CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Sixteenth meeting of the Animals Committee
Shepherdstown (United States of America), 11-15 December 2000

Implementation of Resolution Conf. 8.9 (Rev.)

MOSCHUS SPP.

1. The Annex has been prepared by UNEP-WCMC, in cooperation with TRAFFIC and IUCN, under contract to the CITES Secretariat.

2. It consists of a review of *Moschus* species, as one of the remaining groups of species selected for review during Phase IV of the Significant Trade Review.

3. A copy of the Annex has been sent to all range States of the species concerned, but comments from the range States have either not yet been received or not yet been incorporated in the document.

Moschus spp.

Musk deer
Ciervos almizcleros
Chevrotains porte-musc

Order: ARTIODACTYLA **Family: MOSCHIDAE**

Musk deer *Moschus* spp. were previously reviewed under the Significant Trade process in 1991, and in 1993, when the following recommendations were formulated:

China: The Management Authority of China should suspend exports of specimens of *Moschus* spp., excluding derivatives, until they have provided the following information to the Secretariat:
- available data on population status and trends;
- field research programmes;
- details of measures taken to control harvests;
- the sources of musk used for manufacture of medicines;
- the measures in place (e.g. licensing, record-keeping, etc.) to control the manufacture of products containing musk or musk derivatives; and
- production from captive stocks.

By fax of 5 October 1994, China informed the Secretariat that: the population was about 1 million and declining, particularly because of habitat disturbance and over exploitation; research was under way on distribution, reproduction and habitat conservation; the Scientific Authority was studying management and status; the species were protected by law, and several regulations, orders and notices had been issued; consultations had taken place with local authorities to strengthen controls; musk used included synthetic musk and musk from captive animals; there were about 1500 musk deer in captivity. On 19 December 1994 the Secretariat asked what information was available about the population size of each of the five species in China, and about the production of musk from captive and wild animals.

Russian Federation: The Management Authority of the Russian Federation should suspend exports of specimens of *Moschus* spp., excluding derivatives, until they have provided the following information to the Secretariat:
- available data on population status and trends;
- field research programmes; and
- details of measures taken to control harvests.

On 23 December 1994 the Russian Federation informed the Secretariat that: the musk deer population is 150,000; the population is decreasing because of poaching and habitat change; the annual capture is 3000-4500 animals; capture is prohibited in certain regions; hunting is controlled by licence and a capture quota is set; a study of taxonomy and conservation is planned; stocks are being checked and details will be provided; the Secretariat will be informed of the export quota in January 1995. The Secretariat sought further clarification. By fax of 14 February .1995, the Russian Federation informed the Secretariat that the export quota for 1995 would be 6,000 animals. "6,000 animal units (in case of non-selective shooting - 2,000 males) can give 50 kg of musk. In recent years about 20kg of musk have been stored, and thus the total quota for musk export in 1995 will be 70kg." Also, "Annual quantity of musk deer capture (3,000 - 4,500 animal units) does not take into account [poaching]. Annual systematic quotas for musk capture in 1989-1993 amounted to 7,000 - 8,300 animal units. At present, studies on musk population are being carried out and will be completed in 1996." The Secretariat sought further clarification and asked about the musk deer farm. By fax of 26 May.1995, the Russian Federation informed the Secretariat that, at the beginning of each hunting season the local branches of the Department for Protection and Management of Game Animal Resources carry out a deer census as a basis for establishing a quota. Examples for some areas were provided. Proportion of males to females was said to be 1:2. The musk deer farm in Novosibirsk had operated from 1990 to 1992, with about 160 musk deer, extracting musk from the animals three times a year. For financial reasons it had closed in 1993. The Secretariat was satisfied that no further action was required.

DISTRIBUTION AND POPULATION

Musk deer are native to Asia, and are distributed from the Arctic Circle to the Hindu Kush/Himalayan region of Afghanistan, Nepal, Pakistan and India in the south, and east to Viet Nam (Anon., 2000a).

The taxonomy of *Moschus* has been subject to a great deal of confusion in the past and is still not resolved. When CITES was inaugurated it was considered that the genus was monospecific and, because of confusion over the type locality of *M. moschiferus* Linnaeus 1758, the Himalayan population was listed as *M. m. moschiferus*. This was amended in 1979 to refer to the Himalayan population of *M. moschiferus*.

In 1983, the Parties adopted Honacki *et al.* (1982) as a standard nomenclature for mammals and those authors followed Cai and Feng (1981) in accepting four species in the genus: *M. berezovskii* Flerov 1929, *M. chrysogaster* (Hodgson, 1839), *M. moschiferus* and *M. sifanicus* (Buchner, 1891).

Wilson and Reeder (1993), the standard nomenclature currently adopted by the Parties, also accepted four species but they treated *sifanicus* as a synonym of *chrysogaster*, and listed *M. fuscus* Li 1981 as the fourth species.

Groves *et al.* (1995) considered that there were five or six species:
M. berezovskii (with five subspecies: *berezovskii*, *anhuiensis* Wang, Hu and Yan 1982, *bijiangensis* Wang and Li 1993, *caobangis* Dao 1969, *yunguiensis* Wang and Ma 1993).
M. chrysogaster (with two subspecies: *chrysogaster*, *sifanicus*).
M. cupreus Grubb 1982 (which the authors considered might be a subspecies of *leucogaster*).
M. fuscus (with one subspecies and perhaps an unnamed form from Nepal).
M. leucogaster Hodgson 1839 [synonym *saturatus* Hodgson 1839] (with one subspecies and perhaps two unnamed forms in southern Tibet/Nepal and northwest India).
M. moschiferus (with three subspecies: *moschiferus* [synonyms *arcticus* Flerov 1929, *sibiricus* Pallas 1779], *parvipes* Hollister 1911 [synonym *turowi* Zalkin 1945], *sachalinensis* Flerov 1929).

Sokolov and Prikhod'ko (1998), based on a karyological analysis, considered that the genus was monospecific (with seven subspecies: *arcticus*, *chrysogaster* [synonyms: *berezovskii*, *sifanicus*], *leucogaster*, *moschiferus*, *parvipes*, *sachalinensis*, *turowi*). They did not cite Groves *et al.* (1995) and did not discuss *fuscus* or *cupreus*.

Wemmer (1998), in the *Deer: Status Summary and Conservation Action Plan*, adopted the treatment used by Wilson and Reeder (1993).

Su *et al.* (1999) used molecular studies to examine the phylogeny of the five species suggested by Groves *et al.* (1995) (i.e. excluding *cupreus*). Their results supported the separation of the five species, particularly *moschiferus* and *berezovskii*, which showed marked genetic divergence from the other three.

This account follows Wilson and Reeder (1993) in accepting four species in the genus, which occur in the following countries (distribution modified after Wemmer, 1998).

M. berezovskii (Forest Musk Deer): China, Viet Nam.
M. chrysogaster (Alpine and Himalayan Musk Deer): Afghanistan, China, India, Nepal, Pakistan.
M. fuscus (Black Musk Deer): Bhutan, China, India, Myanmar, Nepal.
M. moschiferus (Siberian Musk Deer): China, Kazakhstan, P.D.R. of Korea, Republic of Korea, Mongolia, Russian Federation.

The 1996 IUCN List of Threatened Animals (IUCN, 1996) categorised *M. moschiferus* as Vulnerable (1acd) and the other three species as Low Risk: near-threatened.

The populations of *Moschus* spp. in Afghanistan, Bhutan, India, Myanmar, Nepal and Pakistan are listed in CITES Appendix I and are not considered further here.

The remaining Appendix II populations occur in the following countries:

China: The following subspecific distribution is taken mainly from Groves *et al.* (1995) (which also maps the distribution in China).
M. moschiferus: *M. m. moschiferus* occurs in northeast Inner Mongolia, northwest Heilongjiang and northeast Xinjiang; *M. m. parvipes* occurs in south Heilongjiang, east Jilin and east Liaoning. *M. moschiferus* has disappeared from Sinkiang, Shanxi, Hebei and Shaanxi (Ohtaishi and Gao, 1990).
M. berezovskii: *M. b. berezovskii* occurs in south Shaanxi, south Gansu, south Ningxia, southeast Qinghai and southeast Tibet; *M. b. anhuiensis* occurs in southwest Anhui; *M. b. caobangis* occurs in south Yunnan and Guangxi; *M. b. yunguiensis* occurs in east Yunnan, Guizhou, east and south Sichuan and west Hubei; *M. b. bijiangensis* occurs in northwest Yunnan and southeast Tibet.
M. fuscus occurs in southeast Tibet and northwest Yunnan (Wemmer, 1998).
M. chrysogaster: *M. c. chrysogaster* occurs in southern Tibet; *M. c. sifanicus* occurs in south Gansu, west Sichuan, Qinghai, south Ningxia, north Yunnan and southeast Tibet; *M. c.* '*leucogaster*' (unnamed form) occurs in southeast Tibet.

