

classical mounted hunting operates, limited economic analyses suggest that the principal motive for these communal fox hunts is as a sport – the number killed is small compared with the cost of the hunting. In these regions, most anthropogenic mortality is by individual farmers shooting foxes. The mounted communal hunts do exhibit restraint – hunting takes place for a limited season, and for a prescribed number of days per week. Elsewhere, in upland regions, communal hunting by foot with guns and dogs may make economic sense, depending on the number of lambs lost to foxes (data on this is poor), and also on the current value of lost lambs. This type of fox hunting may also be perceived as a sport by its participants.

An individual deciding whether or not to control foxes, and by what means, has a complex set of factors to consider, including other interest groups, practicality and economics. For some farmers, there is evidence that a decision to control foxes may be economically perverse. Macdonald *et al.* (2003) modelled the interactions between foxes, rabbits, and rabbit-induced crop damage. For some farmers at least, a decision to kill a fox may, in some circumstances, cost that farmer a significant amount of crop loss to the rabbits that the fox and its descendants would have killed.

Occurrence in captivity

In addition to fur farms, red foxes are widely kept in small wildlife parks and zoos, but there appears to be no systematic data on their breeding success. Being extremely shy they are often poor exhibits.

Current or planned research projects

Controlling red foxes may be necessary where rare species, or threatened populations, are under threat, e.g., nest predation by foxes, has completely prevented recruitment to an internationally important sandwich tern colony in a number of consecutive years (Musgrave 1993). Attempting to control predation by lethal means can be problematic, i.e., intensive fox removal has been shown to have only local and short-term effects on predation because of swift replacement by conspecifics (Chesness *et al.* 1968; Reynolds *et al.* 1993). Non-lethal methods might prove useful in managing undesirable behaviour, with some potential shown for learned food aversions for manipulating fox feeding behaviour (Macdonald and Baker 2003).

Core literature

Baker and Harris 2004; Doncaster and Macdonald 1991; Harris and Rayner 1986; Larivière and Pasitschniak-Arts 1996; Lloyd 1980; Macdonald 1977a, 1979b, 1987; Meia 1994.

Reviewers: Lauren Harrington, Jean-Marc Weber. **Editors:** Claudio Sillero-Zubiri, Michael Hoffmann.

5.4 Raccoon dog *Nyctereutes procyonoides* (Gray, 1834) Least Concern (2004)

K. Kauhala and M. Saeki

Other names

Chinese: háo/háo-zi; **Croatian:** kunopas; **Czech:** psík mývalový; **Danish and Norwegian:** mårhund; **Dutch:** wasbeerhond; **Estonian:** kährikkoer; **Finnish:** supikoira; **French:** chien viverrin; **Georgian:** entiseburi dzagli; **German:** marderhund; **Hungarian:** nyestkutya; **Indonesian:** tjerpelai; **Italian:** cane procione; **Japanese:** tanuki; **Korean:** nurgoori; **Latvian:** jenotsuns; **Lithuanian:** usūrinis ūuo; **Polish:** jenot; **Portuguese:** cão-mapache; **Romanian:** câinele enot; **Russian:** enotovidnaya sobaka; **Slovakian:** psík medvedikový; **Slovenian:** rakunasti pes; **Spanish:** perro mapache; **Swedish:** mårhund.

Taxonomy

Canis procyonoides Gray, 1834. Illustr. Indian Zool., 2: pl. 1. Type locality: Unknown; restricted to “vicinity of Canton, China” by Allen (1938).

The raccoon dog lineage diverged from other canids probably as early as 7–10 million years ago (Wayne 1993). Some features of the skull resemble those of South American canids, especially that of the crab-eating fox (*Cerdocyon thous*), but genetic studies have revealed that they are not close relatives (Wayne *et al.* 1997).

