CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

Other proposals

A. Proposal

The transfer of wild Asian buffalo (*Bubalus bubalis* including the synonym *Bubalus arnee*) from Appendix III to Appendix I is proposed.

The transfer of wild *Bubalus bubalis* from Appendix III to Appendix I is necessary because the species is or may be affected by trade and because it meets the biological criteria for inclusion in Appendix I (A(i), A(ii), and C(ii), as presented in Resolution Conf. 9.24; for further details see Annex 2 to this document).

The world population of wild Asian buffalo is now very small: probably fewer than 1000, and quite possibly fewer than 200 animals. True wild buffalo, if indeed any still remain, are now thought to be restricted to India, Bhutan, Nepal, and Thailand. Any apparently wild buffalo sub-populations which remain in Bangladesh, Cambodia, Indonesia, the Lao PDR, Malaysia, Myanmar, Sri Lanka, and Vietnam are likely to be feral or to have interbred with domestic and/or feral animals.

No sub-populations of more than 500 wild buffalo are known and there may only be one sub-population of more than 50 true wild buffalo (in Kosi Tappu Wildlife Reserve in Nepal).

Information about buffalo population trend is scarce. However the available data suggest that the number of wild buffalo in central India declined by about 80% between 1966 and 1992; few data exist for NE India but there is little doubt that the number of true wild buffalo there has declined and is continuing to decline as a result of interbreeding with domestic and/or feral buffalo, hunting, and habitat loss. In Thailand wild buffalo numbers have apparently been relatively stable since the mid-1980s; and in Nepal the number of wild buffalo is thought to have increased by about 48% between 1976 and 1988 (the sole Nepali sub-population is seriously threatened however, see Section 2.7).

Little quantitative information is available about trends in the species's geographic range but both the area occupied by buffalo and the number of buffalo sub-populations have clearly declined throughout South and Southeast Asia.

The most important threats to wild Asian buffalo are interbreeding with feral and domestic buffalo, hunting, and habitat loss/degradation. Diseases and parasites (transmitted by domestic livestock) and interspecific competition for food and water between wild buffalo and domestic livestock are also serious threats.

The magnitude of the threat posed by international trade in wild buffalo parts (mainly horns) is difficult to quantify, not least because it is unclear how many of the trophies from reportedly wild buffalo are in fact from true wild buffalo rather than from feral or hybrid animals. Nevertheless, given the small size of the remaining wild buffalo population and the fact that trophies have been found for sale in Thailand and the Lao PDR, along the Myanmar-Thai border, the Thai-Lao border, and the Thai-Cambodian border, the threat has to be considered as potentially serious.

The transfer of wild buffalo from Appendix III to Appendix I will significantly strengthen the legislation prohibiting the international trade in horns and other buffalo products and will thus help wildlife protection agencies control this potentially serious threat to the survival of the species.

The transfer of wild *Bubalus bubalis* from Appendix III to Appendix I is considered necessary because the species is or may be affected by trade and because it meets the biological criteria for inclusion in Appendix I (as presented in Resolution Conf. 9.24) (for further details see Annex 2 to this document).

B. Proponent

Thailand

C. Supporting Statement

1. Taxonomy

1.1	**Class:**	**Mammalia**
1.2	**Order:**	**Artiodactyla**
1.3	**Family:**	**Bovidae**
1.4	**Genus and species:**	***Bubalus bubalis*** **(Linnaeus, 1758)**

Honacki *et al.* (1982) and Wilson and Reeder (1993) recognize *Bubalus bubalis* (Linnaeus, 1758) as the valid name for wild Asian buffalo; however Corbet and Hill (1992), and others who do not employ specific names based on domestic specimens, treat wild Asian buffalo as *Bubalus arnee* (Kerr, 1792), reserving *Bubalus bubalis* for domestic forms. Currently wild Asian buffalo are included in CITES Appendix III as *Bubalus arnee* but they were previously listed as *Bubalus bubalis*.

1.5	**Scientific synonyms:**	Formerly included in *Bos* and *Buffelus* ; *arna, arnee, arni, bubalus, buffelus, kerabau, indicus, mainitensis, moellendorfii* are specific synonyms. The following subspecific names have been proposed: *arnee, bubalis, ferus, fluviatilis, fulvus, hosei, italica, limneticus, macrocerus, migona, sepentrionalis, sondaicus, spiroceros* = *speirocerus*.
1.6	**Common names:**	Local names include: *arna* (males) and *arni* (females) (Hindi), *bonoria mah* (in Assam), *trau rung* (in Vietnam), *khoai pa* (Lao, Thai, Tay). Names for domestic and/or feral buffalo include: *kerbau* (in Malaysia and much of SE Asia), *kerbau, mahesa*, and *moending* (in Indonesia), *kwai* and *marid* (in Thailand), *krabey beng* and *krabey leu* (in Cambodia), *bahnar* (in Laos), and *carabao* (in the Philippines) (Dammerman, 1934; Cockrill, 1974; Lekagul & McNeely, 1977; Grzimek, 1990; Anon., 1992).

European names include: water buffalo, Asiatic or Indian buffalo (English), *le buffle d'eau* or *le buffle de l'Inde* (French), *búfalo arni* (Spanish), *wasserbüffel, Indischer büffel*, or *Asiatischer büffel* (German), and *bufalo indiano* or *arni* (Italian)

1.7	**Code numbers:**	ISIS number = 5301419009004001001 (as *Bubalus arnee*) according to Honacki *et al.* (1982). **[CHECK THAT NO CHANGES HAVE BEEN MADE.]**

CITES manual sheet code A-119.009.004.001

2. Biological Parameters

2.1 Distribution

Range States. Remnant sub-populations of wild buffalo are thought to occur in southern Nepal (Corbet & Hill, 1992; Heinen, 1993); in Madhya Pradesh and Assam, and possibly also in Arunachal Pradesh and Meghalaya, India (Divekar & Bharat Bhushan, 1988; Rodgers & Panwar, 1988; Corbet & Hill, 1992; Choudhury, 1994); in southern Bhutan (Blower, 1986); and in western Thailand (Santiapillai, 1990a; Corbet & Hill, 1992) (see Annex 1).

The situation in Indochina is rather more uncertain. Laos, Cambodia, and Vietnam are not included within the range of wild buffalo given in Corbet and Hill (1992) but Honacki *et al.* (1982) do include

Indochina in the range of the species. Free- living buffalo of unknown pedigree occur throughout the region (e.g. Laurie *et al.*, 1989; Salter *et al.*, 1990; Salter, 1993) and MacKinnon and Mackinnon (1986) included wild buffalo in species lists for protected areas in Cambodia and Vietnam (see Annex 1).

Corbet and Hill (1992) include northern Myanmar (formerly Burma) in the species's current range. However, Salter (1983) thought that wild buffalo were probably extinct there by the mid-1930s and any extant free-living buffalo were likely to be feral animals. Wild buffalo are also believed to be extinct in Bangladesh, peninsular Malaysia, and on the islands of Sumatra, Java, and Borneo (see Hedges (1996) for further details).

The origin and current genetic status of the herds of apparently wild buffalo in Sri Lanka is uncertain but it is thought unlikely that any true wild buffalo remain there today (Hedges, 1996).