In the 1950s the population of musk deer in China was estimated to be about 2,000,000-3,000,000 but this decreased to less than 1,000,000 in the 1980s (Anon., 2000b). The most recent population estimate is that there are 200,000-300,000 musk deer in total, with estimates of <20,000 for *Moschus moschiferus,* <100,000 for *Moschus berezovskii*, 100,000-150,000 for *Moschus chrysogaster*, and very small numbers for *Moschus fuscus* (Endangered Species Scientific Commission, P.R.C. [ESSC], 1998; Helin Sheng *in litt.* to IUCN/SSC Wildlife Trade Programme, 22 June 2000). Wang (1998) reported that there were 4,000–5,000 *M. chrysogaster* in Xinglongshan Reserve, and that the population was protected there. Anon. (2000b) provided population estimates for seven provinces, based on a survey carried out in 1992-1993:

Table 1. Population estimates for musk deer in seven Chinese provinces, 1992-1993

	Gansu	Guangxi	Heilongjiang	Henan	Inner Mongolia	Qinghai	Tibet
M. chrysogaster (inc. *M. berezovskii*)	41,950	128-213		3,980		100	75,000
M. c. leucogaster							3,000
M. c. sifanicus	13,464				126-386	5,000	
M. fuscus							27,000
M. moschiferus			5,026	211	11,390		

Note that the figure of 27,000 for *M. fuscus* conflicts with the 'very small numbers' cited by ESSC (1998).

Yang (*in litt*., to TRAFFIC East Asia, 6 June 2000) and Harris (*in litt*., to TRAFFIC East Asia, 5 June 2000), note that it is not clear how the historic population figures cited by Anon. (2000b) and those provided in Table 1, also cited by Anon. (2000b) were reached, and may thus not reflect the actual situation. Population figures in Table 1 should therefore be regarded as providing an indication only of the status of musk deer in China (Parry-Jones and Wu, in prep.).

A National Exclusive Survey on Musk Deer, launched in 1997 by the Northwest Institute for Endangered Zoological Species, under the programme for National Survey on Wildlife Resources, has been gathering data on distribution, population numbers, habits and trade status, and is expected to be concluded at the end of 2000. A monitoring system will be established on the basis of this survey. Also, in recent years, a programme for Closing Off Mountains and Fostering Musk Deer has been conducted in Xinglongshan Nature Reserve in Gansu, and has resulted in an estimated density for *M. chrysogaster* of 23-51/km², and a total population of 4,000-5,000 (Zhang Yue, *in litt.* to IUCN/SSC Wildlife Trade Programme, 22 June 2000).

Anon. (2000b) claimed that, with the strengthening of the protection of musk deer populations and their habitats, and the usage of synthetic musk, the decline in numbers may be halted and recover. This was based on several factors:

i) an area of about 2,000,000 km² is still available for musk deer;

ii) given an optimum density of 1.4-2.5/km² there is a capacity for at least 4,000,000 individuals; the females have an annual average reproductive rate of 1.5-1.7, which would allow populations to increase as long as the government strengthens protective measures and controls illegal hunting;

iii) re-afforestation that is taking place in many areas will provide more suitable habitat for musk deer;

iv) synthetic musk was first synthesized in China in 1993; it has now been accepted and is used increasingly by many medicinal factories – this will take the pressure off musk deer populations;

v) captive-breeding could be developed rapidly if properly managed.

Democratic People's Republic of Korea: *M. moschiferus parvipes* was reported to be widespread but restricted to forests in hilly areas (O Myong Sok, pers. comm. to J. W. Duckworth, 2000).

Kazakhstan: *M. m. moschiferus* occurs on the Kurchum and Narym ridges in the western Altai (Bannikov *et al.,* 1980).

Mongolia: Mallon (1985) reported *M. m. moschiferus* as uncommon and occurring in the taiga of Hentei and Hövsgöl, in parts of the Hangai and perhaps in the Han Höhii massif in the northwest. The musk deer population of Mongolia was estimated to be 44,000 in 1985; no population censuses have been conducted since then; numbers began to decline sharply in the 1950s due to poaching (S. Banzragch, CITES Management Authority of Mongolia, *in litt.* to Office of Scientific Authority, U.S. Fish and Wildlife Service, May 1999).

Republic of Korea: *M. moschiferus parvipes* was widespread in the wooded and mountainous parts, but by the late 1960s it had been almost extirpated from most of its former range. Small numbers still persist in the Taebak mountain ranges, and the current population was estimated to be under 40 individuals in 1981 (Won and Smith, 1999).

Russian Federation: Green and Kattel (1997) reported that three subspecies of *Moschus moschiferus* are present:
M. m. moschiferus is found throughout eastern Siberia;
M. m. parvipes is found in Primorsky Krai in the southern part of the Russian Far East; and
M. m. sachalinensis is limited to four populations in the southern half of Sakhalin island.
Following the break-up of the Soviet Union, musk deer populations across the region have declined significantly as a result of poaching for trade. Poyarkov and Chestin (1993) reported that, in the 1970s, the Russian population consisted of around 100,000-120,000, but by 1991 it had declined by about 50%. Green and Kattel (1997) concurred with this and provided a population estimate for Russia of 56,000-60,000.

Table 2. Estimates of the number of musk deer in Russian territories, 1998-1999

Region/Subject of Russian Federation	1998	1999
Russian Federation (TOTAL)	**150,400**	**156,350**
West Siberia and Altai-Sayan Region Subtotal	***No data***	***1,780***
• Altaisky Krai		280
• Altai Republic		1,500
East Siberia Subtotal	***82,240 (available data)***	***94,660***
• Buryat Republic	17,290	12,620
• Khakas Republic	3,860	2,610
• Tyva Republic	9,200	10,490
• Krasnoyarsky Krai	No data	12,000
• Irkutsk Oblast	10,700	20,540
• Chita Oblast	15,800	22,900
• Ust-Orda Buryat Autonomous Okrug	25,000	400

Region/Subject of Russian Federation	1998	1999
• Aginsky Buryat Autonomous Okrug	No data	100
• Yakutia (Sakha) Republic	No data	13,000
Far-Eastern Region Subtotal	***67,340 (available data)***	***59,410***
• Primorsky Krai	15,000	21,000
• Khabarovsky Krai	26,300 (28,900*)	24,040
• Jewish Autonomous Oblast	No data	260
• Amur Oblast	12,490	13,010
• Sakhalin Oblast	No data	1,100

** According to the regional Directorate of the Protection and the Control of Hunting Resources, Russia*
Sources: Anon. 2000c; CITES Management Authority of Russia *in litt.* to TRAFFIC Europe-Russia, 2000; Regional Directorate of the Department on the Protection and the Control of Hunting Resources, Russia.

It should be noted that less than half of the area occupied by musk deer is included in the government census, because the census is aimed at the sable *Martes zibellina* and large ungulates. Quantification of musk deer is therefore a by-product of the census, and should be regarded as an incomplete assessment of musk deer numbers. Not all suitable areas are surveyed, and the different ecological preferences of the musk deer mean that the census methods used are not optimal for counting musk deer (A. Tikhonov, Vice-Head of the Department on the Protection and the Control of Hunting Resources, pers. comm. to TRAFFIC Europe-Russia, 2000). Census results may be able to reflect population dynamics but cannot provide accurate population numbers (TRAFFIC Europe-Russia, *in litt.* to TRAFFIC International, September 2000). The actual number of musk deer in the various populations occurring in different parts of the Russian Federation is very unclear. Some regional specialists believe that a large part of the population remains unknown, due to inexact and indirect census methods (Sergei Kuznetzov, Regional Executant of TRAFFIC Europe-Russia Far East Musk Deer Project, pers. comm. to TRAFFIC Europe-Russia, 2000; Zavatzky *et al.*, 2000).