It has been suggested that *N. p. viverrinus* and *N. p. albus* (collectively called ‘tanuki’) can be separated as a different species from the other subspecies. Tanuki has fewer chromosomes than other continental subspecies with $2n=38$ (Wada *et al.* 1998), while others have $2n=54$ (Mäkinen 1974; Mäkinen *et al.* 1986; Ward *et al.* 1987; Wada *et al.* 1991). The chromosome number of tanuki has decreased as a result of Robertsonian translocations, which usually happens during speciation. In addition to a number of phenotypic and behavioural differences, preliminary DNA-analyses also suggest that there are considerable differences in gene frequencies between tanuki and *N. p. ussuriensis* from Finland (K. Kauhala unpubl.), and skull and tooth morphometrics also differ (Kauhala *et al.* 1998a). In addition, there are differences in the quality of fur and physiology; since the Japanese raccoon dog is adapted to mild marine climate, it has a stomach of small volume, thin fur with poor insulation properties and a poor ability to alter its body energy reserves seasonally (Korhonen *et al.* 1991).

Description

For *N. p. ussuriensis*: In autumn and winter, the raccoon dog is very fat and has thick fur, giving an expression of a round animal with short and thin legs. The black facial

Table 5.4.1. Body measurements for the raccoon dog.

	<i>N. p. ussuriensis</i> Finland (Kauhala 1993, unpubl.).	<i>N. p. viverrinus</i> Honshu, Japan (Fukue 1993; Y. Fukue pers. comm.; Saeki 2001, unpubl.; S. Yachimori pers. comm.).
HB male	601mm (490–705) n=348	556mm (292–669) n=37
HB female	599mm (515–690) n=821	567mm (505–654) n=24
T male		173mm (50–230) n=37
T female		178mm (150–205) n=26
HF male		109mm (60–124) n=38
HF female		109mm (98–119) n=26
E male		44mm (20–56) n=36
E female		46mm (30–58) n=26
WT male	6.2kg (2.9–12.4) n=662	4.5kg (3.04–6.25) n=43
WT female	6.1kg (3.1–12.5) n=843	4.5kg (3.05–5.85) n=29

mask, small rounded ears and pointed muzzle are typical for the species. Hair is long on cheeks. The body colour varies from yellow to grey or reddish. There are black hairs on the back and shoulders and also dorsally on the tail. Legs, feet and chest are dark. Underhair is grey or reddish. ‘Samson’ raccoon dogs have no guard-hairs and underhair is reddish. The tail is rather short and covered with thick hair (Table 5.4.1). In summer when the fur is thin and fat reserves small, the animal looks much slimmer than in autumn. Dental formula is 3/3-1/1-4/4-2/3=42; m3 sometimes missing.



Raccoon dog, age and sex unknown. Fukui Prefecture, Japan, 1993.

Great Tanuki Club

Subspecies There are six recognised subspecies of the raccoon dog (Ellerman and Morrison-Scott 1951; Ward and Wurster-Hill 1990):

- *N. p. albus* (Hokkaido, Japan: north of Blakiston’s line at the Tsugaru straight). Body size is smaller than that of *N. p. ussuriensis*.
- *N. p. koreensis* (Korean Peninsula)
- *N. p. orestes* (south-western China)
- *N. p. procyonoides* (China and northern Indochina)
- *N. p. ussuriensis* (original range: south-eastern Russia and eastern China; introduced range: north-western parts of Russia, Finland, Sweden, the Baltic states, Belarus, Ukraine, Moldova, Poland, Germany, Hungary, Slovakia, Czech Republic, Romania, Bulgaria and Serbia, occasionally seen in Norway, Denmark, the Netherlands, France, Switzerland, Austria, Slovenia and Bosnia)
- *N. p. viverrinus* (Honshu, Shikoku and Kyushu, Japan: between Blakiston’s and Miyake lines). Similar to *N. p. albus* but with somewhat shorter fur, shorter hind legs, and generally darker colour. Skull and teeth are smaller than those of *N. p. ussuriensis* (Kauhala *et al.* 1998a). Mandible width and jaw height for the skull and the lower and upper molars clearly distinguish the two subspecies.

Similar species Raccoon dogs can be confused with the raccoon (*Procyon lotor*) in Japan, Germany, France and Hungary, or the Eurasian badger (*Meles meles*), although neither are canid species. The badger has black stripes on the white head, is more strongly built and has shorter legs and tail than the raccoon dog. The tail of the raccoon is

furry with dark bands. The badger and raccoon have five toes in each foot.

