids areas where the depth of snow exceeds 150mm, preferring areas where the snow is either shallower or highly compressed.

Corsacs appear to depend on distribution of ground squirrels and marmots for food and shelter (the burrows being enlarged and used for refuge).

Food and foraging behaviour

Food In general, the corsac is opportunistic in its foraging habits. Prey species vary widely over the species' range, with the bulk of its diet comprising the most common small- and medium-sized rodent species in the area. Rodents and lagomorphs make up the bulk of the diet, although birds, reptiles (lizards, snakes and young tortoises) and insects are also commonly preyed upon, especially in summer. Occasionally, corsacs eat small amounts of vegetation. When the main prey species becomes uncommon, such as during winters and periods of low prey abundance, the remains of wolf kills and carcasses of wild and domestic ungulates become a major source of food for corsacs. They will also make use of human garbage.

Typical prey in Western Siberia includes narrow-headed vole (*Microtus gregalis*) and steppe lemming (*Lagurus lagurus*), and, more rarely, red-cheeked souslik (*Cittellus erythrogenys*), water vole (*Arvicola terrestris*), great jerboa (*Allactaga major*) and skylarks (Alaudidae). During winter, small rodents, Arctic hare (*Lepus timidus*), ptarmigans (*Perdix perdix*) and snow buntings (*Pleptrophenax nivalis*) are common prey (Geptner *et al*. 1967; Sidorov and Botvinkin 1987). Some vegetable food was also found in stomachs of animals, which were captured during the winter season with abnormally high snow level (Sidorov and Polyschuk 2002).

In the forest-steppe part of Kazakhstan, the diet consists primarily of steppe lemmings and large-toothed souslik (*Ñittelus fulvus*) (Geptner *et al*. 1967). In deserts of northern Kazakhstan the proportion of prey species in corsac's diet varies, with jerboas (Dipodidae), sousliks (*Cittelus pygmaeus, C. maximus*) and rock conies (*Ochotona* spp.) dominating (Sidorov and Botvinkin 1987). On the Ustyurt Plateau and in Turkmenistan the main prey are gerbils (*Meriones* spp., *Rhombomys opimus*), while in TransBaikalie and Mongolia main species are Brandt's vole, tarbagan marmot (*Marmota sibirica*) and Daurian pika. Birds, Tolai hare (*Lepus tolai*) and long-tailed souslik (*Citellus undulatus*) are uncommon prey (Geptner *et al*. 1967).

Foraging behaviour Corsacs are active during twilight and at night. Hunting starts in the evening and continues through the first part of the night, with a second peak of activity before dawn. Sometimes they are also active during daytime, especially the young. They are solitary foragers, although near carrion or remains of wolf kills up to several corsacs may gather together (and sometimes with red foxes). Corsacs hunt by stalking prey and employing sudden short-distance attacks. Lunges on prey are very quick, faster than red fox. Corsacs find ground-nesting birds and other small prey by sound and smell. Despite their small size they can kill prey up to the size of young marmots, hares, ducks, pheasant and geese.

Damage to livestock or game Corsacs do not cause any significant damage to livestock or game.

Adaptations

Corsacs have the ability to forego water and food for extended periods of time. Although in desert regions they are often seen near springs, water pools and wells, they seem to be attracted there not by thirst, but by the abundance of rodents. In captivity corsacs do not drink water when on a protein diet, and corsacs reportedly

can live without food for 7–15 days (Kadyrbaev and Sludskii 1981).

Corsacs are well adapted to a hot and dry climate. However, according to Kalabukhov (1950), corsacs have imperfect thermoregulation, due to some of their breathing features, whereas the insulating quality of their fur is close to that of the Arctic fox. Corsacs are not resistant to strong cold, and during periods of strong frost and blizzards they do not come out from the den at all for 2–3 days. One behavioural adaptation against cold is the gathering of several animals (up to seven) in one wintering den (Sludskyi and Lazarev 1966).

Corsacs are not well adapted for walking on snow. Despite their small body-weight, their specific weight-pressure is relatively high – 68–80g/cm² in corsacs from Betpak-Dala – and their legs relatively short. By comparison, in red foxes from snowy regions this parameter is 27–30g/cm² (Geptner *et al*. 1967).

Social behaviour

The species' social organisation has not been studied in detail, but some general characteristics are known from studies of the species biology in the wild. The basic social unit is the breeding pair. Monogamous pairs may persist during the entire life of the partners. Even in captivity, a male corsac that was held in a cage with two females in the Moscow Zoo, copulated with only one of them, even though the second female also entered into oestrus.