In the far-eastern region, the dynamics of musk deer populations can be illustrated by data from regional game management directorates in Amur Oblast, where the harvest is prohibited, and in the much larger Khabarovsky Krai, where commercial hunting of musk deer is allowed.

Table 3. Population estimates for musk deer in two Russian regions, 1995-2000

YEAR	Amur Oblast	Khabarovsky Krai
1995	4,780	23,900
1996	7,300	27,100
1997	12,950	31,480
1998	12,490	30,090
1999	9,580	28,900
2000	10,000	Not available

Source: Regional Directorates of the Protection and the Control of Hunting Resources, Russia.

Poyarkov and Chestin (1993) placed the total number of *M. m. sachalinensis* (listed in the Russian Red Data Book) at just 300 individuals. It is now recognised that this figure was an underestimate. It was based on the results of a questionnaire survey administered to local zoologists. Due to lack of funds for field research during the early 1990s, most field work at that time was concentrated in areas that were close by and easy to access. Therefore, while the survey did indicate population declines in these areas (due to poaching), other large areas appeared to experience less hunting pressure, both legal and illegal (TRAFFIC Europe-Russia, *in litt*. to TRAFFIC International, September 2000).

Prikhod'ko (*in litt*. to IUCN/SSC Wildlife Trade Programme, September 2000) estimated that the Russian populations of *M. moschiferus* totalled approximately 70,000 animals, but it is not known how this relates to a recent Government survey estimate of 154,000 (State Service for Statistics on Hunting Resources,

1997). *M. moschiferus parvipes and M. moschiferus sachalinensis* are in danger of extinction according to Wemmer (1998) and Prikhod'ko (2000).

Viet Nam: *M. berezovskii caobangis* occurs in a very small number of sites, in Lang Son and Cao Bang provinces in the northeast (Dao, 1977). In 1990 there were an estimated 200-300 in Cao Bang Province but the population was decreasing (Wemmer, 1998). The population was recently estimated to be no more than a few dozen (Vu Van Dung, pers. comm. to J. W. Duckworth, June 2000).

HABITAT AND ECOLOGY

Musk deer are found in dense, shrubby forest undergrowth on steep slopes and are often associated with rocky outcrops (Green and Kattel, 1997; MacDonald, 1995). In the winter, they are attracted to relatively steep slopes covered with coniferous forests. Favourite habitats are sections with rocky outcrops, which provide shelter from predators. In the summer, most of their time is spent in valleys of forest rivers, around streams, and near fields with good grassy vegetation. The main predators of the musk deer in the northern part of its range are Eurasian lynx *Lynx lynx*, wolverine *Gulo gulo*, sable *Martes zibellina* and yellow-throated marten *Martes flavigula*; the primary predator in the southern part of its range is the leopard *Panthera pardus*. Musk deer are generally nocturnal (Green and Kattel, 1997) and solitary. Groups are usually a mother and her offspring. Home ranges of males do not overlap, while the range of a male may overlap with that of females. Home ranges of females may also overlap with each other (Green, 1985).

Musk deer feed on herbaceous and woody plants, leaves, flowers, twigs, lichen, moss, shoots and grass (Green and Kattel, 1997; MacDonald, 1995). More than 130 plant species are consumed by musk deer. In the winter, arboreal lichens and some terrestrial bushy lichens make up about 70% of the contents of a musk deer's stomach (by weight). In the summer, herbaceous plants are the main diet.

Communication among musk deer is chiefly by olfaction, although they also have excellent hearing and vision. The development of acute smell is typical of small forest ruminants and is well suited to the dense nature of the habitat where vocalizations would directly compromise the predator avoidance strategy used. The role of musk in this communication is not fully understood, but it is thought to be conveyed in the urine of males. There is some evidence that 'latrines', consisting of piles of droppings, are shared by neighbouring individuals. These are thought to represent communication centres, providing information on other musk deer, as opposed to simple boundary markers (Green and Kattel, 1997). Caudal (tail) and interdigital glands are also used to leave scent-marks (Green, 1985).

The relatively high reproductive rate of musk deer has probably been an important factor in preventing extinction of the species. The incidence of twins and even triplets is relatively high in *M. berezovskii* and *M. moschiferus* (Green and Kattel, 1997). Nowak (1991) reported that the usual number of offspring in *M. chrysogaster* is one. The mating season is November-January, depending on area altitude and region. The musk that the males secrete with urine is much more concentrated during the mating season, appearing dark pink or red on snow. In the Himalayas, fawning occurs primarily in May and June after a gestation of 178-198 days. The young grow quickly and females are believed to become sexually mature and capable of breeding in their first year (Green and Kattel, 1997). However, in China at least some populations do not reproduce until their third year (Anon., 2000a; Helin Sheng *in litt.* to IUCN/SSC Wildlife Trade Programme, 22 June 2000).

China:

M. berezovskii: *M. b. berezovskii* occurs at 500-2,500 m, *M. b. anhuiensis* below 500 m, *M. b. caobangis* at 50-400 m, *M. b. yunguiensis* at 800-2,500 m, *M. b. bijiangensis* at 2,000-3,500 m.

M. fuscus occurs at 2,800-4,200 m. It inhabits montane, moist forest (Anon., 2000b), preferring coniferous forest (ESSC, 1998). The food consists of flowers, fruits, tender branches and leaves, rootstocks, mosses and fungi (Anon., 2000b).

M. chrysogaster: *M. c. chrysogaster* occurs at 2,800-4,000 m, *M. c. sifanicus* at 3,500-4,800 m, *M. leucogaster* at 2,500 m and above (Groves *et al.*, 1995). It inhabits rocky coniferous forest and hardwood forest, feeding on leaves of shrubs, mosses, lichens and fungi. The home ranges of animals in the Tibetan Plateau are between 13and 22 hectares (Harris and Guiquan, 1993).

M. moschiferus: *M. m. moschiferus* occurs below 1,500 m, *M. m. parvipes* below 1,000m. The typical habitat is rocky coniferous forest and the food consists of tender conifer branches, lichens, mosses and pinecones (Anon., 2000b).

Democratic People's Republic of Korea : Reported over a wide altitudinal range originally, but there is now very little forest left in lowland areas so the species is now confined to hill forests (J. W. Duckworth, pers. comm. to UNEP-WCMC, July 2000).

Kazakhstan: The habitat is the same as that occupied in southern Russia.

Mongolia: Occurs below 1,500 m (Groves *et al.*, 1995).

Republic of Korea: The small population is found in forested areas between 1,000-2,500 m (Won and Smith, 1999).

Russian Federation: *M. m. moschiferus* occurs below 1,500 m, *M. m. parvipes* below 1,000 m, and *M. m. sachalinensis* below 800 m (Groves *et al.*, 1995). The habitat of *M. moschiferus* varies considerably throughout its range in the country (Bannikov *et al.* 1980). In the Altai, in the south, and in the Baikal region (Ustinov, 1989), the typical habitat is steep mountain slopes, covered by thick mature coniferous forest interspersed with cliffs, and open coniferous forest along the river terraces; arboreal lichens are the most important food. In Yakutia, in the north, they occur in forests dominated by *Larix decidua*, where they feed on terrestrial lichens in poplar-willow forests on alluvial spits. On the Vitimsk plateau they favour shrub communities dominated by *Rhododendron daurica*. In response to heavy snow, some musk deer have been observed to migrate up to 35 km to find food. Most populations, however, appear to be sedentary.

Viet Nam: Restricted to lowland and karst limestone areas in the northeast, but virtually all of the lowland forest in this part of the country has been cleared and the species is now confined to small, isolated karst areas (J. W. Duckworth, pers. comm. to UNEP-WCMC, July 2000).

THREATS TO SURVIVAL AND DOMESTIC USE

In addition to the dramatic impacts that harvest for the trade in musk pods has had on musk deer populations over this century, the loss of suitable habitat has also been a significant factor (Green and Kattel, 1997). In the long term, habitat destruction may represent as serious a threat as poaching. Throughout much of its range, the musk deer has been under pressure from increasing human populations. Subsistence forestry for local fuel and timber use occurs in subalpine and alpine regions. Even where the canopy is intact the dense understory favoured by musk deer for food and shelter is often extensively damaged by domestic livestock. Commercial forestry, tourism, and erosion as a result of poor civil engineering also contribute to the negative impact on the forests (Green, 1986).