Distribution

Historical distribution In the Far East from northern Indochina to the south-east corner of Russia, also in Mongolia. In the Japanese Archipelago, the species was confined to Hokkaido, Honshu, Shikoku, Kyushu, Awaji island, Sado island and other islets of Japan except those south of Kyushu (e.g., Okinawa islands, Nansei islands, Miyako islands and Ogasawara islands). There has been a recent introduction in Yakushima island (S. Azuma pers. comm.).

Current distribution The species has been widely introduced. It is now widespread in northern and eastern Europe (Figure 5.4.1), thriving in moist forests with abundant undergrowth. The northern limit of distribution lies in areas where the mean temperature of the year is just above 0°C, the snow cover about 800mm, the duration of the snow cover 175 days and the length of the growing season 135 days (for example, in Finland the northern limit of permanent distribution is between 65°N and the Arctic Circle). If winters become milder, the raccoon dog may expand its range northwards.

Range countries (including introductions): Belarus, Bulgaria, China, Estonia, Finland, Germany, Hungary, Japan, Korea, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Serbia, Sweden (only in the county of Norrbotten), Ukraine, Vietnam. Occasionally seen in Austria, Bosnia, Denmark, France, the Netherlands, Norway, Slovenia and Switzerland (Ellerman and Morrison-Scott 1951; Mitchell-Jones *et al.* 1999).

Relative abundance

Abundance is unknown in the Far East outside of Japan where it is common. Population estimates have never been conducted in the latter country, but indirect indices (e.g., road-kills per km of the National Expressways and harvest density per prefecture), suggest that relative abundance is high in south-western parts of Japan (i.e., Kyushu, Shikoku, and Chugoku) and low in Hokkaido, Chubu, and extremely urban areas (M. Saeki and D.W. Macdonald unpubl.). See Table 5.4.2 for the status of the raccoon dog in different countries.

Estimated populations/relative abundance and population trends

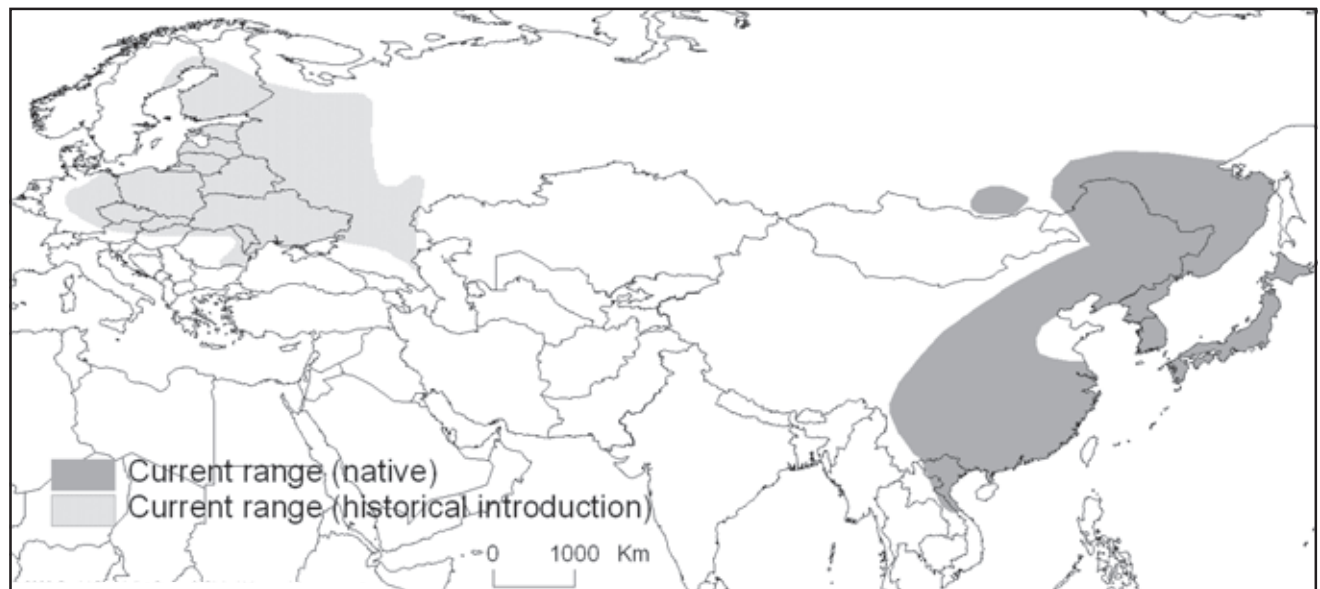
Table 5.4.2. The status of raccoon dogs in various range countries (A=abundant; C=common; R=rare; X: present, but abundance unknown; I=increasing; S=stable).

