CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

Other proposals

A. Proposal

It is proposed that banteng (*Bos javanicus*) (Artiodactyla: Bovidae) be included in Appendix I. Their inclusion is necessary because they are known to be in international trade and because they meet the following biological criteria: A(i), A(ii), and C(ii) (see Annex 2 at the end of this document).

The world population of wild banteng is now very small: it is unlikely to be more than 8000 and is quite possibly fewer than 5000 animals. No sub-populations of more than 500 banteng are known and only 8 or 9 sub-populations of more than 50 animals have been reported in recent years. On the Asian mainland the species has declined alarmingly over the last 20 years; in Thailand, for example, the number of banteng has declined by about 80 percent. On Borneo the species has also declined and while the number of banteng on Java is thought to have been relatively stable over the last 20 years there are few recent data.

The species's geographic range has also declined. Data summarized in this document suggest that the banteng's range area has declined by about 85% in Thailand over the last 15 years, and 70-80% in Vietnam over the last 25-30 years; and while too few data exist to quantify trends in the Lao PDR, Cambodia, and Myanmar they are clearly downwards. In West Malaysia banteng have been extinct since the 1950s. On Java and Bali the range area of the species has declined by about 20% and 30% respectively. Geographic trends are difficult to quantify for Borneo but they are clearly downwards.

Banteng are threatened by hunting (for meat, skins, and horns), habitat loss, and the degradation of their remaining habitat. Interbreeding with domestic cattle threatens the genetic integrity of wild banteng sub-populations in some areas; and diseases and parasites transmitted by domestic livestock (and possibly interspecific competition) are also serious threats.

The magnitude of the international trade in banteng parts is difficult to quantify precisely. Nevertheless, given the small size of the remaining banteng populations and the number of banteng trophies (mainly horns) found for sale in Cambodia, the Lao PDR, Thailand, and Vietnam recently, it is clearly a very serious threat. The inclusion of wild banteng in Appendix I will significantly strengthen the legislation prohibiting the international trade in horns and other banteng products and will thus help wildlife protection agencies control this serious threat to the survival of the species.

Inclusion of banteng (*Bos javanicus*) in Appendix I

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:	***Bos javanicus* d'Alton, 1823**

Honacki *et al.* (1982), Corbet and Hill (1992), and Wilson and Reeder (1993) all recognize *Bos javanicus* d'Alton, 1823 as the valid name for banteng.

1.5 Scientific synonyms: Formerly included in the genus *Bibos* ; *banteng, bantinger, discolor, leucoprymnus, longicornis, sondaicus* are specific synonyms. The following subspecific names have been proposed: *banteng, birmanicus, butleri, domesticus, javanicus, porteri, lowi.*

1.6 Common names: *Banteng* (sometimes written *banting, bantinger, bentinger*), *sapi alas, sapi hutan* (on Java and Bali); *selekiau* (on Borneo, Kenyah Badeng), *keliao* (on Borneo, Penan Menalui), *tembadau* (on Borneo, ethnic group not specified); *ansong* (in Cambodia), *ngua daeng* (in Lao PDR), *to muoi* (Lao and Thai), *so ke* (M'Nong and Ede), *ko ru* (Cham), *bo rung* (in Vietnam); *tsaine, tsine,* or *saing* (in Myanmar) (Hooijer, 1956; Hoogerwerf, 1970; Neese, 1976; Salter, 1983; Payne *et al.*, 1985; Anon, 1992a; Puri, 1992).

Banteng (English), *le banteng* (French), and ***xxxxxxx*** (Spanish).

1.7 Code numbers: ISIS number = 5301419009002002001 according to Honacki *et al.* (1982).**[CHECK THAT NO CHANGES HAVE BEEN MADE.]**

2. Biological Parameters

2.1 Distribution

Range States. Wild banteng currently occur on **Java** and possibly **Bali** [Indonesia] (Ashby & Santiapillai, 1988; Watling, 1991); in **Kalimantan** [Indonesian Borneo] (Payne *et al.*, 1985; WCMC, 1991; Yasuma, 1994); **Sabah** [Malaysian Borneo] (Payne *et al.*, 1985; Payne, 1990); **Thailand** (Srikosamatara & Suteethorn, 1995); **Lao PDR** (Salter *et al.*, 1990; Salter, 1993); **Vietnam** (Anon, 1992a; Le Vu Khoi, MS); and **Cambodia** (MacKinnon & MacKinnon, 1986; Olivier & Woodford, 1994). **Myanmar** (formerly Burma) is included in the species's current range by Corbet and Hill (1992) and they still occur according to Su Su Oung and Khin Than Win (pers. comm. to S. Hedges, July 1995); however, very little information about the current distribution and status of banteng in Myanmar is available (see Salter, 1983; Tun Yin, 1993). A few banteng probably remain in **Sarawak** [Malaysian Borneo] (Labang, cited in Caldecott, 1988); and even if none are resident they may occasionally stray into the country from Kalimantan.

Banteng are extinct in **India** (Prater, 1971; IUCN, 1978) and **Bangladesh** (Gittins & Akonda, 1982). In **West Malaysia** they have probably been extinct since at least the 1950s (Hislop, 1961b; Hedges, 1996). They are also thought to be extinct in **Brunei** (Payne *et al.*, 1985).

'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 wild banteng on the Asian mainland is *ca.* 650,000 km², on Java it is *ca.* 40,000 km², and on Borneo it is unknown, but probably more than 200,000 km². Thus for the species as a whole it is probably more than 900,000 km². However the definition of 'area of distribution' is both vague and largely meaningless for a species such as banteng. A more useful measure is the 'area of occupancy' as used by IUCN (1994), i.e. '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 banteng this 'area of occupancy' is 501-2000 km² on Java, possibly more than 10,000 km² on the Asian mainland, and unknown on Borneo (but likely to be more than 10,000 km²); therefore for the species as a whole it is more than 10,000 km².

Is the distribution of the species fragmented?

The world population of banteng is unlikely to be more than 8000 animals, and is quite possibly fewer than 5000. This world population is scattered over a large area encompassing the SE Asian mainland and the islands of Borneo, Java, and Bali. Very few sub-populations are thought to have an area of distribution of more than 500 km²; and most of the remaining banteng occur in small isolated sub-populations (no sub-populations of more than 500 banteng are thought to occur and there are only 8 or 9 sub-populations with more than 50 banteng). Such a pattern of distribution is judged to meet the criteria for 'fragmentation' (*sensu* Resolution Conf. 9.24 Annex 5).