Homes (1999) gave a figure for the amount of musk obtained from each male as approximately 25 g.

China: Deforestation has substantially impacted musk deer habitats. Although reliable quantitative data are sparse, the extent of deforestation in at least two areas – Sichuan and Heilongjiang Provinces – appears to have been well-documented (Wang, 1999; Winkler, 1998). According to Li (1993) forest cover in Sichuan Province declined from 30% in the 1950s to 14% in the 1980s. Wang (1999) stated that forest cover in Sichuan Province declined from 34% in 1937 to 12% in 1980, and then increased to 19% in 1988. In Ganzi Tibetan Autonomous Prefecture, in western Sichuan, forest cover has been reduced from 19.4% to 10% along the course of the Yarlung River (Winkler, 1998). Unrealistic annual timber harvest quotas assigned to state-owned forestry enterprises and extensive illegal logging have contributed substantially to the problem in Sichuan. Extensive flooding in 1998 led to a logging ban in Sichuan and the eastern Tibet Autonomous Region (Winkler, 1999), and an emphasis on reforestation of watersheds in the upper catchment areas of major rivers. In Heilongjiang Province, forest cover declined from 70% in 1896 to 34.7% in 1986, and a key cause has been commercial timber production (Wang, 1999).

Many musk deer are caught by the use of snares, and these will catch many females and young animals that do not have musk pods. In one valley in southeast Tibet, three people set over one thousand snares in July 1995 (Qiu and Zhang, 1996).
The size and weight of musk pods differ according to the species of musk deer (Q. Yang, *in litt*. to TRAFFIC East Asia, June 2000), the age of the deer and the season in which the pods are collected. Normally, they are 3-7 cm in diameter and 2-4 cm deep (Anon., 1995a; Feng *et al*., 1981, cited in Parry-Jones and Wu, in prep.). The amount of water contained in natural musk varies according to the season, local environment, food, the way the musk is handled after it is collected, and how long it has been stored. Musk collected in summer, "summer musk", is moist and contains 52-57% water; musk collected in winter, "winter musk", is drier and contains 28-30% water (Zeng, 1984, cited in Parry-Jones and Wu, in prep.). A male musk deer of poorer physical condition secretes only 41-46% of the musk secreted by a healthy male musk deer (Yan, 1985) although sometimes it will secrete no musk (H. Xu, *in litt*. to TRAFFIC East Asia, June 2000, cited in Parry-Jones and Wu, in prep.).

Mongolia: Musk deer poaching has increased substantially since 1990 (S. Banzragch, CITES Management Authority of Mongolia, *in litt.* to Office of Scientific Authority, U.S. Fish and Wildlife Service, May 1999).

National utilization

China: Musk deer have long been harvested for national utilisation. Over-harvest has been implicated in population declines. The ESSC (1998) summarised harvest within China from the 1950s to the 1980s and its effects on musk deer populations. For *M. berezovskii*, the ESSC (1998) noted the following:

(1) In Shaanxi Province, the annual output of musk exceeded 100 kg for four years in the 1960s. In 1971-1976, the annual output was only 50-60 kg. Starting in 1977, over-hunting caused the annual output to surpass 200 kg, with the largest quantity - 300 kg - reached in 1980. Four years of over-hunting caused the population to decline rapidly. In 1984-1985, the annual output was only 30 kg.
(2) In Guizhou Province, the highest output of musk was 112 kg in 1965, and subsequently it declined so that, by the 1970s, it was down to 30 kg annually. The musk deer is now believed to be extirpated from Guizhou Province.
(3) In Sichuan Province, annual musk production prior to 1981 was 300-600 kg. Production reached a peak of 862 kg in 1980, which meant that more than 100,000 musk deer were killed that year. From 1981, musk production declined drastically and dropped below 300 kg per year.

For *M. chrysogaster*, the ESSC (1998) estimated that annual musk production in the 1960s exceeded 1,000 kg for six years and that, in 1972, 1,800 kg of musk were produced.

However, according to other sources, China's domestic demand for musk has been estimated at approximately 2,000 kg per annum for the past fifty years (Professor S. Hu, Beijing Academy of Traditional Chinese Medicine, *in litt*. to TRAFFIC East Asia, September 1998, cited in Parry-Jones and Wu, in prep.).

Poaching to supply demand has been an important factor in the decline of populations of *Moschus* since the early 1980s – over 99% of the musk in trade in China is apparently from wild populations (Helin Sheng *in litt.* to IUCN/SSC Wildlife Trade Programme, 22 June 2000).

Russian Federation: The changing socio-economic conditions caused a skyrocketing demand for musk for the international market, beginning in 1989. Official figures for musk collection between 1989-1993 reached 240 kg (Prikhod'ko and Ovsyanikov, 1998). Prikhod'ko (1997, cited in Homes 1999) further estimated that from about 1989 to 1996, the overall quantity of musk traded legally and illegally in the Soviet Union/Russia amounted to about 350-380 kg. This latter quantity was estimated to represent the capture of 23,000–26,000 male animals, or a total capture of 90,000 – 104,000 musk deer (based on four or five musk deer killed for every pod-bearing male). An alternative figure of three or four musk deer harvested to obtain one male with musk was given by Vaisman *et al*. (1999).

Information collected in the Russian Far East through interviews with professional hunters, local game managers, musk buyers and middlemen reveal different figures for the illegal harvest of musk deer. Fluctuations in quantities of illegal musk purchased have been estimated for 1997/8-2000. The table below demonstrates the potential range of quantities purchased for the year, by region. The figures

assume that 25 g of musk are obtained per pod-bearing male. It is estimated that approximately 60,000 to 70,000 animals are harvested illegally in the Russian Far East each year (TRAFFIC Europe-Russia *in litt.* to TRAFFIC International, September 2000).

Table 4. Annual estimate of illegally bought musk in four Russian regions for 1997/8-2000

Region	Illegally bought musk (kg)	Equivalent number of males
Khabarovsky Krai	180-200	7,200 – 8,000
Amur Oblast	130 - 150	5,200 – 6,000
Jewish Autonomous Oblast	10 - 15	400 – 600
Primorsky Krai	100-115	4,000 – 4,600
TOTAL	420 - 480	16,800 – 19,200

Source: TRAFFIC Europe-Russia *in litt.* to TRAFFIC International, September 2000).

INTERNATIONAL TRADE

The long-held status of musk as a highly prized commodity has ensured that it has long been the subject of international trade. In the seventh century AD, musk was being traded with Arabs who valued it for its scent, and mixed it with mortar in the construction of their mosques, such as those at Kara Amed and Tabriz in Iran (Green and Taylor, 1986).

The use of musk in Europe from the fourth century onwards suggests that it has long been an important trading commodity on this continent. The historical peak of the musk trade is considered to have occurred around the turn of the fourth century. It has been estimated that China and the Indian sub-continent were exporting around 1,400 kg of musk each year, at that time (Anon., 2000a). This high level of trade is thought to have had a strong negative effect on musk deer populations, which have never recovered to pre-1900 levels (Green and Taylor, 1986).
As the world's human population grew in numbers and affluence through the twentieth century, so too did the demand for musk on both the domestic and international markets.

Throughout the 1970s and 1980s, Japan was the largest importer of musk, accounting for some 85% of the international trade with average annual imports of around 275 kg, principally via Hong Kong. Most of the remaining musk was destined for France, which was importing around 50 kg per year, at that time. It is thought that most of this musk originated in India and Nepal (Green and Taylor, 1986).

Around 400 patented pharmaceutical preparations containing musk are used in Chinese medicine (TRAFFIC East Asia, *in litt*. to TRAFFIC International, 2000b). Demand from the European perfume industry is likely to represent 5-10% of trade (TRAFFIC Europe, *in litt.* to IUCN/SSC Wildlife Trade Programme, 1999). Interpretation of musk trade is complicated by the fact that musk is often adulterated with other ingredients (M. J. B. Green, *in litt*. to IUCN/SSC Wildlife Trade Programme, 2000; Tsui and Choi, 1997).