'Area of distribution'. From the information contained in the references listed above and in Hedges (1996) the 'area of distribution' (*sensu* Resolution Conf. 9.24 Annex 5) of Asian buffalo in NE India and Bhutan is > 20,000 km², in central India it is also > 20,000 km², in Nepal it is *ca.* 170 km², and in Thailand it is < 2500 km², while in Indochina it is unknown. Thus for the species as a whole it is > 40,000 km². However the definition of 'area of distribution' is both vague and largely meaningless for a species such as Asian buffalo. A more useful measure is the 'area of occupancy' as used by IUCN (1994). The 'area of occupancy' is 'the area within [a taxon's] "extent of occurrence" [IUCN's "extent of occurrence" (IUCN, 1994:12) is effectively equivalent to the "area of distribution" of Resolution Conf. 9.24 Annex 5] which is occupied by a taxon, excluding cases of vagrancy. The measure reflects the fact that a taxon will not usually occur throughout the area of its extent of occurrence, which may for example contain unsuitable habitats.' For Asian buffalo this 'area of occupancy' is > 2000 km² in NE India and Bhutan, probably less than 500 km² in central India, *ca.* 100 km² in Nepal, probably < 500 km² in Thailand, and unknown in Indochina (Hedges, 1996).

Is the distribution of the species fragmented? The world population of wild Asian buffalo is very unlikely to be more than 4000 animals, probably fewer than 1000, and quite possibly fewer than 200 animals. This world population is scattered over a large area encompassing central India, NE India, Bhutan, Nepal, Thailand; and possibly Cambodia, Lao PDR, and Vietnam too. Few if any (0 to 4?) sub-populations are thought to have an area of distribution of more than 500 km²; at most only 2 sub-populations of more than 500 wild buffalo are likely to occur, and there are probably only 5 sub-populations with more than 100 wild buffalo (Hedges, 1996; also see Sections 2.3 and Annex 1). Such a pattern of distribution is judged to meet the criteria for 'fragmentation' (*sensu* Resolution Conf. 9.24 Annex 5).

Habitat. Wild buffalo are very dependent on the availability of water and historically their preferred habitats were low-lying alluvial grasslands and their surrounds; riparian forests and woodlands were also utilized (Lydekker, 1926; Prater, 1971; Choudhury, 1994). In Nepal they now only occur in the seasonally flooded grasslands and mixed forests of the Sapt Kosi floodplain. In Bhutan and Assam (India) they occur in alluvial grasslands along the Manas and Brahmaputra rivers. In the Bastar region of Madhya Pradesh (India) buffalo inhabit tropical dry deciduous forests with an understorey dominated by grasses. In Thailand they are now restricted to grasslands, mixed deciduous forest, and dry evergreen forest along rivers in the Huai Kha Khaeng Wildlife Sanctuary (Nakhasathien & Stewart-Cox, 1990; Uicharoensak, 1992).

Too few data exist to assess the extent of each habitat type over the range of the species.

2.2 Habitat availability

Too few data exist to quantify the rate and extent of habitat loss and/or degradation. Nevertheless habitat loss has been identified as a major threat to the species in NE India; because buffalo habitat is often in areas with alluvial soils suitable for raising winter crops it has proved impossible to prevent clearance except in protected areas, and 'hundreds of hectares of elephant-grass jungle are cleared every year' (Choudhury, 1994). In Thailand it has been estimated that *ca.* 72% of the original area of wild buffalo habitat has been lost, primarily to agricultural development (Santiapillai, 1990a citing information from J. MacKinnon). Habitat loss and degradation is also known to be a threat to wild buffalo in central India (Divekar & Bharat Bhusan, 1988), Bhutan (WCMC/IUCN, 1991), and Nepal (Heinen, 1993).

2.3 Population status

Estimate of total population. The current status of wild Asian buffalo is very poorly known; nevertheless from the limited information which is available it would seem that the total number of wild buffalo remaining is almost without doubt fewer than 4000 animals, probably fewer than 1000, and quite possibly fewer than 200 animals in 1996. However these figures are little more than informed guesses since any assessment of wild buffalo numbers is hampered by the difficulty of distinguishing between free-ranging domestic buffalo, feral buffalo, and truly wild buffalo, as well as hybrids between wild and other buffalo. Indeed it is possible that no purebred wild buffalo remain. Furthermore the quality of survey data varies greatly across the species's range and the criteria used to identify true wild buffalo are generally not made clear.

India. Recent reports are very divergent and are overly reliant on questionable Forest Department figures (i.e. few if any surveys or censuses have been conducted using acceptable methods). Divekar (cited in Kane, 1988) considers the small isolated sub-populations thought to occur in the Bastar and Raipur Districts of Madhya Pradesh (central India) the only purebred wild buffalo remaining in India (and only about 50 wild buffalo were thought to remain in these areas in 1992); but a more recent report by Choudhury (1994) is much less pessimistic, Choudhury suggests that there may still be 3300 to 3500 wild buffalo in NE India (mainly in the state of Assam). However in Assam the remaining reportedly-wild buffalo are largely restricted to two protected areas, Kaziranga National Park and Manas Wildlife Sanctuary/Project Tiger Reserve, and although some reports (e.g. WCMC/IUCN, 1991) suggest that the Manas area contains the only remaining truly wild buffalo in India, other sources (e.g. Ranjitsinh, 1992) suggest that the Manas sub-population has been badly affected by interbreeding. The buffalo in Kaziranga and adjoining areas are also reputed to have been particularly badly affected by interbreeding with domestic stock. Large numbers of domestic buffalo graze within the park, and their owners are apparently unable to keep domestic males with their herds because they are killed by wild males and consequently females are generally served by wild bulls. Potentially far more seriously the resulting hybrid male offspring are sometimes allowed to become feral (see for example Spillet, 1966; Scott, 1969; Maia, 1970; Ranjitsinh, 1992).

Bhutan. An unknown number of buffalo, believed to include truly wild individuals, occurs in the Royal Manas National Park (which is contiguous with Manas Tiger Reserve in Assam, NE India). This is the only sub-population in Bhutan (Blower, 1986; Bunting, 1989).

Nepal. Only 1 sub-population of reportedly-wild buffalo remains in Nepal. The sub-population occurs in and around the Kosi Tappu Wildlife Reserve in SE Nepal, and it is thought to number about 100 animals. It has been suggested that the supposedly wild buffalo sub-population in Kosi Tappu is in fact composed of hybrids animals (e.g. WCMC/IUCN, 1991); however Heinen (1993) disputes this and he suggests that there is little danger of genes from domestic buffalo entering into the wild sub-population because domestic males only occur very infrequently in the reserve and it is unlikely that they would be able to compete with wild males for access to females. Furthermore the offspring of wild males and domestic females are too valuable to be allowed to join wild herds. Good quality census data exist for the late-1980s; subsequent census data have been questioned because it is feared that hybrid (wild x domestic) buffalo were included in counts (J. Heinen *in litt.* to S. Hedges, 1995). [Heinen's point is that hybrid animals (in this case the offspring of domestic females and wild males) do occur in the reserve but they do not join wild herds, or if they do it is on a temporary basis; and, most importantly, any offspring resulting from matings between these domestic animals and wild buffalo are not allowed to remain in the reserve (because they are too valuable to their owners). Heinen claims that he was able to distinguish the true wild buffalo from the hybrids but that subsequent workers have not done so.]

Thailand. About 40 to 50 wild buffalo are reported to occur in the Huai Kha Khaeng Wildlife Sanctuary; this is the only sub-population remaining in Thailand (Nakasatit & Chanard, 1985; Uicharoensak, 1992; N. Bhumpakphan *in litt.* to S. Hedges, 1995). It has been suggested that they may have interbred with domestic animals (IUCN, 1987), but Stewart-Cox (*in litt.* to S. Hedges, 1994) thinks that this is unlikely.

Bangladesh, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, and Vietnam. Any apparently wild buffalo sub-populations which remain are likely to be feral or to have interbred with domestic and/or feral animals (see Annex 1 and Hedges (1996) for further details).

Sri Lanka. Questions have been repeatedly raised about the origin and genetic purity of the Sri Lankan sub-populations and it is thought unlikely that any purebred wild buffalo still exist on the island (see Annex 1 and Hedges (1996) for further details).