Habitat. On the Asian mainland they tend to avoid evergreen rainforest and prefer more open dry deciduous forests; but within the more humid areas of Java and Borneo they occupy secondary forest formations resulting from logging and fires, although they also occur in tracts of sub-humid forest. However, as human utilization of preferred areas has increased they have been forced to retreat to relatively closed forest types (Wharton, 1968). Banteng generally occur from sea level up to at least 2000 metres elevation (Hoogerwerf, 1970; National Research Council, 1983).

In Myanmar they are reported to prefer flat or undulating terrain with light deciduous (particularly *indaing* forest) or mixed deciduous and evergreen forest, with grassy glades which burn annually, and patches of bamboo; but they have retreated to denser hill forest in the face of advancing cultivation (Peacock, 1933; Prater, 1965; Wharton, 1968; Tun Yin, 1967). Similarly in Thailand, Cambodia, Vietnam, and Lao PDR banteng occur (or occurred) in open mainly deciduous forest with glades, parklands, and dense forest patches (Wharton, 1957 & 1968; Hedges, 1996). On Borneo banteng are 'locally common in logged forest on flatland...[and occur] in dipterocarp, swamp and beach forests' particularly along river courses (Payne *et al.*, 1985). In Java banteng occur in semi-deciduous monsoon forest with small clearings, more open grassland-monsoon forest mosaics, and 'parkland' formations (Halder, 1976; Hommel, 1987; Hedges in prep.).
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 one of the two most important reasons for the decline of the species in Thailand since 1980; and loss of habitat is still clearly a major threat to banteng in that country. Habitat loss has been a threat to banteng and is likely to remain so elsewhere on the SE Asian mainland too. On Java and Bali habitat loss was a major threat in the first half of the 20th century; however since the 1970s habitat degradation (especially overgrazing and scrub encroachment) has been a more important factor and is likely to become more severe. Habitat loss has been, and is likely to remain a threat to the species on Borneo (Sabah and Kalimantan) too (see Sections 2.7 and 4.2.2).

2.3 Population status

Estimate of total population. The current status of banteng is not well known but from the limited information which is available it would seem that the world population of banteng is unlikely to be more than 8000 and is quite possibly fewer than 5000 animals in 1996. No sub-populations of more than 500 banteng are known. Only 8 or 9 sub-populations of more than 50 animals have been reported in recent years (i.e. 6 on Java, 1 or 2 in Thailand, and 1 in Vietnam); and even if we assume that several remain in Myanmar and on Borneo it is very unlikely that the total number of such sub-populations exceeds twenty. These figures are informed guesses based on a consideration of both aerial and terrestrial survey data (from parts of Thailand, eastern Java, and eastern Cambodia); field visits and interviews with local people, including hunters; and information about levels of trade in banteng parts, particularly horns. (Refer to Annex 1 at the end of this proposal for further details.)

Indonesia: Java and Bali. It is thought that the total number of banteng is between 750 and 1200, possibly up to 1600; and there are probably 6 sub-populations of more than 50 on Java in 1996. No sub-populations of more than 500 animals are thought to exist. There are very few banteng outside the

protected areas. On Bali they are very probably restricted to 1 sub-population (Bali Barat NP); and in 1991 it was suggested that 30 head would be a reasonable estimate for the number of banteng in that national park, furthermore it was thought 'very likely' that they had interbred with domestic Bali cows (i.e. female domestic banteng) (Watling, 1991).

Indonesia: Kalimantan. The status of banteng in Kalimantan (Indonesian Borneo) is unknown but they appear to be widespread in East Kalimantan since there have been recent (1994 & 1995) reports from many areas including the large Sungai Kayan - Sungai Mentarang NR (16,000 km²), and within or close to Hutan Kapur Sangkulirang proposed NR (2000 km²) (see Annex 1). However, the genetic status of these animals is perhaps a matter for concern since Hoogerwerf (1970) refers to several reports dating from the 1930s and 1940s which mention that many groups of banteng in Kalimantan (and particularly East Kalimantan) were no longer pure-bred having interbred with stray domestic cattle.

Malaysia: Sabah. The current status of banteng in Sabah is unknown. In 1993 they were still present in eastern Sabah (see Annex 1), and in 1990 banteng still occurred south of Gunung Lumaku (in the upper reaches of the Padas River) but they had been extirpated from all other parts of southwestern Sabah according to local people (Payne, 1990).

Malaysia: Sarawak. The current status of banteng is unknown although they may well cross into Sarawak from neighboring Kalimantan where they are known to occur in the large Sungai Kayan - Sungai Mentarang NR. In the early 1980s banteng persisted in the more remote parts of north and east Sarawak (Aken & Kravanagh, 1982) but Payne *et al.* (1985) stated that there had been no recent reports. Nevertheless Labang (1987 cited by Caldecott, 1988) found evidence of their continued presence. Caldecott found 7 banteng trophies among 1113 trophies and pets in longhouses and markets in Sarawak which suggests that their population density may be low.

Thailand. It was estimated that about 470 banteng remained in Thailand in 1994 and only 1 or 2 sub-populations were thought to contain 50 or more animals; there were no banteng outside of the protected areas. The most important areas for banteng conservation are Huai Kha Khaeng WS (with an estimated 290 banteng) and the contiguous Om Koi and Mae Tuen WSs (which may have about 50 banteng) (Srikosamatara & Suteethorn, 1995; Bhumpakphan *in litt.* to S. Hedges, 1995) (see Annex 1).

Lao PDR. The current status of banteng in the Lao PDR is poorly known. Recent (1988-1990) interview-surveys reported by Salter *et al.* (1990) and Salter (1993) revealed that banteng were still present throughout the country: banteng were reported near (within half a day's walk) to 159 of the 328 villages where interviews were conducted (see Annex 1).

Vietnam. Very little is known about the current status of banteng. In 1990-1993 an estimated 200-300 banteng remained in Vietnam, and only 1 sub-population was thought to contain more than 50 animals (Le Vu Khoi, unpub. MS) (see Annex 1).