Pups disperse by the end of summer. However, dispersing young do not go far from their natal range (Scherbina 1995), and some are likely to return to stay over the autumn-winter season. During winters several corsacs often are found in one den, indicating a relatively high degree of sociality. Polygynic families are probable under favourable feeding conditions; Sidorov and Botvinkin (1987) noted finding two litters and two females in one den, thus confirming occurrence of polygyny.

Home range sizes vary widely depending on region and density of foxes. In optimal habitats during favourable years of high prey abundance the home range of a family pair can be as small as 1km² (Scherbina 1995). In the Celenograd area the size of breeding territories varies from1.9–3.7km² (Tchirkova 1952). In contrast, in low quality habitats with low food abundance, home ranges are significantly larger – in PriKaspyi Lowland, for instance, some 35–40km² (Geptner *et al*. 1967). There is no evidence of territoriality during winter.

Scent marking is most important for maintaining territories, and marking with urine and faeces is most frequent near maternity dens (Geptner *et al*. 1967). Barking is the corsacs most common vocalisation and has many different tonal variations (as detected by the human ear) and is produced in a variety of situations, such as courtship, territorial demonstrations and alarm. Barking sounds are higher than the red fox's and have a certain similarity to a cat's mew. An alarm call sounds like "Vyak". Close distance vocalisations are characterised by high-tone rhythmic sounds, peeping, chirping, and yelping.

Reproduction and denning behaviour

Across the range of the species, mating takes place from January until the beginning of March, although the actual period in any particular region is shorter. For example, in Kazakhstan and Turkmenistan, mating takes place between January and February. Gestation has been reported as 52–56 days (Geptner *et al*. 1967) and 60 days (Kadyrbaev and Sludskii 1981). The earliest birth time is mid-March, with most births occurring in April. Average litter size in Kalmikiya, Kazakhstan was 5.5 (range=2–10), similar to that recorded in Turkmenistan. Pups emerge from the dens from mid-May, earlier in southern parts of the species range. There is only one litter per year (Ognev 1931).

Newborn pups weigh 60–65g and measure 130–140mm in length (data from Moscow Zoo; A. Petrova pers. comm.). Pups are born blind with the auditory meatus closed. Eyes open on day 14–16. At the age of 28 days pups start eating meat. The male takes active part in parental care by feeding the young, and in favourable years helpers may join the parental pair to assist with feeding and guarding the young. Often pups play at the den during the morning. They grow rapidly, reaching the size of adults at four to five months. In captivity pups become sexually mature in nine months (Kadyrbaev and Sludskii 1981).

Corsacs develop shelters by modifying those of rodents that construct big, well-developed dens such as marmots, sousliks and great gerbils. Dens are constructed on gentle slopes or on plains. Maternity dens usually have two entrances. Near the maternity den there is a temporary shelter – dens with one entrance and a shallow corridor beneath the surface. The opening of the corridor is about 200mm in diameter. The length of the maternity den corridor varies from 1,400–4,500mm, whereas for temporary dens the corridor is from 500–1,200mm in length. The main chamber is 300 x 400mm in size, 550–1,150mm deep under ground, used for nesting but without any nesting material (Kadyrbaev and Sludskii 1981). In some areas the structure of maternity dens is more complicated. For instance, in Turkmenistan corsac dens with as many as 23 entrances have been found. Such big dens are always constructed on a great gerbil colony (Scherbina 1995). In Turkmenistan, where the climate is warmer, corsacs do not use dens during winter, whereas in colder Kazakhstan, TransBaikalie and Western Siberia, the use of dens during winter is common.

Competition

The main competitors for food within the former Soviet Union and Mongolia include red fox, steppe polecat (*Mustella eversmanii*) and grey wolf (*Canis lupus*), and, in desert regions, also steppe cat (*Felis libyca*), manul cat

(*Otocolobus manul*) and marbled polecat (*Vormella peregusna*) (Geptner *et al*. 1967). The chief competitors are red fox, which generally are better adapted and more successful hunters. In addition, red foxes compete with corsacs for dens – the stronger red fox can displace corsacs from their maternity dens and even kill them; red foxes may dig out the maternity dens of the corsac and kill litters (Geptner *et al*. 1967). When food is plentiful, corsacs and red foxes live next to each other in the same habitats and sometimes are seen feeding together on carrion. Several raptors also compete with corsacs, such as several buzzard species (*Buteo lagopus, B. rufinus, B. hemilasius*), pallid and hen harriers (*Circus macrourus, C. cyaneus*), tawny and golden eagles (*Aquilla rapax, A. chrisaetus*) and Saker falcon (*Falco cherrug*).