Country	Population/abundance	Trend
Belarus	A	
Denmark	R	
Estonia	A	
Finland	45,000	S
Germany	C	
Hungary	X	I
Latvia	C	S
Lithuania	C	
Poland	C	
Russia	C	
Sweden	R	
Ukraine	X	

Habitat

Two features are typical of the habitat of raccoon dogs: 1) they are often found near water, and 2) during autumn

Figure 5.4.1. Current distribution of the raccoon dog.



©2003 Canid Specialist Group & Global Mammal Assessment

they are more or less dependent on fruits and berries, which affects their habitat selection.

In Japan, raccoon dog habitat includes deciduous forests, broad-leaved evergreen forests, mixed forests, farmlands, and urban areas from coastal to subalpine zones. In the countryside, the species prefers herbaceous habitat and uses less *Cryptomeria* plantation throughout year, while riparian areas are often used (M. Saeki and D.W. Macdonald unpubl.). In urban areas, raccoon dogs inhabit areas with as little as 5% forest cover. In the Russian Far East, the raccoon dog favours open landscape, especially damp meadows and agricultural land and avoids dark forests (Judin 1977).

In the introduced range, raccoon dogs favour moist forests and shores of rivers and lakes, especially in early summer (Korneev 1954; Nasimovic and Isakov 1985; Kauhala 1996). In late summer and autumn raccoon dogs favour moist heaths with abundant berries (Morozov 1947; Kauhala 1996). In the Finnish archipelago, however, they favour barren pine forests where they feed on crowberries (*Empetrum nigrum*) (Kauhala and Auniola 2000).

Food and foraging behaviour

Food Raccoon dogs are true omnivores and seasonal food habits shift as food availability changes (Ivanova 1962; Kauhala *et al.* 1993a). In most areas small rodents form the bulk of their diet in all seasons (Bannikov 1964; Nasimovic and Isakov 1985). Frogs, lizards, invertebrates, insects (including adults and larvae of *Orthoptera*, *Coleoptera*, *Hemiptera*, *Diptera*, *Lepidoptera*, *Odonata*), birds and their eggs are also consumed, especially in early summer (Barbu 1972; Kauhala *et al.* 1993a, 1998b). Plants are frequently eaten; berries and fruits are favoured in late summer and autumn when they serve as an important food source before raccoon dogs enter winter dormancy. Oats and other agricultural products (e.g., maize/sweet corn, watermelon, loquat, tangerine, pear) are often found in raccoon dog stomachs. Carrion (e.g. ungulate carcasses), fish and crustaceans (e.g., crabs, crayfish) are consumed when available.

Foraging behaviour As opportunistic generalists, raccoon dogs forage by searching close to the ground and, in Japan, may also climb trees for fruits. They are mainly nocturnal and forage in pairs, leaving their dens 1–2 hours after sunset (Kauhala *et al.* 1993b). When they have pups, females also forage during the daytime while the male is babysitting (Kauhala *et al.* 1998c). Usually the foraging pair wanders some distance apart from each other. Raccoon dogs decrease their food intake before entering winter dormancy (Korhonen 1988).