Cambodia. The current status of banteng in Cambodia is unclear but is certainly a matter for grave concern. During aerial surveys of potentially suitable habitat in Mondolkiri Province (eastern Cambodia) in March 1994 only 97 banteng were seen in an area of 4754 km².

Myanmar. The status of banteng in 1996 is almost completely unknown. Kyatthin WS, Shwe-U-Daung WS, Alaungdaw Kathapa proposed NP, Shwesettaw WS, Pega Yoma proposed Elephant Range/NP, and Pakchan proposed NP may all still contain banteng (see Annex 1); but probably only Alaungdaw Kathapa (1606 km²), Shwesettaw (552 km²), and Pegu Yoma (1462 km²) are big enough to protect significant sub-populations.

Size of the captive population. The captive population of 'wild' banteng was 83 males and 155 females in 34 institutions (on 31 December 1994). An international studbook is held; it was most recently published as: 'Banteng (*Bos javanicus*) International Studbook, 31 December 1994' (data to 31 Dec 1994) and the studbook keeper is Bruce Read, Curator of Mammals, St. Louis Zoological Park, Forest Park, St. Louis, Missouri 63110, USA.

2.4 Population trends

Little quantitative information is available but banteng population trend is clearly downwards on the Asian mainland; apparently relatively stable on Java; and unclear on Borneo. A brief summary is presented below, further details can be found in Hedges (1996).

Asian mainland. It has been estimated that the number of banteng in Thailand declined by at least 80% over the last 20 years (Srikosamatara & Suteethorn, 1995). This estimate is based on the fact that the number of registered trophies in Bangkok (in 1994) represented about 1840 banteng and the number of registered trophies in Uthai Thani Province (in 1992) represented between 174-347 banteng which, Srikosamatara and Suteethorn suggest, makes it highly probable that there were at least 2300-2500 banteng in Thailand in 1970. The possibility that many of the banteng trophies now in Thailand came from elsewhere in the region (e.g. the Lao PDR) should be borne in mind however, as should the difficulty of determining the actual period of time over which the trophies were collected. No quantitative estimates are possible for the remainder of the Asian mainland but the number of banteng trophies reported for sale within Cambodia, and Lao PDR; and along the Thai-Cambodia, Thai-Lao, and Thai-Myanmar borders very strongly suggest the banteng population on the mainland is under unsustainable pressure from hunters and must therefore be declining (see Section 3.3).

In addition habitat loss, cattle diseases, and decades of war and political instability in the region have almost certainly led to a serious decline in the number of wild banteng over the last 60 years (Hedges, 1996). For example, in Myanmar (Burma) in the 1930s banteng were considered common and occurred throughout the country, although even then they were disappearing from the more accessible and settled areas (Peacock, 1933). Rinderpest epidemics in the 1930s and 1940s, along with high levels of poaching (for skins and meat) during World War Two were reportedly responsible for a serious decline in the abundance of banteng in a number of areas. Poaching and diseases together with increasing rates of habitat loss and/or degradation continued to threaten banteng sub-populations throughout the post war years. Unpublished Forest Department questionnaire surveys (for 1960-61 and 1980-81) and field work in the early 1980s indicated that the species was still widely distributed but their range was becoming increasingly fragmented and their numbers were greatly reduced in all but the most inaccessible areas (Salter, 1983).

Java. The number of banteng on Java appears to have been relatively stable since the mid-1970s; and possibly since the 1940s/50s. In the late-1930s there was an estimated maximum of 2000 banteng on Java; while in the late-1950s the total was estimated to be fewer than 1000 (Hoogerwerf, 1970). In 1977 the total Javan sub-population was estimated to be not more than 1500 (Amir & Wind, 1977). In 1986 Ashby and Santiapillai (1988) made brief trips to most of the sites mentioned in Amir and Wind's report and collected information from park staff. From the results of this work they concluded that the species's status on Java was markedly better than the situation described in 1977 and there appeared to be significant sub-populations in 6 protected areas, with a total number of at least 700, and possibly more than 1000 animals. Similar figures were given for the mid-1990s by Hedges (1996) who suggested that the total number of banteng on Java is likely to be between 750 and 1200, possibly up to 1600. It is stressed however that none of these figures were based on reliable surveys (with the exception of the mid-1990s figures which include actual survey data from East Java).

Borneo. The overall trend on the island of Borneo is unclear. The number of banteng in Sabah has declined over the last 50 years (Payne *et al.*, 1985; Payne, 1990). The species also appears to have declined significantly in Sarawak during this century: they were not uncommon at the beginning of the century according to Beccari (1904), but by 1967 few banteng were thought to be left in Sarawak (Anderson pers. comm. to Wharton, 1968), and Payne *et al.* stated that there had been no recent reports (although it is likely that banteng still cross into Sarawak from adjacent parts of Kalimantan). The trend in Kalimantan is, however, unknown.

2.5 Geographic trends.

Little quantitative information is available but both range area and the number of sub-populations have clearly declined on the Asian mainland. The available data suggests that banteng range area has declined by *ca.* 85% in Thailand over the last 15 years, and 70-80% in Vietnam over the last 25-30 years; and while too few data exist to quantify trends in the Lao PDR, Cambodia, and Myanmar they are clearly downwards. In West Malaysia banteng have been extinct since the 1950s. On Java and Bali the range area of the species has declined by about 20% and 30% respectively. Geographic trends are difficult to quantify for Borneo but they are clearly downwards. A brief summary of the available data is presented below, further details can be found in Hedges (1996).

Thailand. Comparing maps of banteng distribution in the late-1970s (Humphrey & Bain, 1990) and the early-1990s (Srikosamatara & Suteethorn, 1995), and taking additional information summarized by Hedges (1996) into account, it would appear that the species's range in Thailand has declined by about 85% over the last 15 years. Information contained in the same sources suggests that the number of sub-populations declined by between 8 and 17 over the same period.

West Malaysia. Small numbers of banteng formerly occurred in parts of Kedah and Perlis, and possibly also parts of Kelantan, but they have probably been extinct since at least the 1950s (Hislop, 1961; Wharton, 1968).