Size of the captive population. ISIS data indicate that 14 (4.10) buffalo belonging to the putative Bornean subspecies (*Bubalus bubalis hosei*) are held at Singapore Zoo. A further 27 (9.18) buffalo belonging to the putative *B. b. arnee* subspecies are held in 5 institutions. The status of all these animals needs clarification because of possible hybridization with domestic buffalo (Read *et al.*, 1994).

2.4 Population trends

Little quantitative information is available but the world population of wild Asian buffalo has clearly been in serious decline since at least the beginning of the 20th century (as a result of interbreeding with domestic/feral buffalo, habitat loss and degradation, hunting, and diseases) (e.g. Flower & Lydekker, 1891; Peacock, 1933; Daniel & Grubh, 1966; Seidensticker, 1975; Hedges, 1996). More information is available for the post-1960 period and these data suggest a decline of about 80% between 1966 and 1992 in central India; in Thailand wild buffalo numbers have apparently been relatively stable since the mid-1980s; and in Nepal the number of wild buffalo is thought to have increased by about 48% between 1976 and 1988 (the sole Nepali sub-population is seriously threatened however, see Section 2.7). In NE India insufficient data exist to enable trends to be calculated but there is little doubt that the number of true wild buffalo has declined and is continuing to decline as a result of interbreeding with domestic and/or feral buffalo, hunting, and habitat loss (Section 2.7; Annex 1; Hedges, 1996). A brief summary of the available data for the last 15-25 years is presented below.

Central India	1966	250-300 (Daniel & Grubh, 1966)
	1988	< 125 (Divekar & Bharat Bhusan, 1988)
	1992	ë 50 (H. Divekar pers. comm. to S. Hedges 1995)
	Trend:	*ca.* 80% decline over 26 years (1966-1992)
NE India & Bhutan	unknown but believed to be downwards	
Nepal	1976	63 (Dahmer, 1978)
	1988	93 (Heinen, 1993)
	Trend:	*ca.* 48% increase over 12 years (1976-1988)
Thailand	unknown but believed to be relatively stable	

2.5 Geographic trends

Little quantitative information is available but both the range area and the number of sub-populations have clearly declined in South and Southeast Asia. A brief (qualitative) summary is presented below, further details can be found in Hedges (1996).

Bhutan. Unknown

India. Wild buffalo were formally numerous and widely distributed in the riverain forests and plains of north-east India, extending west from the plains of the Ganges and Brahmaputra to Uttar Pradesh and southwards through eastern peninsular India to the Godavari river (Daniel & Grubh, 1966; Seshadri, 1969). They are now largely restricted to Assam and the Bastar district of Madhya Pradesh and most if not all surviving sub-populations are believed to have interbred with domestic and/or feral buffalo (Hedges, 1996).

Nepal. Prior to 1950 wild buffalo were relatively widespread throughout the central lowlands but by the 1970s the species was confined to the Kosi Tappu Wildlife Reserve in SE Nepal. Malaria eradication programmes and the consequent immigration of large numbers of people and their livestock into the buffalo's former strongholds with the concomitant effects of habitat loss and disease were largely responsible for the decline of the species in Nepal (Seidensticker, 1975; Dahmer, 1978).

Thailand. Wild buffalo formerly occurred in riparian forests and alluvial grasslands throughout Thailand but only a mere 40 or 50 animals remain in the country (they all occur in the Huai Kha Khaeng Wildlife

Sanctuary). This is the only recently confirmed sub-population (Nakasatit & Chanard, 1985; Uicharoensak, 1992; N. Bhumpakphan *in litt.* to S. Hedges, 1995). Within the 2575 km² Huai Kha Khaeng WS wild buffalo have been recorded from an area close to the junction of the Kwae Yai and Huai Kha Khaeng rivers as well as along the Huai Mae Dee river and in the Khao Ban Dai, Huai Hin Tung, and Kreng Kai areas (Prayurasiddhi, 1987); previously (*ca.* 15-20 years ago) their range within this sanctuary extended as far north as Huai Ai Yoh and Huai Yu Yi (McNeely & Seidensticker, 1975; Nakhasathien & Stewart-Cox, 1990).

Elsewhere. There is too much uncertainty about the genetic status of free-living buffalo sub-populations to allow even qualitative assessments of trend to be made.

2.6 Role of the species in its ecosystem

Too little is known about the ecology, abundance, and distribution of wild Asian buffalo to enable predictions to be made about the ecological consequences of its decline.

2.7 Threats

The most important threats to wild Asian buffalo are interbreeding with feral and domestic buffalo, hunting, and habitat loss/degradation. Diseases and parasites (transmitted by domestic livestock) and interspecific competition for food and water between wild buffalo and domestic stock are also serious threats.

The scale of the threat posed to wild Asian buffalo by the trade in wildlife products is difficult to quantify, not least because it is unclear how many of the trophies from reportedly wild buffalo are in fact from wild buffalo rather than from feral or hybrid animals. Nevertheless given the small size of the remaining wild buffalo population and the fact that trophies have been found for sale in Lao PDR and Thailand, along the Myanmar-Thai border, the Thai-Lao border, and the Thai-Cambodian border the threat has to be considered as potentially serious (see Section 3.3).

The major threats to wild Asian buffalo are summarized below; for further details see Hedges (1996).

NE India. In NE India the remaining reportedly-wild buffalo sub-populations are chiefly threatened with the loss of their genetic integrity as a result of interbreeding with the large numbers of feral, domestic, and hybrid buffalo which share their habitat; hunting; habitat loss; and diseases transmitted by domestic stock (Choudhury, 1994; Hedges, 1996). Buffalo are frequently killed for food by tribal people in the Lakhimpur and Dhemaji districts of Assam, and in the East Siang and Dibang Valley districts of Arunachal Pradesh; and there have been reports that hunting is a threat in other parts of NE India too (Choudhury, 1994). Hunting is also a serious threat to wildlife in the Kaziranga area, but it is not clear whether buffalo are major targets for the hunters (Anon., 1996b). Some sub-populations (most notably those in the Manas area) are also threatened by large scale disturbances and habitat degradation resulting from the activities of armed insurgents; these insurgents are also reported to be killing wildlife for food and to raise the money to buy weapons (Oliver, 1990; Deb Roy, 1991; Sarkar, 1994; Anon., 1996a).

Central India. The reportedly-wild buffalo in Madhya Pradesh are threatened by hunting (including the communal hunts or *paradh* which are staged by large groups of local tribal people), forest fires, expansion of village agricultural land, and the presence of domestic cattle. The Madhya Pradesh sub-populations are believed to be unaffected by interbreeding with domestic or feral buffalo, unlike the larger sub-populations of *Bubalus bubalis* which still exist in NE India and they could therefore represent the last purebred wild buffalo in India. It should be noted however that feral buffalo were reported to occur in Pamed Wildlife Sanctuary. Villagers were also reported to have domesticated wild buffalo in the Pamed area (Divekar & Bharat Bhushan, 1988).

Bhutan. Little known. An unknown number of buffalo, believed to include truly wild individuals, occurs in the Royal Manas National Park (which is contiguous with Manas Tiger Reserve in Assam, NE India). Political unrest on the Indian side of the border, which has led to the presence of armed insurgents in Manas Tiger Reserve, presents a major threat to the area's wildlife. The presence of poachers from Bhutan and development of agricultural areas within the park are also listed as threats to the park by WCMC/IUCN (1991). Interbreeding with feral and domestic buffalo, and diseases spread by

domestic/feral livestock are presumably threats too (based on the situation in the Indian part of the sanctuary).