CITES Annual Reports (1991-1998) show that the majority (80%) of reported international trade in *Moschus* spp. has been in musk or its derivatives. The rest consisted of live animals, trophies, bones, skin and scientific specimens (Table 7). Eight countries reported total imports of 2,718 kg of musk between 1991 and 1998 (averaging about 340 kg/year) (Table 9), substantially greater than reported exports which totalled 556 kg (averaging 70 kg/year) (Table 8). The main country involved was the Republic of Korea with a total import of 2,300 kg, followed by Hong Kong, Japan and Germany, which imported much smaller quantities. In addition, large numbers of derivatives were imported into East and Southeast Asia from China. The Republic of Korea consumes a large amount of musk within the country, while Japan consumes large quantities but also re-exports a significant volume of musk (as derivatives).

On 19 September 1999 the European Union introduced an import restriction on *Moschus* from the wild from China and the Russian Federation.

China: During the 1950s and 1960s, around 1,500 kg of musk were being taken annually from deer populations in Yunnan, Sichuan and Guizhou. Around 60% of this musk is thought to have come from the

Forest Musk Deer *M. berezovskii* (Wang *et al.*, 1993). In 1979, the Chinese authorities relaxed border restrictions with Hong Kong and Chinese musk flooded the Hong Kong market. This resulted in a switch from imports of Himalayan to Chinese musk (Green and Taylor, 1986). In the early 1980s, total musk production in China was estimated at 2,000 - 2,500 kg (Wang *et al.*, 1993). The export of derivatives involves very large numbers, with a peak in 1996 of 1,506,807 and 20 cartons, 25,600 boxes and 720 cartons – it is not possible to relate these figures to the amount of musk that was involved in their production. Given that hunting of musk deer has been prohibited since 1989 (see Conservation Measures), that captive-breeding farms produce a maximum of around 6 kg of musk per annum (see Captive-breeding) and that some of this musk is exported, and given that reported exports of musk to China only total 9 kg from 1993 to 1998, it would appear that medicinal derivatives claiming to contain musk either a) do not contain any natural musk, or b) that they contain musk illegally harvested in China or illegally imported into China. However, analysis in Taiwan (province of China) of seized medicines made in China and claiming to contain musk revealed that only 1.3% of medicines claiming to contain musk actually contained musk. It is therefore most likely that many medicinal derivatives claiming to contain musk do not actually contain natural musk but actually may contain synthetic musk (Parry-Jones and Wu, in prep.).

Anon. (2000b) claimed that only a small number of deer are involved in the trade in derivatives; Tianjin Lerentang Medicine Factory uses less than 30 g of musk (some of which is synthetic) annually, although 400 boxes of Shaoyaowan, which includes musk as an ingredient, are produced for export. Relatively little raw musk has been reported as direct exports (only 9 kg during 1991-1998 – see Table 7).

Democratic People's Republic of Korea: There was no trade reported in the CITES trade data for 1991-1998.

Kazakhstan: There was no trade reported in the CITES trade data for 1991-1998.

Mongolia: The Republic of Korea reported importing a total of 350 kg of musk from Mongolia in 1994-1995 (Table 9).

Republic of Korea: Large quantities were reported as imports with a total of 2,300 kg (including around 1,200 kg under questionable circumstances from Cambodia, Kyrgyzstan, Mongolia and Uzbekistan, and 892 kg from an unknown country. Small quantities of musk, originating in China and Russia, were reported as re-exports in CITES data (Table 7).

Russian Federation: Between 1978 and 1991 reported exports of musk from the USSR ranged from zero in 1982 to about 80 kg in 1987 and 1988 (Homes, 1999). During the period 1991 to 1998 exports from Russia averaged 49 kg annually, with a peak of 95 kg in 1995 (Table 7). The reported export of 48 kg exceeded the export quota of 40 kg for that year but the 1998 figure of 29 kg (reported by importing countries) was within the quota of 35 kg. However, note that this may be due to carrying over an unused part of a quota to the following year.

Viet Nam: There was no trade reported in the CITES trade data for 1991-1998.

If one accepts a figure of three or four musk deer killed to obtain one male with musk (Vaisman *et al.*, 1999), and use a figure of 25 g of musk obtained from each male (Homes, 1999), these together suggest that approximately 30,000 to 50,000 musk deer are killed each year to supply the reported legal trade in musk. This estimation is based on the average of CITES reported imports (340 kg/year) and reported exports (82 kg/year) of musk for the period 1991-1998. The number killed to provide the reported trade in musk derivatives cannot be estimated.

Illegal trade

Due to the small size of musk pods, the ease with which they can be concealed, the substantial demand for musk, and the high prices that can be obtained, levels of illegal trade are likely to be high (TRAFFIC Europe, *in litt*. to IUCN/SSC Wildlife Trade Programme, September 1999; R. B. Harris, *in litt*. to IUCN/SSC Wildlife Trade Programme, 2000). Evidence of illegal international trade is widespread, e.g. in musk from illegally harvested deer in Russia (Chestin, 1998; Vaisman *et al.*, 1999) and in China (Wang, 1998). Anon. (2000b) noted that 1,154 kg of musk, of Chinese origin, was smuggled to Japan directly or indirectly from

Hong Kong from 1979-1985. In 1995, 230 kg were imported illegally in to the Republic of Korea from Korea P.D.R. (TRAFFIC East Asia, *in litt*. to TRAFFIC International, 2000c). Businessmen and tourists from China, Japan and the Republic of Korea have been found smuggling musk pods back to their countries on flights out of Vladivostok (TRAFFIC International, 1994).

Of the 240 kg of musk that was reported as officially traded in the Russian part of the Soviet Union and in Russia from 1989 to 1993, 30-40%, or approximately 70-100 kg, was estimated to be from illegal sources (Prikhod'ko, 1997, cited in Homes 1999). A survey by TRAFFIC of the illegal trade in musk and other natural products in the Russian Far East showed that Vladivostok and Khabarovsk were major centres of legal and illegal trade in the region (TRAFFIC International, 1994)

In summary, the reported legal trade in musk is unlikely to be having a significant effect on wild musk deer populations in most countries, although the importance of the reported trade in derivatives needs to be clarified. However, the substantial volume of illegal trade that has been documented, particularly in the Russian Far East must be having a significant impact on some populations.

CONSERVATION MEASURES

Protective legislation prohibiting or regulating harvest exists in most of the range states of the musk deer and it is the effectiveness of enforcement that has constituted a major problem (Green and Kattel, 1997).

China: Musk deer come under several different regulations. Ohtaishi and Gao (1990) noted that *M. berezovskii*, *M. moschiferus* and *M. chrysogaster* are on the Chinese Government list of second-grade protected wild animals. Green and Kattel (1997) reported that, under the federal Wildlife Protection Law 1988, Category II species may only be taken with a permit granted by the provincial authority. Under the Wildlife Resources Protection and Management Regulations 1988, Qinghai Provincial Government declared a special emergency notice regarding musk deer in an effort to increase awareness of the concerns and to strengthen protection (Green and Kattel, 1997). Legislation in China has not been directly effective in protecting the species, although nature reserves set up to provide habitat for the Giant Panda have indirectly benefited populations of Forest Musk Deer *M. berezovskii* (Green and Kattel, 1997).

An Official Letter (No. 133, 1990) issued by the Ministry of Forestry (now State Forestry Administration) detailed the correct procedures for the export of medicines containing derivatives of wild animals. Attached to this letter is a list of medicines, including 165 listed medicines containing musk, for which export must be accompanied by an export permit issued by the CITES Management Authority (MA). This permit must be submitted to Customs for approval of export. Official Notice Number 2 (1999) issued by the CITES MA and the Head Office of Customs details the correct procedures and permit requirements for the export of musk and for medicinal products containing musk. The customs codes for natural musk and medicinal products containing musk are also provided.

No hunting permits have been issued for musk deer since 1989. However, provincial authorities may issue permits for capture of musk deer for augmenting captive populations. Exports of natural musk have been prohibited since 1997. Musk from captive-breeding can be exported in 'the appropriate amounts' as determined by the CITES MA. Medicines containing natural musk may be exported (if accompanied by the appropriate documents in accordance with Official Letter No. 133, 1990) (Z. Fan, China CITES MA pers. comm. to TRAFFIC East Asia, 3 February 2000).

Democratic People's Republic of Korea :

Kazakhstan: There are no provisions protecting musk deer (Krever *et al.*, 1998).

Mongolia: Totally protected as an endangered species under legislation introduced on 5 June 1995 (Wemmer, 1998).