Vietnam. Comparing maps of banteng distribution in the mid-1960s (Wharton, 1968) and the early-1990s (Le Vu Khoi, unpub. MS) suggests that the range area of the species in Vietnam declined by between 70 and 80% over that period. The data are too few to quantify changes in the number of sub-populations, but there is no doubt that the number has declined over the last 25 years (Wharton, 1968, Le Vu Khoi, unpub. MS; Hedges, 1996).

Lao PDR. There are too few data relating to the distribution of banteng in the Lao PDR to allow trends in banteng range area or number of sub-populations to be quantified. Nevertheless there is very little doubt that both are declining. While interview-surveys revealed that banteng were still present in many parts of the Lao PDR in 1988-1990 (Salter *et al.*, 1990; Salter, 1993), the large number of banteng trophies reported for sale in the country and along the Lao-Thai border strongly suggests that the species must be in decline (Srikosamatara *et al.*, 1992; Baird, 1993; Srikosamatara & Suteethorn, 1994; Baird and Nash, in prep.). Banteng have already been extirpated from the Nakai-Nam Theun area in central Lao PDR, and it is thought that the main cause of their decline in the area was hunting (Evans & Timmins, 1994). Elsewhere in the Lao PDR their status is unknown, but hunting and the loss of habitat is believed to have caused a major decline in banteng numbers (McNeely, 1975; Srikosamatara & Suteethorn, 1995; Hedges, 1996).

Cambodia. There is insufficient data to quantify trends in range area or number of sub-populations. Nevertheless decades of warfare and political instability in the country make it almost certain that both the range area of the species and the number of sub-populations have declined since the 1930s. Furthermore the alarming numbers of banteng trophies which have been found on display and/or for sale in Cambodia make it very likely that the number of sub-populations is continuing to decline (Olivier & Woodford, 1994; S. Nash *in litt.*, to S. Hedges, May 1994; Lic Vuthy *et al.*, 1995).

Myanmar. Insufficient data exist to quantify trends in either range area or number of sub-populations. Nevertheless both are likely to be declining as a result of hunting pressure and habitat loss. For example, Rabinowitz *et al.* (1995) report that gaur are in danger of being eliminated from Taminthi WS if current levels of illegal hunting are allowed to continue; and banteng are usually extirpated from an area by hunting before gaur because they are smaller, reputedly less aggressive, and tend to occur closer to areas of human habitation (Lekagul & McNeely, 1977; Srikosamatara & Suteethorn, 1995). It is therefore interesting to note that while Wharton (1968) thought it probable that banteng occurred in the Taminthi area, neither Salter (1983) nor Rabinowitz *et al.* report their occurrence.

Java and Bali. Comparing the maps of banteng distribution produced by Amir and Wind (1977) and Ashby and Santiapillai (1988), and taking additional information summarized by Hedges (1996) into account, it would appear that the banteng's range declined by approximately 20% on Java and 30% on Bali between the mid-1970s and mid-1990s. However the areas lost were those occupied by very small numbers of banteng, and the number of sub-populations of more than 50 banteng seems to have remained relatively stable over the same period. (It should be noted that the quality of the data which is available is rather poor.)

Malaysian Borneo: Sabah. Too few quantitative data exist for estimating trends in range area. Nevertheless it is clear that both the range and the number of sub-populations of banteng in Sabah have declined. Prior to the 1940s banteng were reported to be common in riverain areas in eastern Sabah and in many areas of shifting cultivation in the west and north, even in the hilly interior. However the subsequent widespread use of guns led to their rapid extermination from most areas. In 1985 they were reported to be locally common in logged-forest on flat terrain, but were again under threat as their habitat was converted into permanent agricultural land (Payne *et al.*, 1985). In 1990 banteng still occurred south of Gunung Lumaku (in the upper reaches of the Padas River) but they had been extirpated from all other parts of southwestern Sabah according to local people (Payne, 1990); they are still present in the eastern lowlands and the Danum valley area (see Annex 1).

Malaysian Borneo: Sarawak. No quantitative data exist. However it is clear that both the range area and the number of sub-populations of banteng have declined since the beginning of the 20th century because they were previously reported to be widespread, if uncommon, but they are now thought to be locally extinct, except along the border with Kalimantan (see Beccari, 1904; Harrisson, 1961; Wharton, 1968; Aken & Kravanagh, 1982; Payne *et al.* 1985; and Hedges, 1996).

Indonesian Borneo: Kalimantan. Unknown.

2.6 Role of the species in its ecosystem

Too little is known about banteng to enable predictions to be made about the ecological consequences of its decline.

2.7 Threats

The most important threats to banteng are hunting, habitat loss, and the degradation of the species's remaining habitat. Interbreeding with domestic cattle threatens the genetic integrity of the remaining wild banteng sub-populations in some areas; and diseases and parasites transmitted by domestic livestock (and possibly interspecific competition) are also serious threats.

The magnitude of the threat posed to banteng by the trade in wildlife products is difficult to quantify precisely. Nevertheless, given the small size of the remaining banteng population and the number of trophies found for sale in Cambodia, the Lao PDR, Thailand, and Vietnam recently, during what were essentially opportunistic surveys (see Section 3.3 below), it is clearly a major threat on the Asian mainland.

The most important threats to wild banteng are summarized below; for further details see Hedges (1996).

Java and Bali. During the 19th century and the first half of the 20th century interbreeding between wild banteng and domestic livestock, habitat loss, and diseases were reported to be the major threats. By the 1930s, however, hunting had also been identified as a major threat to the species's continued survival on Java. Since the 1970s habitat degradation and diseases from domestic livestock have been the major threats (Hoogerwerf, 1970; Hedges, 1996). Currently predation by Asiatic wild dog (*Cuon alpinus*) is also a very serious threat to one of the six sub-populations thought to be larger than 50 animals (Hedges & Tyson, 1996).

Thailand. Hunting and loss of habitat have been the major reasons behind the decline of the banteng in Thailand since the 1940s but it is thought that habitat destruction overtook hunting as the most serious threat in the period 1980-1990 (Lekagul & McNeely, 1977; Leng-Ee, 1978; Srikosamatara & Suteethorn, 1995).

Myanmar. Diseases (especially rinderpest) and hunting (for skins and meat) were the major threats in the 1930s and 1940s. In subsequent years habitat loss became a major threat too (Salter, 1983). All three factors remain serious problems today; and wildlife trade in this area is expected to increase when a new economic cooperation zone ('the Golden Growth Quadrangle') between Thailand, China, Myanmar, and the Lao PDR comes into effect (Srikosamatara & Suteethorn, 1994).