Nepal. The only sub-population of reputedly-wild buffalo in Nepal is located in the Kosi Tappu Wildlife Reserve. The sub-population is far from secure: its small size (æ 100 animals), the frequency of flood-induced mortality of calves, the presence of large numbers of domestic animals (primarily a disease risk, but loss of genetic integrity is a possibility too), and the fact that the reserve does not include the full annual home range of any buffalo herd are all threats (Heinen, 1993). Furthermore the floods which frequently devastate the area are expected to become an increasing problem as a result of hydro-development schemes in the surrounding area.

Thailand. The only reputedly-wild buffalo in Thailand are located in the Huai Kha Khaeng Wildlife Sanctuary. In recent years the main cause of buffalo mortality in the sanctuary has reportedly been hunting by humans (Songsri, 1987); but the chief threat to the sub-population is now the damming of the Kha Khaeng river (Anon., 1996c). Other threats to this important sub-population include its small size (< 50 animals), habitat degradation resulting from the indiscriminate use of fire as a management tool, and disease transmission from the large number of domestic livestock which graze illegally in the sanctuary (Humphrey & Bain, 1990; Santiapillai, 1990a).

3. Utilization and Trade

3.1 National utilization

Not applicable. Wild buffalo are nominally protected throughout their range (although there is some confusion regarding the legality of national trade in wildlife meat and other products in the Lao PDR, see Section 4.1.1).

3.2 Legal international trade

Unknown but believed to be minimal (since it would appear that trade in wild buffalo is prohibited by the laws of most range States, see Section 4.1.1).

3.3 Illegal trade

There have been several recent (1991, 1992, and 1993) reports of international trade in 'wild' buffalo horns at markets selling wildlife products at Tachilek on the Myanmar-Thai border (Srikosamatara & Suteethorn, 1994; Environmental Investigation Agency *in litt.* to S. Hedges, 1994; S. Nash *in litt.* to S. Hedges, 1994); at markets along the Thai-Lao border (Srikosamatara *et al.*, 1992); and at the Poi Pet market in Cambodia (on the border with Thailand). 'Wild' buffalo horns have also been found for sale at the Talat Sao market in Vientiane, Lao PDR, and during police raids on private houses in Bangkok, Thailand (S. Nash *in litt.* to S. Hedges, 1994). The likely sources of these putative wild buffalo horns are thought to be Myanmar, Lao PDR, and Cambodia, and since it is uncertain whether any truly wild Asian buffalo remain in these countries it is difficult to assess the seriousness of the threat posed by this trade.

3.4 Actual or potential trade impacts

Illegal trade is potentially a serious threat to the survival of wild Asian buffalo. This is evident from the precarious status of the remaining wild sub-populations and fact that an illegal trade in trophies from reportedly-wild buffalo is known to exist (see Sections 2 and 3.3). Furthermore because the trade is illegal it makes no contribution to the national economies of the range States; and even the contribution made by such trade to the economic welfare of the people who kill wild buffalo can clearly only be short-term because the very small size of the remaining wild buffalo sub-populations cannot sustain such levels of harvesting.

The inclusion of wild Asian buffalo in Appendix I will prohibit international trade in horns and other wild buffalo products and will thus help wildlife protection agencies control this serious threat to the survival of the species.

3.5 Captive breeding or artificial propagation for commercial purposes (outside country of origin)

There is no captive breeding of wild Asian buffalo for purely commercial purposes (i.e. excluding zoos) outside the countries of origin.

4. Conservation and Management

4.1 Legal status

4.1.1. National (i.e. range States and former/possible range States)

(a) Range States

Bhutan. The legal status of wild Asian buffalo is unknown.

India. In India wild buffalo are listed in Schedule 1 of the Wildlife Protection Act, 1972 which confers total protection; they also receive additional legal protection under the regulations of the state of Madhya Pradesh (Thornback, 1983; IUCN-ELC *in litt.* to S. Hedges, 1991).

Nepal. Asian buffalo are included in the list of fully protected animals in the National Parks and Wildlife Protection Act, 1973 (IUCN-ELC *in litt.* to S. Hedges, 1991).

Thailand. The killing of wild buffalo is legally prohibited and the animal receives total protection under the Wild Animals Reservation and Protection Act (WARPA), B.E. 2503 (1960) (IUCN-ELC *in litt.* to S. Hedges, 1991). However, Thailand updated her wildlife laws in 1992 and Srikosamatara and Suteethorn (1994) list wild Asian buffalo as 'Reserved' animals under the terms of WARPA B.E. 2535 (trading in Reserved or Protected animals without an official permit is forbidden and can be punished with imprisonment for up to 7 years or a fine of up to US$4000 or both).

(b) Former/possible range States

Bangladesh. Asian buffalo are afforded total protection and national and international trade is prohibited under the terms of the Bangladesh Wildlife (Preservation) Act of 1973 (IUCN-ELC *in litt.* to S. Hedges, 1991).

Cambodia. In 1988 a total hunting ban was declared in Cambodia under Forestry Decree No. 35 but proposed revisions to the wildlife protection component of existing forestry legislation await ratification. At present, however, the Wildlife Protection Office is unable to enforce the ban and hunting of all species is prevalent throughout the country (Olivier & Woodford, 1994).

Indonesia. Asian buffalo are afforded partial protection under the terms of the 'Hunting Regulations Java and Madura 1940' legislation (IUCN-ELC *in litt.* to S. Hedges, 1991).

Lao PDR. Trade in wildlife is prohibited by the decree of the Council of Ministers No. 185/CCM in Relation to the Prohibition of Wildlife Trade (21 October 1986). Responsibility for enforcing these regulations rests with the central and provincial forestry authorities. However, Laotian laws appear to be contradictory since the Decree of the Council of Ministers No. 47/CMM on the State Tax System (26 June 1989) appears to indicate that the trade in wildlife meat and products is still legal because traders are subject to tax. The use of wildlife for subsistence purposes is exempted from resource tax but must be carried out in accordance with existing state regulations. Nevertheless there would appear to be nothing in the decree to cancel the validity of decree No.185 (Srikosamatara *et al.*, 1992). Furthermore some tribal minority groups claim that hunting and the trade in wildlife products including meat are necessary for their subsistence and so the enforcement of regulations is complicated by sensitive ethnic issues (Srikosamatara *et al.*, 1992). It was reported in 1990 that hunting would be banned in legislation then pending (Salter *et al.*, 1990); more recently is has been reported that wild Asian buffalo are included in a 'Prohibited' category which means that hunting and trapping are banned in all seasons (Srikosamatara & Suteethorn, 1994).

Malaysia. Unknown.

Myanmar. Unknown.

Sri Lanka. Partial protection conferred; possession and/or national trade is prohibited and international trade is prohibited or regulated according to the terms of the Fauna and Flora Protection Ordinance of 1938 (IUCN-ELC *in litt.* to S. Hedges, 1991).

Vietnam. Wild buffalo are afforded total protection by Decree (No. 18) of the Council of Ministers determining the list of rare and precious forest flora and fauna and regulations for their management and protection, 17 January 1992; and the Instructions of the Prime Minister regarding the management and protection of rare and precious flora and fauna, 27 March 1993 (A. Rosser *in litt.* to S. Hedges, July 1996).

4.1.2 International

At present wild Asian buffalo are included in Appendix III of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the species was submitted for inclusion in Appendix III by Nepal; they are currently listed as *Bubalus arnee* but were formerly included as *Bubalus bubalis*. Domestic Asian buffalo are not subject to the provisions of the Convention (IUCN/SSC *in litt.* to S. Hedges, 1995; CITES Secretariat, 1995).

[REQUIRES ADDITIONAL INFORMATION FROM IUCN-ELC AND/OR IUCN WILDLIFE TRADE PROGRAMME REGARDING THE PROTECTION AFFORDED WILD ASIAN BUFFALO BY OTHER INTERNATIONAL LEGISLATION.]