Mortality and pathogens

Natural sources of mortality The major mortality factor for the corsac probably is death from starvation during winter, caused by lack of availability of rodents due to deep snow-cover or decline of rodent populations. Strong frost and long periods of winter blizzards can cause significant losses in corsac populations. Predation from grey wolves during winter is also important, and wolves sometimes kill corsacs during the summer and dig out corsac dens. However, wolves play an important role for corsacs, as remains of wolf kills are an important food source for corsacs during winter. This role of wolves as food provider is more pronounced in areas of Kalmikiya, Kazakhstan, inhabited by saiga (*Saiga tatarica*). Stray and feral dogs also kill corsacs. Corsac remains were found among prey remains of tawny and golden eagles (Sidorov and Botvinkin 1987). In Semipalatinsk remains of three corsacs eaten by eagle owl (*Bubo bubo*) were reported (Geptner *et al*. 1967).

Persecution Corsacs do not fear humans, and often allow humans to approach within about 10m, before running away. They do not escape in dens from humans, unlike their reaction to wolves, dogs or eagles. When dug out of a den, corsacs sham death by lying motionless with closed eyes (Geptner *et al*. 1967).

Hunting and trapping for fur The corsac is a valuable fur-bearer species and has been trapped for a long time. For example, the following number of pelts were brought to a fur fair in Irkutsk: 1881 – 5,000; 1884 – 30,000; 1885 – 25,000; 1886 – 15,000; 1887 – 5,000; 1888 – 15,000; 1889 – 45,000; 1890 – 6,000 (Sludskyi and Lazarev 1966). In Turkmenistan, from 1924 to 1989, 103,500 corsac pelts were taken, which caused a significant decrease in corsac numbers during the same period. From 1924 to 1929, more than 4,000 animals were taken every year; from 1930 to 1939, the harvest was close to 3,000; from 1940 to 1949, the take was close to 1,000; from 1950 to 1959, approximately 1,500; from 1960 to 1969, slightly more than 1,000; from 1970 to 1979, less than 500; and from 1980 to 1989 close to 500 (Scherbina 1995). In Uzbekistan, 1,905 pelts were taken in 1923. From 1935 to 1937, the take was 732 to 1,511 pelts every year; from 1946 to 1949 between 535 and 1,359 pelts; and from 1959 to 1967, between 1,508 and 2,739 pelts. In 1980 the harvest had fallen to only 65–100 pelts per year (Ischunin 1987). In Mongolia at the beginning of the 20th century about 15,000 corsac pelts were taken to Kalgan. In this country about 20% of pelts are used in local markets. This trend is also common for regions of Russia and countries of the former Soviet Union – a certain proportion of the total take is left for local sales. This trend became more pronounced after the break-up of the Soviet Union. Current take is unknown, although Sidorov and Poleschuk (2002) indicated that at the end of 1980s and early 1990s more than 98% of corsac skins were traded in local markets and unregistered by government officers.

Road kills Road kills are not a significant mortality factor for corsacs.

Pathogens and parasites Corsacs are susceptible to rabies (Geptner *et al*. 1967). The following helminths have been found in corsacs: *Mesocestoides lineatus, Macracanthorhynnchus catulinus* (Agapova and Sapozhenkov 1961) and *Isopoda buriatica*. In Turkmenistan several flea species were found on corsacs, among them *Pulex irritans* and *Chaetopsylla korobkovi* (Scherbina 1995). In south-eastern TransBaikalie, during a period of several years, more than 6,400 fleas were found on 195 corsacs, and representing the following species: *Pulex irritans* 70%, *Oropsylla silantiewi* 4%, *Chaetopsylla homoeus* 5%, *Ctenophyllus hirticus* 12%, and *Amphalius runatus* 3% (Geptner *et al*. 1967). The number of fleas on a fox varies over months, increasing in summer and peaking in early autumn (Brom *et al*. 1948, in Geptner *et al*. 1967)

Longevity Maximum recorded longevity is nine years (Sidorov and Botvinkin 1987).

Historical perspective

The corsac harvest is known in Kazakhstan since the Bronze Age. Kazakh and Kirgiz people in the 13th century used corsac pelts almost as a means of purchasing goods. Corsacs are traditional game for hunting with aboriginal greyhounds (tazi), and with Saker falcons and golden eagle.

Conservation status

Threats Development in Kazakhstan in the mid-1850s caused a significant reduction of corsac numbers in previously undisturbed habitats. In the 20th century several catastrophic population declines were recorded. During

such crashes hunting on corsacs in the former Soviet Union was banned. For example, hunting of corsacs was stopped within the entire Kazakhstan territory from 1928 to 1938. Current population status, and the nature of major threats, is unknown in most regions. The western part of the range populations are recovering and their range expanding. In Kalmikiya large desert areas are changing into grass steppes, less suitable for corsacs. In Middle Asia and Kazakhstan a dramatic decrease of livestock during the last decade influenced many ecosystems and wildlife populations. However, the exact influence of this process on corsac populations remains unknown.