Cambodia, Lao PDR, and Vietnam. Hunting, largely to supply the trade in horns and other trophies, is believed to be the most important threat; the other major threats are habitat loss and diseases transmitted by domestic stock (Hedges, 1996).

Borneo. Interbreeding with domestic and feral livestock as well as the diseases which can be transmitted by such livestock have long been major threats to the wild banteng on Borneo, and they continue to be a serious problem today (Hedges, 1996). Loss of habitat and hunting are also major threats (Payne *et al.*, 1985; Caldecott, 1988 & 1992).

3. Utilization and Trade

3.1 National utilization

Not applicable. Wild banteng 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 banteng is prohibited by the laws of most range states, see Section 4.1.1).

3.3 Illegal trade

Obviously the level of illegal trade is difficult to quantify, however the number of banteng products (mainly horns) which have been found during what were often brief opportunistic surveys clearly indicates that such trade is frequent and widespread.

Across Thai-Lao border. Over 100 pairs of gaur and banteng horns were found during a brief survey of 15 locations along the Thai-Lao border in 1991. The areas were visited between March 25-April 9, June 5-14, and July 23-31 1991. Many of the horns were mounted on artificial heads, and the price of a pair of banteng horns varied from US$12 to US$140 (Srikosamatara *et al.*, 1992). Approximately 50% of the horns were banteng, and many were from females (S. Srikosamatara *in litt.* to S. Hedges, July 1996). Four of the sites were revisited in April 1993 and at one of them (Ban Mai) 4 vendors were found to have a total of 36 pairs of gaur and banteng horns (and again about 50% were banteng, including females) (Srikosamatara & Suteethorn, 1994; S. Srikosamatara *in litt.* to S. Hedges, July 1996). Baird (1993) visited the same 4 vendors 3 months later and found 41 pairs of gaur and banteng horns for sale; and in May 1996 a WWF-Thailand Project survey found 13 gaur and banteng horns for sale at Ban Mai (S. Srikosamatara *in litt.* to S. Hedges, July 1996). Most of the horns for sale along the Thai/Lao border are believed to be from Lao PDR and Cambodia (Salter, 1993).

Across Thai-Myanmar border. A visit to Tachilek market in April 1993 found 10 vendors selling wildlife products including banteng horns. Wildlife trade in this area is expected to increase when a new economic cooperation zone ('the Golden Growth Quadrangle') between Thailand, China, Myanmar, and the Lao PDR comes into effect (Srikosamatara & Suteethorn, 1994). In May 1996 a WWF-Thailand Project survey

found 15 pairs of gaur and banteng horns for sale at Meavadi in Myanmar (across the border from Mae Sot in Tak Province, Thailand); a further 18 pairs of gaur and banteng horns were seen for sale at Victoria Point in Myanmar (on the border with Thailand's Ranong Province) (S. Srikosamatara *in litt.* to S. Hedges, July 1996).

Cambodia. A visit to Poi Pet market on 20 Oct 1992 revealed about 12 stalls selling wildlife products including banteng horns. The main buyers were allegedly members of the Thai military and police and the usual procedure was for a Thai customer to order what s/he wanted from a trader, who would then arrange for the goods to be smuggled into Thailand (S. Nash *in litt.* to S. Hedges, May 1994). Phipps (cited in Olivier & Woodford, 1994) obtained information from a trader from Lomphat (eastern Cambodia) who reported that between 1988 and 1993, 100-150 bovid trophies were purchased per month during the dry season. Staff from the Wildlife Protection Office consider these figures to be too high, but numbers probably exceeded 150 per season; of these 60% were said to be gaur and 40% banteng. During December 1993 a larger harvest than usual was reported with almost 300 skulls/horns of wild cattle being sold in Lomphat. It is thought that this increase was the result of heavier than usual hunting pressure in 1993 as members of an ethnic minority group from Vietnam (known by the acronym FULRO) attempted to raise as much money as possible before their resettlement in the USA.

Lao PDR. Chazée (1990 cited in Baird & Nash, in prep.) found banteng horns for sale in markets in Attapeu City in 1990. Banteng horns were for also for sale during a visit to Talat Chao morning market in Vientiane in 1991 (Srikosamatara *et al.*, 1992). Several other reports also mention that banteng horns are sold as trophies throughout southern, central, and northern-central Lao PDR (Salter, 1993).

Thailand. Police raids on two houses in Bangkok on 28 January 1992 yielded 249 trophies including 7 pairs of banteng horns (S. Nash *in litt.* to S. Hedges, May 1994).

Vietnam. Bezuijen (1994) found 5 banteng horns (priced at US$10/kg) for sale in Cau Mong Animal Market, Ho Chi Minh City during surveys on 22 and 29 January 1994. Wildlife and wildlife products for sale at this market were reported to come not only from Vietnam but were also ordered from neighbouring countries (e.g. Lao PDR, Cambodia, Thailand, China, and Malaysia).

3.4 Actual or potential trade impacts

Illegal trade is a major threat to the survival of wild banteng on the Asian mainland. This is clearly demonstrated by the data on population size, trends, threats, and the scale of illegal trade presented above (Sections 2 and 3). Furthermore, because the trade is illegal it makes no contribution to the national economies of the banteng range states; and even the contribution made by such trade to the economic welfare of the people who kill banteng can clearly only be short-term because the small size of the remaining banteng population cannot sustain such high levels of harvesting.

The inclusion of wild banteng in Appendix I will prohibit international trade in horns and other banteng 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 banteng for purely commercial purposes (i.e. excluding zoos) outside the countries of origin. (The origin of the so-called experimental herds in the USA and Australia, referred to in the paragraph below, is unknown; it is possible, if unlikely, that these herds were established using wild rather than domestic banteng.)

Domestic banteng ('Bali cattle') are widely used throughout the Indonesian archipelago outside the original range of the species; they are particularly common on the Indonesian islands of Lombok, Sulawesi, Sumbawa, and Timor; small numbers have also been introduced to Sumatra (Payne and Rollinson, 1973; Siregar and Superjata, 1975; Thornback, 1983; National Research Council, 1983). Domestic banteng have also been introduced to Malaysia, the Philippines, New Guinea, and northern Australia (where there are

now herds of feral animals). There are also experimental herds in Texas, USA and New South Wales, Australia (Kirby, 1979; National Research Council, 1983; Moran, 1987).