4.2 Species management

4.2.1 Population monitoring

No programmes for monitoring the status of wild buffalo using standard survey/census techniques or credible criteria for distinguishing wild buffalo are known to exist. One sub-population in Nepal (Kosi Tappu) and 1 in Thailand (Huai Kha Khaeng) have been the subject of short-term scientific studies which have provided data on the status and trend of those sub-populations.

No programmes are in place to monitor the sustainability of offtake from the wild (because there are no legal harvesting schemes for wild buffalo).

4.2.2 Habitat conservation

(a) Range States

Bhutan. The only sub-population of wild Asian buffalo in Bhutan is located in Royal Manas National Park (which is contiguous with Manas Tiger Reserve in Assam, NE India). Thanks to its previous status as a royal hunting reserve Royal Manas NP is the only protected area in southern Bhutan which has not been extensively exploited. Nevertheless, in recent years there has been some encroachment and a sugarcane plantation has been established within the park's boundaries. Other problems include the unregulated setting of fires, theft of timber, and poaching (WCMC/IUCN, 1991). Political unrest on the Indian side of the border has led to the presence of armed insurgents in Manas Tiger Reserve and presents a major threat to the area's wildlife habitat (Anon., 1996a).

India. In central India there are no wild buffalo outside of the protected areas and even within the 4 supposedly protected areas (Indravati NP, Bhairamgarh WS, Pamed WS, and Uddanti WS) where reputedly-wild buffalo still occur their habitat is seriously threatened. Encroachment (development of agricultural land and establishment of villages), uncontrolled burning, logging, and poaching are all rife. Competition for water between wild buffalo and domestic livestock is also a problem in some areas (Divekar & Bharat Bhusan, 1988). In NE India there are still a few apparently wild buffalo outside of the protected areas but remaining buffalo habitat is being rapidly cleared for agricultural developments. There is no real chance of halting such clearance outside of conservation areas; Reserved Forests do not provide adequate protection, for example all former buffalo habitat in the 107 km² Gali Reserved Forest in Assam has now been cleared (Choudhury, 1994). Even within the conservation areas buffalo habitat is not inviolate. The 2 most important areas for wild buffalo conservation in NE India are Kaziranga NP and Manas Tiger Reserve. Unfortunately the latter area has in recent years suffered from large scale disturbances and habitat degradation resulting from the activities of armed insurgents, plus increased levels of poaching as the rebels kill animals for food and to sell (Oliver, 1990; Deb Roy,

1991; Sarkar, 1994; Anon., 1996a). In Kaziranga the major threats are the large numbers of domestic buffalo and poaching rather than habitat loss/degradation (WCMC/IUCN, 1991; Anon., 1996b).

Nepal. Loss of habitat to humans and their livestock was one of the most important reasons for the species's decline in Nepal and there is now only 1 sub-population in the country. This sub-population is located in the Kosi Tappu Wildlife Reserve but its habitat is under threat there too. The area is too small to encompass the full annual home range of any buffalo herd and wild buffalo which move out of the reserve come into conflict with local people. The area is also prone to flooding which leads to high calf mortality; and flooding is expected to become an increasingly severe problem as a result of hydro-development schemes in the surrounding area (Heinen, 1993).

Thailand. Habitat destruction has been one of the most important reasons for the decline of reputedly-wild Asian buffalo in Thailand and there is now only 1 sub-population of wild buffalo in the country. This sub-population is located in the Huai Kha Khaeng Wildlife Sanctuary but unfortunately even there the species's habitat is under threat as a result of the planned construction of a dam on the Kha Khaeng river (Anon., 1996c). Habitat degradation resulting from the over-use of fire as a management tool, agricultural encroachment, and logging have also been reported (IUCN, 1987; Santiapillai, 1990a).

(b) Possible range States

Bangladesh. Insufficient data: there have been no recent reports of free-living buffalo (Hedges, 1996).

Cambodia. A new protected area system has recently been developed in Cambodia, and in November 1993 King Norodom Sihanouk signed a declaration creating 23 protected areas covering approximately 15% of the country's surface area. However this network of protected areas had to be established in the absence of current data on the distribution and status of wildlife in Cambodia and is therefore likely to have a number of shortcomings as far as the conservation of large mammals including wild buffalo is concerned (indeed it is not known whether any wild buffalo still exist in Cambodia). Furthermore effective management of Cambodia's protected areas and wildlife is hindered by a lack of resources and confusion over which agencies are responsible for the different activities (Olivier & Woodford, 1994). As a result buffalo habitat currently receives very little protection, and logging, uncontrolled burning, and unregulated livestock grazing and/or grass gathering for feeding domestic livestock are major problems (Henning, 1994; Lic Vuthy *et al.*, 1995). Historically, responsibility for wildlife management has lain with the Wildlife Protection Office (WPO) of the Forestry Department (currently within the Ministry of Agriculture). The WPO's major function is to enforce the total ban on hunting declared in 1988 (although as presently employed it is unable to fulfill this role). To-date the WPO has received little external support (with the exception of wildlife surveys in cooperation with IUCN). The recent creation of a Secretariat of State for the Environment (SSE) which includes a Department of Nature Protection has, however, raised a number of questions about the future management of natural resources in Cambodia. Currently the SSE's mandate is somewhat vague and it is not yet based on any specific legal instruments although it has already received support from UNDP, IUCN, and the International Development and Research Centre (a Canadian NGO) (Olivier & Woodford, 1994).

Indonesia. Insufficient data: extant free-living buffalo sub-populations in Kalimantan likely to be feral in origin and in any case almost nothing is known about their current distribution and abundance; wild buffalo are almost certainly extinct elsewhere in Indonesia (Hedges, 1996).

Lao PDR. The Lao government is in the process of developing a protected area system. In October 1993 18 protected areas covering 10% of the country's land surface were officially declared as National Biodiversity Conservation Areas (NBCAs). Free-ranging buffalo of unknown origin are thought to occur in at least 2 of these NBCAs (see Annex 1). Extractive commercial uses are prohibited within NBCAs but subsistence use by local people is permitted outside designated core areas. In the short- to medium-term these areas will be *de facto* multiple use areas, but by the third or fifth year of management it is anticipated that a sizeable core zone meeting the criteria for national park or nature reserve status will have been established (Berkmüller *et al.*, 1995). It remains to be seen how effective this new network of protected areas will be at protecting buffalo habitat.

Malaysia. Insufficient data: extant free-living buffalo sub-populations in Sarawak and Sabah are likely to be feral in origin and almost nothing is known about their current distribution and abundance (Hedges, 1996).

Myanmar. Insufficient data: any apparently wild buffalo in Myanmar are likely to be feral or hybrid animals, and in any case next to nothing is known about their current distribution and abundance (Hedges, 1996).
Sri Lanka. In the early-1980s there were still thought to be significant numbers of free-ranging Asian buffalo of unknown genetic status outside of the protected areas but whether this is still the case is unknown. However, such free-ranging buffalo are also thought to occur in at least 8 protected areas. Unfortunately effective management of many of these areas is hampered by political and security problems. Threats to buffalo habitat include: encroachment (Flood Plains NP, Madura Oya NP complex, Ruhuna NP, Somawathiya Chaitiya NP, Wilpattu NP);
deforestation/fuelwood gathering (Flood Plains NP, Hurulu FR, Madura Oya NP complex, Ruhuna NP, Somawathiya Chaitiya NP, Wilpattu NP); presence of domestic livestock (Flood Plains NP, Gal Oya NP complex, Madura Oya NP complex, Ruhuna NP, Somawathiya Chaitiya NP); and poaching (Gal Oya complex, Madura Oya NP complex, Ruhuna NP, Wilpattu NP) (IUCN, 1990).