Damage to livestock or game Waterfowl and their eggs are consumed at the seashore and the archipelago in early summer (Ivanova 1962; Naaber 1971, 1984). Fish from

fish ponds may also be consumed (Saeki 2001). In the inland habitats of Finland, birds occur in the diet less often, and most of them are passerines (Kauhala *et al.* 1998b). Remains of grouse are found only occasionally in the faeces of raccoon dogs (Judin 1977). When the diets of raccoon dogs, red foxes (*Vulpes vulpes*) and badgers in early summer were compared in southern Finland, the diet of raccoon dogs was the most diverse, and raccoon dogs consumed game animals less frequently than foxes (Kauhala *et al.* 1998b).

Adaptations

Among canids, winter lethargy is a unique feature of raccoon dogs. In areas where winters are harsh, raccoon dogs spend the winter asleep; for example, in southern Finland, they start hibernation in November and become active again in March (K. Kauhala pers. obs.). Adults usually settle in the dens first (the pair together) and young later. Adult raccoon dogs almost double their weight between June and October; in June they weigh 4.5kg on average, in October 8.5kg, and sometimes 12kg (Kauhala 1993). Adults start to fatten themselves first and young when they have finished growing in late September. Autumn fattening is a consequence of decreased activity rather than increased food intake. The rate of metabolism (which is measured by thyroid activity) decreases during winter lethargy and increases again in spring. This results in weight loss which is a precisely controlled process (Korhonen 1987, 1988).

Raccoon dogs can be seen during daytime in spring, when they are sunbathing on the southern slopes of hills; they sit with their dark chest towards the sun to warm their body and save energy (Harri and Korhonen 1988).

Social behaviour

The raccoon dog is strictly monogamous, the male and female forming a permanent pair (Judin 1977; Kauhala *et al.* 1993b). Pair formation may take place before the breeding season (e.g., in September; M. Saeki pers. obs.). Pairs share their home range and also forage together. Only if one of the pair dies, will the remaining member form a new pair bond with a new mate. Some non-paired adults may stay within the same area and/or share the resting or feeding sites or dens, but, unlike pairs, non-paired adults usually do not move together. Sometimes two males move together as a pair, while in Finland, two females have not been observed together after the young have dispersed in autumn (S. Puonti pers. comm.).

Both male and female defend the home range against individuals of the same sex. The home range size varies according to the abundance of food. The core areas of different pairs are totally exclusive, especially during the breeding season. The peripheral areas of home ranges may overlap to some extent. In autumn there is more overlap than in spring and summer. Different pairs seem to avoid

each other even when their home ranges overlap to some extent (Kauhala *et al.* 1993b). Resting sites may be shared with related family members (Yachimori 1997), and latrine sites may be shared by several individuals (Ikeda 1982).

The following home range sizes have been calculated from various reported population densities: 10–20km² in the introduced range in European Russia; 7–10km² in the regions of Volga and Tatar, 4–10km² in Ukraine; 1.5km² in the Novgorod area, and 0.4–1.3km² in the Gorki area (Kozlov 1952, Morozov 1953, Popov 1956, Bannikov 1964). In Białowieża Forest and in Suwałki Landscape Park, Poland, home ranges are 4–10km² (Jedrzejewski and Jedrzejewska 1993; Goszczynski 1999; Kowalczyk *et al.* 2000). In eastern Germany, mean home range was 3.97km² (Drygala *et al.* 2000). In Japan, home range size varies greatly, from as little as 0.07km² in an urban setting to 6.1km² in a subalpine setting (Fukue 1991, Yamamoto *et al.* 1994, respectively). According to radio-tracking studies in southern Finland, the home range size varies between 2.8 and 7.0km² (Kauhala *et al.* 1993a; K. Kauhala and K. Kiviahio unpubl.).

Raccoon dogs do not bark, but growl when menaced. In Japan, their vocalisations are higher in tone than those of a domestic dog and more or less resemble the sounds of a domestic cat. Dominant raccoon dogs can raise their tails in an inverted U-shape.

Reproduction and denning behaviour

The basic reproductive physiology of the raccoon dog is similar to that of other canids. Testosterone levels in males peak in February/March, and progesterone levels in females coincide even with absence of males, suggesting that the species is “a monoestrous, seasonal and spontaneous ovulator” (Yoshioka *et al.* 1990). Raccoon dogs achieve sexual maturity at 9–11 months and can breed in the first year, but a first-year female will enter oestrus later (>1 month) than older females (M. Saeki pers. obs.). Females can reproduce every year. Mating usually occurs in March (Helle and Kauhala 1995). This indicates the impact of climate on reproduction; the onset of spring and the length of winter lethargy determine the time of ovulation. Mating occurs in the back-to-back copulatory posture typical of other canids (Ikeda 1982).