Republic of Korea: Protected since 1968, when it was designated as Natural Monument No. 216. A Musk Deer Preservation Council was established in 1978 under the auspices of the Korean Wildlife Preservation

Association (Wemmer, 1998). The Republic of Korea became a Party to CITES on 7 October 1993, with a reservation on *Moschus* in Appendix II, but the reservation was withdrawn on 6 October 1996.

Russian Federation: Regulations on the hunting of musk deer vary according to region. In Krasnojarski Krai, the harvest was banned in 1994, while at the same time in Khabarovsky Krai, a quota of 2,000 animals was set. Protection of the rare Sakhalin Island subspecies *M. m. sachalinensis* will hopefully be achieved through the creation of a reserve planned to be established by the year 2000 (Wemmer, 1998). The subspecies is included in the Red Data Book of the Russian Federation and therefore receives the highest protection status; all harvest of this taxon is strictly prohibited. Legal hunting of musk deer in the Russian Federation is regulated through the issue of licences, based on the musk deer counts (Homes, 1999). In addition, the Russian Federation sets annual export quotas for legal trade of musk from musk deer:

Table 5. Russian Federation CITES export quotas for *Moschus moschiferus*, 1997-2000

	1997	1998	1999	2000
Quota (kg)	40	35	63.5	83.255

Viet Nam: National legislation has protected musk deer since 1963 (Wemmer, 1998).

CAPTIVE-BREEDING

Captive-breeding of musk deer for commercial purposes does occur, but primarily within countries of origin, where it has shown limited success.

China: Captive-breeding of musk deer began in 1958 but many captive-breeding centres have not been successful; e.g. the Anhui Musk Deer Breeding Center began breeding *M. moschiferus* in the 1970s but, despite the introduction of additional animals in 1980-1981, none was left by 1986. There are currently four breeding centres remaining, with a total population of 1,500-2,000 musk deer, but the captive population is not stable (ESSC, 1998). China's captive musk deer population produces a maximum of 6 kg per year (TRAFFIC East Asia, *in litt*. to TRAFFIC International, 2000b), of which about 5 kg are exported (Helin Sheng *in litt.* to IUCN/SSC Wildlife Trade Programme, 22 June 2000). Anon. (2000b) provided the following table of the status of some of the larger farms:

Table 6. Details of some larger musk deer farms in China

	Date of establishment	*M. chrysogaster* (inc. *berezovskii*)	*M. c. sifanicus*	Number of young annually	Musk produced annually (kg)
Beijing Yusheng Wildlife Farm	1995	62		12	0.13
Gansu Xinglongshan Reserve Farm	1990		72	9	?
Sichuan Chuanxi Forestry Farm	1958	115		17	0.4
Sichuan Musk Deer Farming Institute	1958	989	21	230	3.5-4
One farm in Guangxi	?	28		?	?

Democratic People's Republic of Korea: Some musk deer farms have been established but it is not known how successful these have been (J. W. Duckworth, pers. comm. to UNEP-WCMC, July 2000).

Russian Federation: Prikhod'ko (2000) claimed that *Moschus* have been farmed on an experimental basis.

It is unlikely that captive breeding of this genus will provide sufficient musk to meet demand in the near future. Although it is possible to harvest musk from live deer in the wild, the methodology is not yet well-developed (Green and Kattel, 1997).

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Table 7

Gross exports of *Moschus* spp. 1991-1998

TAXON	TERM	UNIT	EXPORTER	1991	1992	1993	1994	1995	1996	1997	1998
Moschus spp.	bone carvings		VN	0	0	0	4	0	0	0	0
Moschus spp.	Bones		CN	0	0	0	0	5	16	0	0
Moschus spp.	bone pieces		CN	0	0	0	0	0	6	0	0
Moschus spp.	derivatives		AU	0	0	0	0	0	67	0	4
Moschus spp.	derivatives		CA	0	0	0	0	0	0	92	32
Moschus spp.	derivatives		CH	0	0	0	0	0	0	0	5
Moschus spp.	derivatives		CI	0	0	0	0	0	0	0	7
Moschus spp.	derivatives		CN	43	8	1298	992	1628	1807	3061	1804
Moschus spp.	derivatives		FJ	0	0	0	0	0	0	1	0
Moschus spp.	derivatives		HK	0	7175	10	0	4	83	175	225
Moschus spp.	derivatives		ID	0	0	5	0	0	0	5	25
Moschus spp.	derivatives		IN	0	0	0	0	0	0	15	0
Moschus spp.	derivatives		JP	30	0	0	0	0	40	0	2
Moschus spp.	derivatives		KE	0	0	0	0	0	5	8	0
Moschus spp.	derivatives		KH	0	0	0	0	0	33	0	0
Moschus spp.	derivatives		KR	375	0	20	7	0	2034	26	131
Moschus spp.	derivatives		LT	0	0	0	0	0	0	0	1
Moschus spp.	derivatives		MY	0	0	0	0	0	0	98	2
Moschus spp.	derivatives		SG	0	0	1	0	0	14	2	8
Moschus spp.	derivatives		TD	0	0	0	0	0	10	0	0
Moschus spp.	derivatives		TH	0	0	6	0	0	10	38	52
Moschus spp.	derivatives		TW	0	0	0	0	0	24	34	12
Moschus spp.	derivatives		US	0	0	0	0	0	0	26	1
Moschus spp.	derivatives		VN	0	0	4	1	0	127	7	620
Moschus spp.	derivatives		XX	124	39	107	28	70	41	319	88
Moschus spp.	derivatives	bags	CN	0	0	0	33	276	0	0	0
Moschus spp.	derivatives	bags	JP	0	0	0	5	0	0	0	0
Moschus spp.	derivatives	bags	MY	0	0	0	5	0	0	0	0
Moschus spp.	derivatives	bags	VN	0	0	0	0	30	0	0	0
Moschus spp.	derivatives	bags	XX	0	0	0	7	455	0	0	0
Moschus spp.	derivatives	cartons	CN	0	0	0	0	0	0	0	500
Moschus spp.	derivatives	g	CN	0	0	0	150	0	0	0	0
Moschus spp.	derivatives	kg	CN	0	0	0	0	7	7	0	0
Moschus spp.	horn carvings		CN	0	0	0	0	0	0	0	1
Moschus spp.	horn products		CN	0	0	0	0	0	0	4	0
Moschus spp.	horn products		XX	0	4	0	0	0	0	0	0

TAXON	TERM	UNIT	EXPORTER	1991	1992	1993	1994	1995	1996	1997	1998
Moschus spp.	musk		CN	0	0	0	0	0	13	0	6
Moschus spp.	musk		DE	0	0	0	117	0	0	0	0
Moschus spp.	musk		ES	0	0	0	0	0	0	0	35
Moschus spp.	musk		HK	0	0	0	0	0	0	0	2
Moschus spp.	musk		MY	0	0	0	0	0	0	41	0
Moschus spp.	musk		XX	0	0	0	0	0	0	54	0
Moschus spp.	musk	bottles	CN	112	0	0	0	0	0	0	0
Moschus spp.	musk	g	HK	0	0	0	0	5000	4200	0	0
Moschus spp.	musk	g	RU	0	0	0	0	0	7682	0	0
Moschus spp.	musk	kg	CN	0	0	0	0	0	0	0	2
Moschus spp.	musk	kg	DE	0	0	0	8	10	16	0	0
Moschus spp.	musk	kg	HK	0	0	0	0	7	0	6	0
Moschus spp.	musk	kg	RU	0	0	0	0	0	26	0	0
Moschus spp.	musk	kg	SG	0	0	0	0	0	30	6	0
Moschus spp.	musk	kg	XX	0	0	0	0	0	892	21	0
Moschus spp.	oil		CN	0	0	1	0	0	0	0	0
Moschus spp.	skin pieces		CA	0	0	0	0	0	1	0	0
Moschus spp.	skin pieces		CN	0	0	5	215	4	0	0	0
Moschus spp.	skin pieces		HK	0	0	0	0	0	34	0	0
Moschus spp.	skin pieces		KP	0	0	0	0	461	0	0	0
Moschus spp.	skin pieces		XX	0	0	0	0	0	1	0	0
Moschus spp.	specimens		CA	1	0	0	0	0	0	1	0
Moschus spp.	specimens		US	0	0	0	0	0	4	0	0
Moschus spp.	specimens		XX	2	0	0	0	0	0	0	0
Moschus spp.	specimens	g	US	0	0	0	0	0	30	0	0
Moschus spp.	trophies		KR	0	0	1	0	0	0	0	0
Moschus spp.	unspecified		CN	0	0	0	0	0	0	2	0
Moschus spp.	unspecified		RU	0	0	0	0	0	0	4	0
Moschus berezovskii	derivatives	cartons	CN	0	0	0	0	0	20	0	0
Moschus berezovskii	musk		CN	0	0	0	0	1000	0	0	0
Moschus berezovskii	musk	g	CN	0	0	0	0	1000	0	0	0
Moschus berezovskii	musk	kg	CN	0	0	0	0	0	3	3	0
Moschus fuscus	skin pieces		FR	0	0	0	0	0	0	2	0
Moschus moschiferus	bodies		CA	0	0	0	0	20	0	0	0
Moschus moschiferus	bodies		CN	0	0	0	0	1	0	0	0
Moschus moschiferus	bodies		FI	1	0	0	0	0	0	0	0
Moschus moschiferus	bodies		KR	0	0	0	0	1	0	0	0
Moschus moschiferus	bodies		MX	0	0	0	0	0	0	1	0
Moschus moschiferus	bodies		SU	1	0	0	0	0	0	0	0