Vietnam. Wild-type Asian buffalo may still occur in 2 protected areas (see Annex 1) but little information is available about the effectiveness of habitat protection and management in these areas.

4.2.3 Management measures

No controlled harvest from the wild nor reintroduction, ranching, or quota systems for wild buffalo exist within the range States.

It is not known how many supposedly wild buffalo are held in captivity within the range States. **[ISIS DATA IS REQUIRED]**

4.3 Control measures

4.3.1 International trade

None are known (other than the legislation discussed in Section 4.1.1).

4.3.2 Domestic measures

Not applicable since there are no sustainable harvesting programmes for wild buffalo.

5. Information on Similar Species

There are three other species in the genus *Bubalus* : tamaraw (*Bubalus mindorensis*), lowland anoa (*Bubalus depressicornis*), and mountain anoa (*Bubalus quarlesi*); however all three are considerably smaller than wild *Bubalus bubalis* and the growth form of their horns is also significantly different (see CITES manual sheets A-119.009.004.003, A119.009.004.002, and A-119.009.004.004).

There is however the problem of distinguishing between wild, feral, and domestic Asian buffalo; although this problem has presumably already been considered by the CITES Secretariat since wild Asian buffalo are currently included in Appendix III. Furthermore the similar problem of distinguishing between wild and domestic yak (*Bos mutus* also known as *Bos grunniens*) did not preclude the inclusion of wild yak in CITES Appendix I.

6. Other Comments

This proposal has not yet been circulated to the range States. This will be done once a Party willing to propose the transfer of Asian buffalo from Appendix III to Appendix I has been identified in consultation with IUCN-HQ.

7. Additional Remarks

7.1 Recommended terminology for classifying Asian buffalo (*Bubalus bubalis* including the synonym *Bubalus arnee*) (Source: Hedges, 1996).

Wild buffalo: Buffalo which have never been domesticated and which are not descended from domestic, feral, or hybrid buffalo. (Wild buffalo can have mated with non-wild buffalo of course but they cannot be *descended* from non-wild buffalo.)

Wild-type buffalo: Free-living (i.e. neither domestic nor semi-feral) buffalo which are phenotypically distinct from local domestic buffalo and which show traits that are believed to be typical of the original wild buffalo of Asia (i.e. they resemble true wild buffalo in size, body conformation, horn length/shape, colour, and behaviour); however, because their history is unknown the possibility that they are in fact feral or hybrid animals cannot be excluded.

Domestic buffalo: Buffalo which are kept by humans for any or all of the following purposes: the production of milk and/or meat, as working animals, or for religious/cultural reasons. They are not allowed to roam freely for long periods and breeding is (mainly) controlled by their owners.

Feral buffalo: Buffalo are considered to be feral if they or their ancestors were formerly domestic but they are now living independently of humans.

Semi-feral buffalo: Domestic buffalo which are allowed to roam freely for most of the time but which are recaptured on occasion.

Hybrid buffalo: Is used to refer to the offspring of matings between any of the above (e.g. wild x domestic, wild x feral, wild-type x domestic, etc.); could also be used to refer the offspring between valid subspecies of buffalo; and in theory for the offspring of interspecific unions, for example *Bubalus bubalis* x *B. mindorensis* crossbreeds (although none are known to exist).

Swamp buffalo: A type of domestic buffalo particularly common in SE Asia.

River buffalo: Another type of domestic buffalo, particularly common in India and Pakistan.

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Annex 1

Location and size of reportedly-wild Asian buffalo sub-populations (source: Hedges, 1996)

India

Assam	Probably about 800-1000 in the state at the start of the 1980s (Thornback, 1983). An estimated 3000-3200 in 1993 (Choudhury, 1994).
Manas WS / Tiger Reserve	Thought to be between 300-400 in 1966/67 (Maia, 1970); 'thousands present' according to Bedi (1984) and Negi (1985). Probably the only remaining wild buffalo in India according to WCMC/IUCN (1991). Approximately 1200 in 1993 (Forest Dept. figures cited by Choudhury, 1994). (Manas NP is contiguous with Royal Manas NP in Bhutan).
Orang WS	Present, but in unknown numbers (Israel & Sinclair, 1992); but wild buffalo do not occur according to A. Choudhury (*in litt.*, 1995).
Laokhowa WS	Present, but in unknown numbers (Bedi, 1984; Israel & Sinclair, 1992). Choudhury (1994) reports an estimate of about 200 buffalo for this WS and the contiguous Burhachapori WS and Rone Tapu (Baghe Tapu) areas in 1993.
Sonai Rupai WS	Unknown numbers (Israel & Sinclair, 1992); but A. Choudhury (*in litt.*, 1995) states that Sonai-Rupai does not contain wild buffalo.
Kaziranga NP	Approximately 500 (Anon, 1980c); 677 in 1984 according to Choudhury (1987). Approximately 1100 in the park and adjacent areas in 1993 (Forest Dept. figures cited by Choudhury, 1994).
Karbi Anglong area	Small numbers in 1993 (Choudhury, 1994).
Laknimpur area (E. Assam)	Estimated to be about 100 (Maia, 1970). Choudhury (1994) estimated that there were 100-150 buffalo in the Kadam RF, Borchapori, and Kaopak chapori areas; and small numbers in the Dulung and Kakoi RFs and in the Dhakuakhana (Borkalia) areas of Lakhimpur in 1993; but buffalo reportedly became extinct during the 1970s in Pabha RF.
Jamjing RF & Sengajan RF (Dhemaji district)	An estimated 150-200 in 1993 (Choudhury, 1994).
Gali RF (Dhemaji district)	Wild buffalo became extinct in the 1970s (Choudhury, 1994).
Dibru-Saikhowa WS, Koplong chapori, Poba RF, Kobo chapori & Amarpur (Dibang) chapori areas in Dhemaji & Tinsukia districts	An estimated 250 in 1993 (Choudhury, 1994).
Doom dooma RF (Tinsukia district)	An estimated 8 or 9 in 1993 (Choudhury, 1994).
Kollolua (Dibrugarh district)	An estimated 13-15 in 1993 (Choudhury, 1994).
Madhya Pradesh	Daniel & Grubh (1966) estimated that 200-250 wild buffalo remained in the forested parts of West Bastar with a further 50 in South Bastar. By 1988 it was though that fewer than 125 survived and that these animals represented the only purebred wild buffalo sub-populations remaining in India. In 1988 only 5 isolated sub-populations survived in the Bastar and Raipur districts: 2 of these were in Indravati NP and the others were in the Bhairamgarh, Pamed, and Udanti WSs (Divekar & Bharat Bhusan, 1988). By 1992 the total number of wild buffalo in Madhya Pradesh had dropped to about 50; with about 25 in Raipur district (Uddanti WS), and approximately 27 in Bastar district (Indravati NP, Bhairamgarh WS, and Pamed WS) (H.K. Divekar pers. comm., 1995). [See below.]
Indravati NP	Daniel and Grubh (1966) thought that there were no more than 200-250 wild buffalo in West Bastar (in an area of 1036 km^2 encompassing the present Indravati NP and Bhairamgarh WS). Seshadri (cited in Heinen *et al.*, n.d.) reported a large sub-population in Indravati NP and Thornback (1983) gives a figure of 190 for this NP in 1983/84. Surveys in 1988 suggest that the number of wild buffalo had dropped to between