4. Conservation and Management

4.1 Legal status

4.1.1. National (i.e. range states)

Thailand. Banteng are protected by the Wild Animals Preservation and Protection Act (WARPA) of B.E. 2503 (1960) as amended by Announcement of the Revolutionary Party No. 228, B.E. 2515 (1972) although they may be hunted under permit from the Forestry Department (Thornback, 1983; Humphrey & Bain, 1990). Thailand's wildlife laws were, however, updated in 1992 and Srikosamatara and Suteethorn (1994) list banteng as 'Protected' animals under the terms of WARPA B.E. 2535. Trading in 'Reserved' or 'Protected' animals or their carcasses without a permit is punishable with a US$4000 fine and/or seven years imprisonment. Although trading in wildlife across Thai borders is illegal under the terms of WARPA B.E. 2535 the law does not differentiate between export and re-export (Sections 4, 23, and 24 of WARPA B.E. 2535) which presents problems for the regulation of international trade; and in any case there is very little enforcement because many Thai officials consider trade in wildlife to be a trivial issue (Srikosamatara & Suteethorn, 1994).

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).

Vietnam. Banteng 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).

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 banteng are included in a 'Prohibited' category which means that hunting and trapping are banned in all seasons (Srikosamatara & Suteethorn, 1994).

Myanmar. Banteng are afforded partial protection under the Burma Wildlife Protection Act, 1936 (IUCN-ELC *in litt.* to S. Hedges, 1991).

Indonesia. Banteng are afforded total protection through their inclusion on the 1979 list of protected wild animals in Indonesia (IUCN-ELC *in litt.* to S. Hedges, 1991).

Malaysia (Sabah). Partial protection is conferred by the Fauna Conservation Ordinance, 1963 and Fauna Conservation Rules, 1965 (IUCN-ELC *in litt.* to S. Hedges, 1991).

Malaysia (Sarawak). Banteng are totally protected under the Wildlife Protection Ordinance, 1990 (IUCN-ELC *in litt.* to A. Rosser, 1996). **Brunei.** Unknown.

4.1.2 International

Banteng are afforded total protection under the US Endangered and Threatened Wildlife and Plants Act of 1975. **[REQUIRES ADDITIONAL INFORMATION FROM IUCN-ELC AND/OR IUCN WILDLIFE TRADE PROGRAMME; PARTICULARLY REGARDING THE NATURE OF THE PROTECTION AFFORDED BANTENG BY THIS AND OTHER INTERNATIONAL LEGISLATION.]**

4.2 Species management

4.2.1 Population monitoring

There are no comprehensive programmes for monitoring the status of wild banteng. A few sub-populations in Indonesia (Baluran, Alas Purwo) and Thailand (Huai Kha Khaeng) have been the subject of medium-term (< 10 year-long) scientific studies which have provided data on the status and trend of those sub-populations; but the status of other sub-populations of wild banteng in those countries is poorly known and no monitoring schemes are in place.

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

4.2.2 Habitat conservation

Myanmar. The current, fully gazetted protected area network comprises 15 sanctuaries, 1 national park, and a further 2 parks with primarily recreational functions, and covers a total of 7080 km². A further 19,690 km² has been proposed for protection, including 4 further national parks (Blower & Paine, 1991). Banteng may still occur in and around 4 wildlife sanctuaries, 1 nature reserve, 1 national park, and 1 proposed national park (see Annex 1); but little information is available about the effectiveness of the protection afforded banteng habitat through its inclusion in these protected areas. However Blower and Paine report that many of the 15 wildlife sanctuaries have been badly neglected and have lost much of their conservation value; and Rabinowitz *et al.* (1995) reported high levels of human disturbance in Tamanthi Wildlife Sanctuary (Tamanthi WS does not contain banteng but it is likely to be indicative of the protection afforded areas which do.) Even less information is available about habitat conservation outside the protected areas.

Thailand. Since 1980 habitat destruction has ranked among the two most severe threats to banteng in Thailand (the other being hunting). There are now no banteng outside the protected area network and only 1 or 2 protected areas with more than 50 banteng (Srikosamatara & Suteethorn, 1995; Hedges, 1996). A further 13 to 18 protected areas may still contain small numbers of banteng (see Annex 1). Unfortunately the extent and quality of the remaining banteng habitat continues to decline despite the supposedly protected status of these areas. For example the core area of Huai Kha Khaeng Wildlife Sanctuary, the most important area for banteng in Thailand, is threatened by plans to build a dam (Anon., 1996). Dam projects are a threat to banteng habitat in other protected areas too. Other threats include agricultural encroachment and logging. Banteng habitat in many of these areas, including the vitally important Huai Kha Khaeng WS, is also utilized by domestic livestock which presents the threat of disease transmission and hybridization (IUCN, 1987; Srikosamatara & Sutheethorn, 1995; 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 banteng is concerned. 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 banteng 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).

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). Banteng are thought to occur in about 14 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 banteng habitat.

Vietnam. Banteng are currently thought to occur in and around at least 5 protected areas (see Annex 1) but little information is available about the effectiveness of habitat protection and management in these areas.

Malaysia (Sabah). Banteng are currently thought to occur in and around at least 5 protected areas (see Annex 1) but little information is available about the effectiveness of habitat protection and management in these areas. However there is concern that few of these areas receive complete protection, and fears have been raised that they could be subject to disturbance as the pressure for agricultural land, timber, and minerals increases. Such developments are likely to be concentrated in central and eastern Sabah (which is where the most important areas for banteng conservation are located) (Anon., 1988; Collins, 1991).

Indonesia. Banteng occur in 10 protected areas on Java and Bali, and at least 2 in Kalimantan. Unfortunately many of these areas lack the basic resources required for effective conservation. A shortage of well-trained and motivated nature conservation personnel has also been repeatedly identified as a major limiting factor for the successful implementation of conservation initiatives in Indonesia (e.g. Anon, 1991; Cox & Collins, 1991; WCMC, 1991). As a result there is little effective protection or management of banteng habitat; for example, in the Baluran and Alas Purwo protected areas (2 of the 3 most important areas for banteng conservation on Java) the long-term security of the banteng sub-populations is threatened as a result of serious habitat degradation (overgrazing and scrub encroachment), poorly managed artificial water supplies, and the presence of large numbers of domestic livestock (Watling, 1991; Hedges, in prep.). Very few banteng are thought to occur outside the protected area system on Java and Bali; but there may be considerable numbers in Kalimantan, although their habitat there is increasingly threatened by pressures for land, timber, and minerals.