TAXON	TERM	UNIT	EXPORTER	1991	1992	1993	1994	1995	1996	1997	1998
Moschus moschiferus	derivatives		CN	457670	339220	12600	573194	889006	1505000	318589	114004
Moschus moschiferus	derivatives		HK	0	0	0	2	0	0	16	0
Moschus moschiferus	derivatives		KH	0	0	0	30	0	0	50	0
Moschus moschiferus	derivatives		KR	0	0	0	4	0	89	0	0
Moschus moschiferus	derivatives		TH	0	0	0	5	0	0	0	0
Moschus moschiferus	derivatives		TW	0	0	6	0	45	0	1	0
Moschus moschiferus	derivatives		XX	2	0	100	0	0	62	0	0
Moschus moschiferus	derivatives	bags	CN	20000	144000	0	0	0	0	0	0
Moschus moschiferus	derivatives	bags	TW	0	0	0	0	15000	0	0	0
Moschus moschiferus	derivatives	bottles	CN	10	0	0	0	0	0	0	0
Moschus moschiferus	derivatives	boxes	CN	282434	262690	6	3500	4020	25600	28530	12000
Moschus moschiferus	derivatives	boxes	TW	0	0	0	3000	0	45000	0	0
Moschus moschiferus	derivatives	cases	CN	0	107	0	0	0	0	0	0
Moschus moschiferus	derivatives	cartons	CN	125241	8433	452	20109	635	720	481	16
Moschus moschiferus	derivatives	g	CN	0	0	0	0	0	0	0	11
Moschus moschiferus	derivatives	kg	CN	0	0	0	0	8	0	42	805
Moschus moschiferus	feet		RU	0	0	12	0	0	0	0	0
Moschus moschiferus	live		DE	0	2	0	0	0	0	0	0
Moschus moschiferus	live		PL	0	0	0	0	0	3	6	0
Moschus moschiferus	live		RU	0	0	7	8	11	7	0	0
Moschus moschiferus	musk		CH	0	0	5	0	0	0	0	0
Moschus moschiferus	musk		FR	424	0	0	0	0	0	0	0
Moschus moschiferus	musk		GE	0	0	0	117	0	0	0	0
Moschus moschiferus	musk		JP	0	424	0	0	0	0	0	0
Moschus moschiferus	musk	g	CN	0	0	0	0	500	0	0	0
Moschus moschiferus	musk	g	FR	0	5	0	0	0	0	0	0
Moschus moschiferus	musk	g	HK	0	100	0	0	500	22480	17490	305
Moschus moschiferus	musk	g	JP	0	0	0	0	0	0	2480	0
Moschus moschiferus	musk	g	KR	0	0	0	2250	2387	0	0	0
Moschus moschiferus	musk	g	RU	0	0	200	50746	94720	0	0	0
Moschus moschiferus	musk	kg	CH	5	0	5	5	0	0	7	1
Moschus moschiferus	musk	kg	DE	0	0	0	8	10	22	0	10
Moschus moschiferus	musk	kg	FR	0	7	0	0	0	0	3	0
Moschus moschiferus	musk	kg	HK	13	5	13	9	6	25	50	21
Moschus moschiferus	musk	kg	JP	0	7	0	0	0	0	2	0
Moschus moschiferus	musk	kg	KG	0	0	0	0	125	0	0	0
Moschus moschiferus	musk	kg	KH	0	0	0	114	298	250	0	0
Moschus moschiferus	musk	kg	MN	0	0	0	100	250	1	0	0
Moschus moschiferus	musk	kg	RU	0	21	24	31	10	54	66	29

TAXON	TERM	UNIT	EXPORTER	1991	1992	1993	1994	1995	1996	1997	1998
Moschus moschiferus	musk	kg	SG	4	7	29	17	10	1	0	5
Moschus moschiferus	musk	kg	SU	36	7	0	0	0	0	0	0
Moschus moschiferus	musk	kg	UZ	0	0	0	51	75	0	0	0
Moschus moschiferus	musk	pieces	RU	0	0	0	0	852	0	0	0
Moschus moschiferus	skins		RU	0	0	3	0	0	0	0	0
Moschus moschiferus	skins		XX	0	0	3	0	0	0	0	0
Moschus moschiferus	skulls		XX	0	0	3	0	0	0	0	0
Moschus moschiferus	specimens		CH	0	0	0	0	0	0	7	0
Moschus moschiferus	specimens		DE	0	0	0	117	0	0	0	0
Moschus moschiferus	specimens		KR	0	0	0	0	0	1	0	0
Moschus moschiferus	specimens		RU	0	0	20	0	0	0	0	0
Moschus moschiferus	specimens		US	0	0	0	0	0	0	0	1
Moschus moschiferus	specimens	g	RU	0	0	500	8000	0	0	0	0
Moschus moschiferus	specimens	kg	RU	0	0	2	0	0	0	0	0
Moschus moschiferus	specimens	kg	SU	0	2	0	0	0	0	0	0
Moschus moschiferus	specimens	millilitres	RU	0	0	250	0	0	0	0	0
Moschus moschiferus	trophies		RU	0	3	3	1	0	0	0	1
Moschus moschiferus	trophies		SU	0	3						

Table 8.

Trade in Moschus spp. (expressed as kg of musk) from 1990 to 1998, by country of (re-)export and origin

				Year								
Exporter	**Origin**	**Original Unit**	**Data**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**Total**
CH	RU	kg	imports			5.00	5.00			7.00	1.00	**18.00**
			exports								1.00	**1.00**
	SU	kg	imports									
			exports	5.00								**5.00**
CN	(blank)	g	imports					0.50				**0.50**
			exports					1.00				**1.00**
		kg	imports						3.00			**3.00**
			exports							3.00	2.00	**5.00**
DE	GE	kg	imports									
			exports				8.00					**8.00**
	RU	kg	imports				8.00	10.00	22.00		10.00	**50.00**
			exports					10.00	38.00		10.00	**58.00**
FR	RU	kg	imports							3.00		**3.00**
			exports									
	SU	g	imports		0.01							**0.01**
			exports		0.01							**0.01**
		kg	imports		7.00							**7.00**
			exports		7.00							**7.00**
HK	RU	g	imports					5.00	26.68	17.49	0.01	**49.18**
			exports					0.50	0.54	0.02	0.31	**1.36**
		kg	imports			8.00	6.00	6.00		33.00	7.00	**60.00**
			exports			13.00	6.00	12.00	25.00	50.00	20.00	**126.00**
	SU	g	imports		0.10							**0.10**
			exports									
		kg	imports	5.00	2.00							**7.00**
			exports	13.00	2.00							**118.00**
	(blank)	kg	imports								1.00	**1.00**
			exports									
JP	RU	g	imports									
			exports							2.48		**2.48**
		kg	imports							2.00		**2.00**
			exports									
	SU	kg	imports		7.00							**7.00**
			exports									
KG	(blank)	kg	imports					125.00				**125.00**
			exports									
KH	RU	kg	imports				45.00					**45.00**
			exports									
	(blank)	kg	imports				69.00	298.00	250.00			**617.00**
			exports									
KR	CN	g	imports									
			exports					0.14				**0.14**
		kg	imports									
			exports									
	RU	g	imports				2.25					**2.25**
			exports					2.25				**2.25**
MN	XX	kg	imports									
			exports						1.00			**1.00**
	(blank)	kg	imports				100.00	250.00				**350.00**
			exports									
RU	(blank)	g	imports			0.20			7.68			**7.88**
			exports			0.20	50.75	94.72				**145.67**
		kg	imports			23.00	31.00	10.00	80.00	46.00	29.00	**219.00**
			exports		21.00	6.00				48.00		**75.00**
SG	CN	kg	imports			29.00						**29.00**
			exports									
	RU	kg	imports				17.00	10.00	11.00	6.00	5.00	**49.00**
			exports				17.00		30.00		5.00	**52.00**
	SU	kg	imports		5.00							**5.00**
			exports	4.00	7.00							**11.00**
SU	(blank)	kg	imports	15.00	7.00							**22.00**
			exports	36.00								**36.00**
UZ	(blank)	kg	imports				51.00	75.00				**126.00**
			exports									
XX	(blank)	kg	imports						892.00	21.00		**913.00**
			exports									
Total imports				**20.00**	**28.11**	**65.20**	**334.25**	**789.50**	**1292.36**	**135.49**	**53.01**	**2717.91**
Total exports				**58.00**	**140.01**	**19.20**	**81.75**	**120.61**	**94.54**	**103.50**	**38.31**	**655.90**