The gestation period is nine weeks, with most parturition occurring in May (varies from April to June). The parents settle in a den about a week before the pups are born. Raccoon dogs will den in old badger sets or fox dens or they will dig dens in soft sandy soil. They will also use active badger setts, usually together with badgers (Kowalczyk *et al.* 1999). Winter dens are usually located within their home range but if suitable dens are not available, the winter den may be several kilometres outside the summer home range.

In Japan, the mean litter size (only four to five) is smaller than in other parts of the distribution area and

birth weight is around 100g. However, in Finland and Poland, the mean litter size is nine and birth weight about 120g; (Helle and Kauhala 1995; Kowalczyk *et al.* 2000). Similarly, in the original distribution area in south-east Russia, the mean litter size is nine (Judin 1977). On the other hand, in north-west Russia, litter size is smaller (six to seven) because of the continental climate with harsh winters. The abundance of wild berries also affects litter size; when berries are abundant, females are in good condition the following spring, and foetal mortality rate is low and litter size is large. Furthermore, in areas where spring comes late, the young are born late and remain small and slim in late autumn, and may not reproduce the following spring. Therefore, the productivity of the population is lower in areas with long winters compared to areas with milder climates (Kauhala and Helle 1995).

Pups start emerging from the den at three to four weeks of age and are weaned at approximately four to five weeks. Both sexes exhibit parental care, taking turns to attend the den during the early nursing period (Ikeda 1983). Because the food items of raccoon dogs are small, food is not carried to the den, and the pups are fed with milk until they start to forage for themselves (Yamamoto 1984; Kauhala *et al.* 1998c). The young usually reach adult body size by the first autumn.

Competition

Potential competitors include red fox and Eurasian badger. Direct and indirect competition may take place as their diets are similar and raccoon dogs often use burrows that were dug by foxes or badgers (Yamamoto 1994). However, the degree of competition is unclear since some differences in diet do exist: the badger consumes more invertebrates and the fox consumes more mammals and birds than the raccoon dog. Furthermore, food is abundant in summer and competition between these carnivores is not likely to be severe. In winter, food is scarce but raccoon dogs and badgers hibernate and, hence, no food competition exists in winter in northern areas. In Finland, a rapid raccoon dog population increase during the 1970s and 1980s coincided with a badger population increase, suggesting that competition is not severe between these species.

In addition to these, direct and indirect competition may take place with the Japanese marten (*Martes melampus*) and with the introduced masked palm civet (*Paguma larvate*) in Japan. In Belarus, the native generalist predator populations began to decline after the raccoon dog reached a high population density; competition on carcasses in winter was proposed as a factor in the observed decline (Sidorovich 2000). Conversely, a population increase in the common raccoon in Hokkaido, Japan, may have caused a decrease in the raccoon dog population (Ikeda 1999).

Mortality and pathogens

Natural sources of mortality In Japan, stray dogs often kill raccoon dogs. Raccoon dogs, especially puppies, also fall victims to other predators such as foxes, wolves, lynxes and large predatory birds. In Japan, a masked palm civet was observed entering a raccoon dog den and possibly predated on the pups (Y. Fukue pers. obs.). Puppies may also die because of malnutrition and parasites.

Persecution They seldom are hunted for their fur (because the fur of wild raccoon dogs currently has little value), but rather because they are considered pests. In Finland, the yearly hunting bag for 2000 was 60,000–70,000 (Finnish Game and Fisheries Research Institute 2001). In Hungary, raccoon dogs have been hunted since 1997, with the yearly bag being only one to nine animals (Heltai *et al.* 2000). In Poland, raccoon dogs are hunted from August to March and the annual bag was 450–600 in the early 1990s (Biuletyn Stacji Badawczej Czempiniu 1994), but 6,200 were shot in 2002/2003 (M. Panek pers. comm.). In Sweden, the annual catch is two to seven individuals.