4.2.3 Management measures

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

According to the most recent international studbook the captive population of banteng was 83 males and 155 females in 34 institutions (on 31 December 1994); but only 39 animals in 4 institutions were within the range States. In addition to the animals included in the international studbook there are a further unknown number of wild banteng in captivity in the Range States, but they have made little input to international attempts to develop a captive breeding programme.

Furthermore the development of an effective captive breeding programme for banteng has been hindered by the presence of suspected hybrid animals (i.e. *Bos javanicus* x *Bos taurus* and wild banteng x domestic banteng hybrids) in zoological collections. In addition the question of how many (if any) subspecies should be recognized and/or included in captive breeding programmes for banteng is still unanswered. In recognition of these constraints a comprehensive long-term breeding programme for wild banteng has yet to be implemented (Read, 1994; Read *et al.*, 1994).

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 banteng.

5. Information on Similar Species

Most trade in banteng specimens involves trophies (horns). Although an 'informed non-expert' should be able to make a firm identification in most cases there is the possibility that banteng horns will be confused with those of other bovids (e.g. gaur, *Bos gaurus* also known as *Bos frontalis*; and kouprey, *Bos sauveli*). It is therefore recommended that illustrated guidelines to the distinguishing features are prepared and made available to Customs personnel, CITES officials, etc.

Live specimens of adult wild banteng should present few identification problems since they are sufficiently distinct from other wild cattle species; however juvenile banteng might present some non-experts with difficulties (for example Wharton (1957) considered it unwise to use colour as a basis for identifying the young of kouprey, gaur, and banteng until after the fifth month of age because before then they are too similar).

There is the further problem of distinguishing between wild and domestic banteng ('Bali cattle'). This will presumably need to be dealt with in the same way as for wild and domestic yak (wild yak, *Bos mutus* also known as *Bos grunniens*, are included in CITES Appendix I). (Information about the appearance of wild and domestic banteng is included in sections 7.1 and 7.2.)

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 inclusion of banteng in Appendix I has been identified in consultation with IUCN-HQ.

7. Additional Remarks

7.1 Description of wild banteng and regional (racial) differences between banteng from Borneo, Java and Bali, and the SE Asian mainland.

Size/habitus. Wild banteng are the smallest of the so-called *Bibos* cattle (gaur and its domestic relatives and kouprey). They have a small dewlap and a relatively prominent dorsal ridge. Sexual dimorphism is pronounced. Adult males may stand 180 cm at the shoulder and Hoogerwerf (1970) gives a figure of 191 cm for a bull in West Java. Pfeffer (1965) quotes figures of 170 cm and more than 900 kg for adult males in the Baluran region (East Java). A 10 year old male in Ujung Kulon weighed 825 kg according to Bartels who estimated that it would have reached nearly 900 kg had it not been shot (Hoogerwerf, 1970). According to a National Research Council (1983) report an average-sized male of the Javanese or mainland subspecies stands 160 cm at the shoulder and weighs about 635 kg. However, Hoogerwerf mentions early sources which suggests that continental banteng were smaller than Javan animals and Lekagul and NcNeely (1977) state that the putative *Bos javanicus birmanicus* subspecies (i.e. the banteng of the Asian

mainland) is smaller than the typical Javan form. Bornean banteng are also reported to be smaller in stature (National Research Council, 1983).

Adult females are smaller and considerably more slender than adult males. The National Research Council report gives the following figures for average cows of the Javan and mainland races: 140 cm shoulder height and 400 kg weight. An adult cow generally stands about 20 cm shorter at the shoulder than a male of the same age (Hoogerwerf, 1970).

Coloration: Java and Borneo. Adult males are predominantly black but a few animals do retain the chestnut brown of the females into adulthood (particularly in eastern Java). Juvenile males are the same reddish or chestnut brown as females but by their second year they are already beginning to darken, particularly on the back, neck, and face, which can often be an ashy black-brown. Subadult males are generally blackish-brown all over and may show the black coloration of adult bulls. Females do not show such pronounced colour changes as they age. The female's coat 'varies from a beautiful reddish-brown or chestnut to a dull pale brown or yellowish brown; however, the last colour was rarely seen in specimens younger than approximately 8-10 years' (Hoogerwerf, 1970:171). Old females sometimes show dark, somewhat oily looking, spots and stripes (Hoogerwerf, 1970; S. Hedges, pers. obs.).

During their first year calves of both sexes are almost fawn coloured or a reddish brown colour (but lighter than that of the adult females); male calves are usually somewhat darker than female calves. Calves of both sexes have a dark coloured stripe running along the spine.

Coloration: Asian mainland. On the SE Asian mainland bulls are generally golden brown or chestnut but they darken as they age, especially on the shoulders and the dorsal surface of the forelegs and neck. In Thailand a few males with very dark brown skins flecked with white have been recorded. There also appears to be a clinal variation from north to south, with a greater proportion of black bulls in the south. Females and young males are a bright rufous brown although some are more fawn-coloured (Lekagul & McNeely, 1977).

Markings. Regardless of body colour both sexes have striking white 'stockings' on the lower part of the legs and a large white rump patch (often referred to as the 'mirror'). These markings become more noticeable with age (in animals less than a couple of months old the stockings and mirror are not very pronounced). There are also, less conspicuous, white markings on the lips, over the eyes, and on the edges and insides of the ears. The tuft at the tip of the tail is very dark, almost black, in both sexes (Hoogerwerf, 1970; Lekagul & McNeely, 1977; Payne *et al.*, 1985).