Table 9.

Trade in Moschus spp. (expressed as kg of musk) from 1990 to 1998, by country of import, (re-)export and origin

					Year								
Importer	**Exporter**	**Origin**	**Original Unit**	**Data**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**Total**
CH	FR	SU	g	imports		0.01							0.01
				exports		0.01							0.01
	HK	RU	g	imports								0.01	0.01
				exports								0.01	0.01
			kg	imports			5.00					1.00	6.00
				exports			5.00					1.00	6.00
		SU	kg	imports	5.00								5.00
				exports	5.00								5.00
	RU	(blank)	g	imports									
				exports				11.93	26.36				38.29
			kg	imports				2.00					2.00
				exports		1.00					7.00		8.00
CH imports					**5.00**	**0.01**	**5.00**	**2.00**				**1.01**	**13.01**
CH exports					**5.00**	**1.01**	**5.00**	**11.93**	**26.36**		**7.00**	**1.01**	**57.30**
CN	RU	(blank)	kg	imports									
				exports			1.00				8.00		9.00
CN imports													
CN exports							**1.00**				**8.00**		**9.00**
DE	HK	RU	kg	imports								5.00	5.00
				exports								5.00	5.00
	RU	(blank)	g	imports						7.68			7.68
				exports				10.00	48.36				58.36
			kg	imports					10.00	31.00		5.00	46.00
				exports							5.00		5.00
DE imports									**10.00**	**38.68**		**10.00**	**58.68**
DE exports								**10.00**	**48.36**		**5.00**	**5.00**	**68.36**
FR	CH	RU	kg	imports			5.00					1.00	6.00
				exports								1.00	1.00
	HK	RU	g	imports						2.04	0.27		2.31
				exports					0.50	0.04	0.02	0.30	0.86
			kg	imports			3.00		4.00		7.00		14.00
				exports			3.00		3.00	2.00	7.00		15.00
		SU	g	imports		0.10							0.10
				exports									
			kg	imports		2.00							2.00
				exports		102.00							102.00
		(blank)	kg	imports								1.00	1.00
				exports									
	SU	(blank)	kg	imports	15.00	7.00							22.00
				exports	15.00								15.00
FR imports					**15.00**	**9.10**	**8.00**		**4.00**	**2.04**	**7.27**	**2.00**	**47.41**
FR exports					**15.00**	**102.00**	**3.00**		**3.50**	**2.04**	**7.02**	**1.30**	**133.86**
HK	DE	GE	kg	imports									
				exports				8.00					8.00
		RU	kg	imports				8.00		22.00		5.00	35.00
				exports						22.00		5.00	27.00
	FR	RU	kg	imports							3.00		3.00
				exports									
		SU	kg	imports		7.00							7.00
				exports		7.00							7.00
	JP	RU	g	imports									
				exports							2.48		2.48
			kg	imports							2.00		2.00
				exports									
		SU	kg	imports		7.00							7.00
				exports									
	RU	(blank)	g	imports			0.20						0.20
				exports			0.20	11.83	11.76				23.78
			kg	imports			23.00	7.00		28.00	46.00	24.00	128.00
				exports		20.00	5.00				28.00		53.00
	SG	RU	kg	imports						10.00	6.00		16.00
				exports						20.00			20.00
		SU	kg	imports		5.00							5.00
				exports		5.00							5.00
HK imports						**19.00**	**23.20**	**15.00**		**60.00**	**57.00**	**29.00**	**203.20**
HK exports						**32.00**	**5.20**	**19.83**	**11.76**	**42.00**	**30.48**	**5.00**	**146.26**

Trade in Moschus spp. (expressed as kg of musk) from 1990 to 1998, by country of import, (re-)export and origin

					Year								
Importer	**Exporter**	**Origin**	**Original Unit**	**Data**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**Total**
JP	CN	(blank)	g	imports									
				exports					1.00				1.00
			kg	imports						3.00			3.00
				exports							3.00	2.00	5.00
	HK	RU	g	imports					5.00	24.64	17.23		46.87
				exports						0.50			0.50
			kg	imports				6.00	1.00				7.00
				exports			5.00	3.00	8.00	23.00	17.00	13.00	69.00
		SU	kg	imports									
				exports	8.00	3.00							11.00
	KR	CN	g	imports									
				exports					0.14				0.14
			kg	imports									
				exports									
		RU	g	imports				2.25					2.25
				exports					2.25				2.25
	SG	RU	kg	imports				2.00		1.00			3.00
				exports				2.00					2.00
		SU	kg	imports									
				exports	4.00	2.00							6.00
JP imports								**10.25**	**6.00**	**28.64**	**17.23**		**62.12**
JP exports					**12.00**	**5.00**	**5.00**	**5.00**	**11.39**	**23.50**	**20.00**	**15.00**	**96.89**
KR	CH	RU	kg	imports				5.00			7.00		12.00
				exports									
		SU	kg	imports									
				exports	5.00								5.00
	CN	(blank)	g	imports					0.50				0.50
				exports									
	HK	RU	kg	imports					1.00		26.00	1.00	28.00
				exports				3.00	1.00		26.00	1.00	31.00
	KG	(blank)	kg	imports					125.00				125.00
				exports									
	KH	RU	kg	imports				45.00					45.00
				exports									
		(blank)	kg	imports				69.00	298.00	250.00			617.00
				exports									
	MN	(blank)	kg	imports				100.00	250.00				350.00
				exports									
	RU	(blank)	g	imports									
				exports					6.25				6.25
			kg	imports				5.00		20.00			25.00
				exports									
	SG	CN	kg	imports			29.00						29.00
				exports									
		RU	kg	imports				15.00	10.00			5.00	30.00
				exports				15.00		10.00		5.00	30.00
	UZ	(blank)	kg	imports				51.00	75.00				126.00
				exports									
	XX	(blank)	kg	imports						892.00	21.00		913.00
				exports									
KR imports							**29.00**	**290.00**	**759.50**	**1162.00**	**54.00**	**6.00**	**2300.50**
KR exports					**5.00**			**18.00**	**7.25**	**10.00**	**26.00**	**6.00**	**72.25**
SG	DE	RU	kg	imports					10.00			5.00	15.00
				exports					10.00	16.00		5.00	31.00
	RU	(blank)	g	imports									
				exports				16.99	2.00				18.99
			kg	imports				17.00		1.00			18.00
				exports									
	SU	(blank)	kg	imports									
				exports	21.00								21.00
SG imports								**17.00**	**10.00**	**1.00**		**5.00**	**33.00**
SG exports					**21.00**			**16.99**	**12.00**	**16.00**		**5.00**	**70.99**
XX	MN	XX	kg	imports									
				exports						1.00			1.00
XX imports													
XX exports										**1.00**			**1.00**
Total imports					**20.00**	**28.11**	**65.20**	**334.25**	**789.50**	**1292.36**	**135.49**	**53.01**	**2717.91**
Total exports					**58.00**	**140.01**	**19.20**	**81.75**	**120.61**	**94.54**	**103.50**	**38.31**	**655.90**