In Japan, legal culling has increased since the 1970s, with 4,529 annual kills on average during 1990 and 1998 (Environment Agency 1972 to 1999). However, the numbers harvested have declined. Between 18,000 and 76,000 raccoon dogs were harvested each year in Japan after World War II, declining since 1982 (although still the largest among five fur-bearer species in Japan). The scale of poaching is not known but can be substantial because people are generally unaware of the law prohibiting the capture/killing of wildlife. Furthermore, poaching is routinely overlooked in Japan. In continental Asia, little is known about the persecution level. In Finland, some raccoon dogs are killed in summer when females with puppies are protected; hunters first kill the female and then the entire litter.

Hunting and trapping for fur See Persecution and Commercial use.

Road kills Many raccoon dogs, especially young dispersing in August and September, fall victims of traffic. In Japan, conservative estimates of road kills were 110,000–370,000 per year (M. Saeki and D.W. Macdonald unpubl.).

Pathogens and parasites Raccoon dogs face a serious problem with infestation of scabies or sarcoptic mange (*Sarcoptes scabiei*), which seems to be widespread in many parts of Japan and northern Europe (Wildlife Management Office, Inc. 1998; Shibata and Kawamichi 1999). Mass deaths of the infested animals can occur in winter but raccoon dogs may also recover from the disease (M. Saeki pers. obs.). Raccoon dogs are potential vectors of *Echinococcus multilocularis*, a dangerous parasite that also infects humans. Raccoon dogs can also spread

trichinosis. In Belarus, raccoon dog numbers fluctuate because of helminth infections (V. Sidorovich pers. comm.).

The raccoon dog is an important vector of rabies in Europe, with increasing significance towards the east and north. In Poland, 7% of rabies cases between 1990 and 1998 have been found in raccoon dogs, 9% in Lithuania, 12% in Latvia, and 16% in Estonia (Müller 2000). During a rabies epidemic in Finland in 1988 and 1989, 77% of the cases identified were in raccoon dogs (Westerling 1991). An outbreak of canine distemper in 1991 was reported to have eliminated about 70% of the local population in western Tokyo (Machida *et al.* 1993).

Longevity Maximum life span is seven to eight years (exceptionally 10 years), with a record in captivity of 13 years. Only about 1% of raccoon dogs live to five years, and 88% of the young (in Finland) die before their first year.

Historical perspective

The raccoon dog or tanuki has often appeared in Japanese folklore (Nakamura 1990; Matsutani 1995). Tanuki used to be raised for fur and was exported mostly to the USA before World War II (Kitamura 1934).

Conservation status

Threats Road kills, persecution, government attitudes, epidemics (scabies, distemper and rabies), and pollution (organotins, lead, PCDDs, PCDFs and PCBs) remain the major threats to the species across its range.

Commercial use The Russians introduced raccoon dogs into the wild in the European part of the former Soviet Union because they wanted to establish a valuable new fur animal in the wild. Raccoon dog furs continue to be commercially sold, although today they are produced in fur farms. While the species is still commonly farmed for fur in Finland, raccoon dogs are no longer farmed in Sweden (J.-O. Helldin pers. comm.) or Hungary, where the last fur farm was closed in 1995 (M. Heltai pers. comm.). In Japan, raccoon dog fur is also used in the production of calligraphic brushes, stuffed animals, and other products.

Occurrence in protected areas Raccoon dogs occur in national parks and other wildlife protection areas in Japan, where hunting and some other activities are prohibited. Raccoon dogs occur in national parks also in Finland (although they are hunted in some parks). Elsewhere across their range, they occur in numerous protected areas and wildlife sanctuaries.

Protection status CITES – Not listed.

Current legal protection In many countries where the raccoon dog is legally hunted, hunting is permitted year

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 (18.4km²), 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.

Reviewers: Yuko Fukue, Hiroshi Ikeda, Bogumila Jedrzejewska, Rafal Kowalczyk. **Editors:** Claudio Sillero-Zubiri, Deborah Randall, Michael Hoffmann.

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: kirsu, 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-