	30 and 50 and they appeared to be largely restricted to the Pilur and Pengonda areas within the park (Divekar & Bharat Bhusan, 1988).
Bhairamgarh WS	Bhairamgarh WS was part of the former Kutru Wild Buffalo Sanctuary: a conservative estimate of 35-40 buffalo has been given for 1965 but it was thought that possibly fewer than 15 wild buffalo survived in May 1988 and they were believed to be confined to the riverine tracts. There were not thought to be any movements between Bhairamgarh and the nearby Indravati NP sub-population (Divekar & Bharat Bhusan, 1988).
Pamed WS	Possibly about 25 wild buffalo occurred in the Sanctuary in 1988 and they were believed to be confined to the Talperu river tract: feral buffalo may also have been present in the sanctuary (Divekar & Bharat Bhusan, 1988).
Uddanti WS	Probably about 25 wild Asian buffalo occurred in the Sanctuary in 1988 and 1992 (Divekar & Bharat Bhusan, 1988; H. K. Divekar pers. comm., 1995); local villagers reported that domestic buffalo were not allowed to graze freely in the forest for fear of losing them to tigers and 'it can be safely assumed (after due inspection of domestic buffaloes) that there is no interbreeding between the domestic and wild buffaloes in the Uddanti sanctuary' (Divekar & Bharat Bhusan, 1988:27).
Andhra Pradesh	No wild buffalo have been reported from Andhra Pradesh in recent years A. Choudhury (*in litt.*, 1995)
Kinnersani WS	Unknown numbers (Israel & Sinclair, 1992).
Orissa	Maia (1970) gives an estimate of about 100 buffalo for the state: but Orissa's buffalo were thought to be virtually extinct by the 1980s although there were unconfirmed reports of small groups of buffalo in the region bordering Orissa, Andra Pradesh, and Madhya Pradesh in the early 1980s (Thornback, 1983; Behura & Mohanty-Hejmadi, 1987). No wild buffalo have been reported from Orissa in recent years according to Divekar and Bharat Bhushan (1988) and A. Choudhury (*in litt.*, 1995).
Kondakabmeru WS	Reported present (Rodgers & Panwar (1988).
Sunabeda WS	Reported present (Rodgers & Panwar (1988).
Balimela WS	Reported present (Rodgers & Panwar, 1988).
Koraput district	Possibility of a small herd (Ranjitsinh, 1992).
Meghalaya	
Balphakram NP	Reportedly 24 in 1981 (Kumar & Rao, 1985). Reported present by Rodgers and Panwar (1988). A small sub-population in 1993 (Choudhury, 1994).
Siju WS	Possibly still occurred (Rodgers & Panwar, 1988).
Rewak RF	Unknown numbers (Thornback, 1983).
Songsak RF (northern slopes of Garo Hills)	Unknown numbers (Thornback, 1983).
Arunachal Pradesh	A few stragglers may remain (Ranjitsinh, 1982). Approximately 150 in 1993 (Choudhury, 1994).
Namdapha NP	Listed by WCMC/IUCN (1991) but wild buffalo do not occur according to A. Choudhury (*in litt.*, 1995).
D'Ering WS	A 'significant [sub-]population' (Rodgers & Panwar, 1988). Approximately 100 in 1993, this WS is contiguous with Kobo chapori in the Dhemaji district of Assam (Choudhury, 1994).
Dibang RF	A small, scattered sub-population in 1993 (Choudhury, 1994).
Maharashtra	No wild buffalo have been reported from Maharashtra in recent years (Divekar & Bharat Bhusan, 1988; A. Choudhury *in litt.*, 1995)
Chandrapur District (adjoining Bastar District in Madhya Pradesh)	Vanished in the mid-1970s (Thornback, 1983).

Bhamragarh prop. WS/NP	Reported present (Rodgers & Panwar, 1988).
Current status in India	**Unknown in 1996.**
	Divekar (cited in Kane, 1988) suggests that there are fewer than 100 truly wild buffalo left in India (in Madhya Pradesh) but Choudhury (1994) thinks there may be about 3300-3500 in Assam and the adjacent states of north-east India plus a small number in Madhya Pradesh (see section 2.3).

Bhutan

Royal Manas NP	This NP which includes the Namgyal Wangchuk WR (formerly Goley GR) and is contiguous with Manas NP in India contains the only sub-population of wild buffalo in Bhutan (Blower, 1986; Bunting, 1989).
Current status in Bhutan	**Unknown in 1996 (the sub-population is shared with India).**

Nepal

Kosi Tappu WR	The Kosi Tappu buffalo represent the only sub-population of this species in Nepal. The sub-population numbered about 65 in 1976 (Dahmer, 1978); 60 in 1977 (Poppleton & Shah, 1977); fewer than 100, probably 80-90 in 1987 (Heinen, 1987; Bauer, 1987); and 93 in 1988 (Heinen, 1993). A more recent figure of 150 has been reported but Heinen (*in litt.*, 1995) considers this to be an impossibly high figure (and probably the result of domestic back-crosses being included in the total).
Current status in Nepal	**Fewer than 100 animals in 1988 and an unknown number in 1996.**
	It has been reported that the 'entire [sub-]population has hybridized with feral water buffalo' (WCMC/IUCN, 1991), but Heinen (1993) thinks this is unlikely.

Thailand

Huai Kha Khaeng WS	An estimated 35-40, possibly as many as 50 in the 1980s (Nakasatit & Chanard, 1985; Santiapillai, 1990a). The results of a 1992 census revealed little change, with 36-39 animals counted. During aerial surveys in 1995 a herd of 12 animals was filmed (Bhumpakphan *in litt.*, 1995). **This is the only recently confirmed sub-population in Thailand.** It has been suggested that they may have interbred with domestic animals (IUCN, 1987), but Stewart-Cox (*in litt.*, 1994) thinks that this is unlikely.
Thung Yai Naresuan WS	This area (which is adjacent to Huai Kha Khaeng WS) previously contained wild buffalo (Humphrey & Bain, 1990); but they almost certainly no longer occur (many surveys have been conducted and no wild buffalo have been located, and local people have not reported the presence of wild buffalo). The riparian areas along the Mae Chan valley, which are similar to wild buffalo habitat in Huai Kha Khaeng, are occupied by 4 or 5 villages containing hundreds of Karen people (Bhumpakphan *in litt.*, 1995).
Khao Soi Dao WS	May have contained wild buffalo until relatively recently, as this was one of two areas (the other being Huai Kha Khaeng) where Pong Leng-Ee (1978) thought that significant numbers remained, but the species no longer occurs (B. Stewart-Cox *in litt*, 1994).
Elsewhere	Santiapillai (1990a) cites information obtained from J. MacKinnon which suggests that wild buffalo may also occur in the Erawan, Sri Nakarin, Khlong Lan, Mae Wong, Salak Phra, and Umpang protected areas; but Stewart-Cox (*in litt*, 1994) considers Sri Nakarin the only site in this list where wild buffalo might still be present and she thinks it unlikely even there. Note: the former habitat of the wild buffalo in Sri Nakarin is now flooded as a result of the Sri Nakarin Dam development (Bhumpakphan *in litt.*, 1995).
Current status in Thailand	**Unlikely to be more than 50 animals in 1996; trend is unknown.**