Commercial use Corsac pelts have been intensively traded. In general, over much of Russia during the 19th century, as many as 40,000–50,000 corsac pelts were traded in some years. For the time being, corsac pelts are not as highly appreciated as red fox pelts, and corsacs are usually trapped only incidentally.

Occurrence in protected areas Corsacs are protected in the following strict nature reserves (the highest protection status for the territory) (Z) and in national parks (NP):
— *China*: Chernyi Irtish (Z), Ksilingolskyi (Z), Bogdedskyi (Z), Dalainurskyi (Z);
— *Russia*: Chernie Zemli Kalmikyi (Black Soils of Kalmik) (Z), Rostovskyi (Z), Orenburgskyi (Z), Altaiskyi (Z), Ubsunurskaya Kotlovina (Z), Daurskyi (Z);
— *Kazakhstan*: Alma-Atinskyi (Z), Kurgaldzhyiskyi (Z), Naurzumskyi (Z), Barsa-Kelmes (Z), Bayanoulskyi (NP);
— *Turkmenistan*: Krasnovodskyi (Z), Repetekskyi (Z), Syunt-Khasardagskyi (Z), Kaplankirskyi (Z), Badkhiz (Z);
— *Uzbekistan*: Arnasaiskyi (Z), Karakulskyi (Z), Kizilkumskyi (Z), Nuratinskyi (Z), Chatkalskyi (Z), Uzbekskyi (NP);
— *Tadzhikistan*: Tigrovaya Balka (Z), Dashti-Djumskyi (Z);
— *Mongolia*: Oton-Tengerekskyi (Z), Nemgerekskyi (Z), Great Goby Biosphere Reserve (Z), Malyi Gobyiskyi (Z), Malyi Gobyiskyi (Z), Eastern Mongolian Mongol-Daurskyi (Z), Ubsu-Nur (Z), Khorgo (NP), Gurvan-Saikhanskyi (NP).

Protection status CITES – not listed.
Listed in some regional Red books in Russia: Bashkir (Volga tribute) and Buryat (Transbaikalia region) with category III status (species with declining populations).

Current legal protection Hunting of corsacs is regulated by special national legislation, in which the species is considered a fur-bearer species (Russia, Kazakhstan, Turkmenistan, Uzbekistan, Mongolia). Trapping/hunting is allowed only from November through March in Russia, Kazakhstan, and Turkmenistan. Certain methods of hunting are prohibited, such as digging or smoking animals out of dens, den flooding, and poisoning.

Conservation measures taken No special conservation programmes have been carried out. Outside of protected areas, the corsac has the status of game species.

Occurrence in captivity
Corsacs breed well in captivity, and there are some 29 animals currently listed in ISIS. In Moscow Zoo during 1960s one pair of corsacs produced six litters during the time that they remained together. Corsacs are easily habituated to humans.

Current or planned research projects
None known.

Gaps in knowledge
There are several aspects of this species' biology that require investigation, including social organisation and behaviour, population structure, current distribution and population status in different regions, current levels of trapping/hunting impact, and other threats to the species.

Core literature
Chirkova 1952; Sludskyi and Lazarev 1966; Geptner *et al.* 1967; Kadyrbaev and Sludskii 1981; Ognev 1931, 1935; Scherbina 1995; Sidorov and Botvinkin 1987; Sidorov and Poleschuk 2002.

Reviewer: Nikolay A. Poyarkov. **Editors:** Claudio Sillero-Zubiri, Deborah Randall, Michael Hoffmann.

5.6 Tibetan fox *Vulpes ferrilata* (Hodgson, 1842) Least Concern (2004)

G.B. Schaller and J.R Ginsberg

Other names
English: Tibetan sand fox, sand fox; **Chinese:** shahuli(li), caohu(li); **French:** renard sable du Thibet; **German:** Tibetfuchs; **Tibetan:** wa, wamo.

Taxonomy
Vulpes ferrilatus Hodgson, 1842. J. Asiatiac Soc. Bengal 11:278. Type locality: near Lhasa, Tibet.
Chromosome number 2n = 36 (Xu and Gao 1986).

Description
The Tibetan fox is small and seemingly compact with a soft, dense coat, a conspicuously narrow muzzle and a bushy tail (Table 5.6.1). It is tan to rufous-coloured on the