Sri Lanka

Wilpattu NP	An estimated 160 in the late 1960s (Eisenberg & Lockhart, 1972): *possibly* as many as 350-400 (Santiapillai, *in litt.* 1994).
Ruhuna (Yala) NP	Estimates from the early to mid-1980s were generally in the range 300-520 for Block I (Ashby & Santiapillai, 1983 & 1986a: Burge, 1986). More recent (1992-93) figures suggest a sub-population of between 500-600 in Block I (de Silva, nd): and c. 2000 in the whole complex (de Silva *et al.*, 1994).
Flood Plains NP	Unknown numbers (IUCN, 1990): *possibly* 50-100 based on densities in Wilpattu and Ruhuna NPs (Santiapillai, *in litt.* 1994).
Somawathiya Chaitiya NP	Unknown numbers (IUCN, 1990): *possibly* 100-150 based on densities in Wilpattu and Ruhuna NPs (Santiapillai, *in litt.* 1994). [Adjacent to Flood Plains NP.]
Uda Walawe NP	Unknown but reportedly increasing numbers (IUCN, 1990): *possibly* 200-300 based on densities in Wilpattu and Ruhuna NPs (Santiapillai, *in litt.* 1994).
Gal Oya NP complex	Unknown numbers (IUCN, 1990): *possibly* 150-200 based on densities in Wilpattu and Ruhuna NPs (Santiapillai, *in litt.* 1994).
Madura Oya NP	Unknown numbers (IUCN, 1990): *possibly* 150-200 based on densities in Wilpattu and Ruhuna NPs (Santiapillai, *in litt.* 1994).
Hurulu Forest Reserve	Unknown numbers (IUCN, 1990): *possibly* 50-100 based on densities in Wilpattu and Ruhuna NPs (Santiapillai, *in litt.* 1994).
Outside protected areas	Significant numbers (Ashby & Santiapillai, 1983): current status unknown.
Current status in Sri Lanka	**Unknown in 1996, but possibly in the range 3000-3500; trend is unknown.**

Questions have been raised about the origin and genetic purity of the Sri Lankan sub-population and it is thought unlikely that any purebred wild buffalo still exist. (See Hedges (1996) for further details.)

Lao PDR

Northern and central Lao PDR (north of 16°N)	Reports suggest that wild water buffalo occurred in Khammouane province (Sayer, 1983): their current status in the area is unknown.
Phou Khao Khouay NBCA	Wild water buffalo may occur (Santiapillai, 1990b).
Nakai-Nam Theun NBCA and environs	Water buffalo listed for this area by MacKinnon & MacKinnon (1986).
Southern Lao PDR (south of 16°N)	Recent (December 1989) surveys conducted by Salter *et al.* (1990) found that water buffalo were apparently still widely distributed in the lowlands of southern Lao PDR: they were reported near to 24 of the 93 villages where interviews were conducted. However it is possible that some or all these supposedly wild buffalo were in fact feral or had interbred with domestic and/or feral animals. Buffalo were reported in Xe Piane NBCA, Dong Ampham NBCA, and Xe Khampho proposed NBCA, and in or close to Bolovens Southwest proposed NBCA. Local informants told Cox *et al.* (1991) that no wild buffalo occurred in the Xe Kong Plains area of southern Lao PDR
Current status in Lao PDR	**Unknown in 1996.**

Apparently still widespread at the end of the 1980s but it is uncertain whether these animals were actually wild buffalo and not feral or hybrid animals.

Vietnam

Yok Don NP	Le Vu Khoi found the skull and horns of an apparently wild type buffalo in the northern part of Yok Don in December 1987 (Le Vu Khoi *in litt.*, 1991). Free-ranging buffalo were reported in 1989 although these may well have been feral or domestic animals: there were many

	domestic buffalo near Ban Don and Bon Drang Phok, and local people reported interbreeding between domestic and free-ranging buffalo (Laurie *et al.*, 1989).
Bu Gia Map NR	Reported by locals in 1992 (Le Vu Khoi pers. comm., 1995).
Nam Bai Cat Tien NP	Listed by MacKinnon & MacKinnon (1986).
Current status in Vietnam	**Unknown in 1996.**
	Any apparently wild buffalo sub-populations which remain in Vietnam are likely to be feral or to have interbred with domestic and/or feral animals.

Cambodia

Virachey NP	Apparently wild water buffalo occurred in the 1970s (McNeely, 1975); and they still occur according to local people (Henning, 1994; Sun Hean pers. comm., 1995).
Lomphat WS area	Listed by MacKinnon & MacKinnon (1986) and Henning (1994) but not detected during aerial surveys of the eastern part of the WS and adjacent areas in March 1994 (Olivier & Woodford, 1994); however WPO staff have reported recent sightings (Sun Hean pers. comm., 1995).
Kulen-Promtep WS	Reported by local people (Sun Hean pers. comm., 1995).
Phnom Kulen NP	Reported by local people (Sun Hean pers. comm., 1995).
Current status in Cambodia	**Unknown in 1996.**
	Any apparently wild buffalo sub-populations which remain in Cambodia are likely to be feral or to have interbred with domestic and/or feral animals.

Myanmar

Throughout Myanmar	Probably extinct by the mid-1930s; any extant free-living buffalo are likely to be feral animals (Salter, 1983).
Current status in Myanmar	**Extinct?**

Indonesia

Countrywide	There is little doubt that all extant free-living buffalo sub-populations in Indonesia are either feral in origin and/or have interbred with feral animals. (See Hedges (1996) for further details.)
Current status in Indonesia	**Extinct?**

Malaysia

Countrywide	Extinct in peninsular Malaysia and all free-living buffalo in Malaysian Borneo are probably feral. (See Hedges (1996) for further details.)
Current status in Malaysia	**Extinct?**

Bangladesh

Madhupur NP	Extinct (Reza Khan, 1985).
Sundarbans E. W. & S WSs	Became extinct this century (Salter, 1984).
Current status in Bangladesh	**Extinct.**

World Population

If Divekar (cited by Kane, 1988) is correct, and the buffalo in the Bastar district of Madhya Pradesh (India) are the only truly wild buffalo remaining, the world population is probably fewer than 50 animals.

Alternatively, Choudhury (1994) suggests that there are about 3300 to 3500 wild buffalo in NE India, plus an unknown number in Madhya Pradesh (but see cautionary remarks in text). If we include the Nepalese sub-population (possibly 80-90) and the Thai sub-population (a probable maximum of 50) but exclude the free-living buffalo which occur in Sri Lanka and SE Asia, the total world population would appear to be about 3500-4000 buffalo. It is stressed that these figures should be treated with great caution.

Abbreviations

CFR = Commercial Forest Reserve
EIA = Environmental Impact Assessment
FR = Forest Reserve
GR = Game Reserve
GS = Game Sanctuary
NBCA = National Biodiversity Conservation Area
NP = National Park
NR = Nature Reserve
WR = Wildlife Reserve
WS = Wildlife Sanctuary
VJR = Virgin Jungle Reserve

Annex 2

Biological Criteria for Appendix I

Wild Asian buffalo (*Bubalus bubalis*) should be included in Appendix I because the species is or may be affected by trade [i.e. it is probably in trade but conclusive evidence is lacking] and it meets the following biological criteria.

A. **The wild population is small** [i.e. it is very unlikely to be more than 4000, is probably fewer than 1000, and quite possibly fewer than 200 animals; indeed it is possible that no wild Asian buffalo remain (see Section 2.3)], **and is characterized by:**

i) **observed, inferred, and projected declines in the number of individuals and in the area and quality of habitat;**

[i.e. observed (central India) and inferred (elsewhere - as a result of hybridization, hunting, habitat loss) from the information summarized in Sections 2.4 and 2.5; and projected from the information about overlap with domestic and/or feral buffalo, and habitat loss/degradation presented in Sections 2.7 and 4.2.2, taking into account the small and fragmented nature of the world population]

and ii) **each sub-population is very small**

[i.e. most if not all sub-populations contain fewer than 500 truly wild buffalo, and only 5 are thought to contain more than 100 individuals (see Section 2.3 & Annex 1)]

C. **A decline in the number of individuals in the wild, which has been:**

ii) **inferred and projected on the basis of the following:**

- a decrease in area and/quality of habitat [see Sections 2.7 and 4.2.2] and

- threats from extrinsic factors, in this case hybridization [see Sections 2.3, 2.4, and 2.7]