Horns. The horns of male banteng curve outward and forward: in older animals the horn tips are inward-pointing. The basal section is heavily corrugated in older animals. In cross-section the horns are oval. The horns are smaller in circumference than those of gaur; and the width between the horn cores is less than in the gaur, but much greater than in the kouprey (Lekagul & McNeely, 1977). Hoogerwerf thought that a basal horn girth of 48 cm and a span of 111 cm was probably the upper limit for Javan bulls. Male horns vary in colour from black to a golden yellow colour; those of females are a uniform dark grey or near-black and are usually duller than those of the bulls. The horns of females are usually much more upright and considerably less massive; the horn tips sometimes touch or even cross. In Java horn lengths of 25-30 cm and a span of about 38 cm were reported for adult females (Hoogerwerf, 1970).

Frayed horn tips are not uncommonly encountered (among bulls) but the fraying is less pronounced than in the kouprey (Frank, 1940; Wharton, 1957; Hoogerwerf, 1970; S. Hedges pers. obs.). There is a patch of thick often cracked, naked skin between the horn bases; this 'frontal shield' is unique to banteng (Lekagul & McNeely, 1977).

7.2 The relationship between 'Bali cattle' and banteng

That the so-called 'Bali cattle' are in fact a domestic form of banteng is supported by studies of milk proteins (Bell *et al.*, 1981 a & b); multivariate analysis of cranial measurements (Hayashi *et al.*, 1988); and hybridization studies (Jellinek *et al.*, 1980). Bali cattle and banteng are fully interfertile, while F1 males from crosses between Bali cattle and *Bos taurus* are sterile due to cessation of sperm development at the secondary spermatocyte stage. Infertility has also been noted in 1/4 and 3/4 Bali bulls and the fertility of 1/4 and 3/4 Bali heifers appears to be lower than that of F1 heifers (National Research Council, 1983; Moran, 1987). Although very similar in appearance to wild banteng Bali cattle do differ in a number of characteristics from their wild ancestor: they are smaller and have less well developed withers; the skull is narrower and lighter and resembles the juvenile stage of the wild form; sexual dimorphism is less pronounced; the horns are less developed; sexual maturity is attained earlier and the gestation period is shorter. In addition some domestic bulls tend to remain rather reddish-brown when mature, rather than attaining the black coloration of most wild male banteng of the Javanese race. Typical mature live-weights under village management are 400 kg for bulls and 300 kg for females, but under feedlot conditions males can grow to 500 kg (National Research Council, 1983; Moran, 1987; Hayashi *et al.*, 1988).

While 'Bali cattle' were derived from wild *Bos javanicus* many of them are no longer of pure banteng stock because of the widespread deliberate hybridization of Bali cattle and *Bos taurus* (of the zebu type) in Indonesia (Jellinek *et al.*, 1980; National Research Council, 1983; Davis & Read, 1985). Such hybrids are not always easy to distinguish from purebred banteng, indeed studies have revealed 'Bali-like cattle' which appeared phenotypically to be banteng but whose hemoglobin profiles revealed a genetic history similar to other hybrid cattle in Indonesia (Namikawa & Widodo, 1978; Davis & Read, 1985).

8. References

Aken, K.M. and Kravanagh, M. (1982). Species conservation priorities in the tropical forests of Sarawak, Malaysia. Pages 17-22 in: Mittermeier, R.A. and Konstandt, W.R. [Eds]. *Species conservation priorities in the tropical forests f southeast Asia.* Occasional papers of the IUCN Species Survival Commissionm, Number 1. IUCN, Gland, Switzerland.

Amir, H. and Wind, J. (1977). *Distribution of Banteng (*Bos javanicus*) in Java and Bali, Indonesia.* WWF/PHPA memo, Bogor, Indonesia.

Anon. (1985a). *Laporan Sensus Badak Jawa (*Rhinoceros sondaicus *Desm.) dan Banteng (*Bos javanicus*) di Taman Nasional Ujung Kulon.* Taman Nasional Ujung Kulon, Labuan, Jawa Barat, Indonesia.

Anon. (1985b). *Kulamba Wildlife Reserve. Survey Report and Management Recommendations.* Prepared by WWF-Malaysia for Wildlife Section, Sabah Forest Department. WWF Project No. MAL 62. WWF-Malaysia, Kuala Lumpur, Malaysia.

Anon. (1988). *Malaysia WWF Country Plan.* Prepared by the The Conservation and Education Departments of WWF Malaysia, WWF Malaysia, Kuala Lumpur, Malaysia.

Anon. (1989). *Laporan Inventarisasi Satwa di Taman Nasional Meru Betiri. Banteng (*Bos javanicus*).* Unpublished report. Departemen Kehutanan, Direktorat Jenderal Perlindungan Hutan dan Pelestarian Alam, Balai Konservasi Sumber Daya Alam IV, Sub Balai Konservasi Sumber Daya Alam Jawa Timur II, Jember, JATIM, Indonesia.

Anon. (1990). *Laporan Inventarisasi Mammalia Besar di Taman Nasional Baluran. Kawasan Baluran dan Kawasan Alas Purwo.* Unpublished report. Departemen Kehutanan, Direktorat Jenderal Perlindungan Hutan dan Pelestarian Alam, Taman Nasional Baluran, Banyuwangi, JATIM, Indonesia.

Anon. (1991). *Biodiversity Action Plan For Indonesia. Final Draft August, 1991.* WWF-IP/PHPA, Jakarta, Indonesia.

Anon. (1992a). *Red Data Book of Vietnam Volume 1. Animals.* Science and Technics Publishing House, Hanoi, Vietnam.

Anon. (1992b). *Laporan Inventarisasi Mammalia Besar di Taman Nasional Baluran. Kawasan Baluran dan Kawasan Alas Purwo.* Unpublished report. Departemen Kehutanan, Direktorat Jenderal Perlindungan Hutan dan Pelestarian Alam, Taman Nasional Baluran, Banyuwangi, JATIM, Indonesia.

Anon. (1994). Vietnam prepares to join CITES. *Oryx* **28(1)**: 9.

Anon. (1996). Dam in Thailand would harm sanctuary. *Oryx* **30(1)**: 15.

Ashby, K.R., and Santiapillai, C. (1988). The status of the banteng (*Bos javanicus*) in Java and Bali. *Tigerpaper* **15(4)**: 16-25.

Baird, I.G. (1993). Logging and lorises in Cambodia. *IPPL News* **20(2)**: 19-20.

Baird, I.G. and Nash, S.V. (in prep.) Wildlife Trade in the Southern Provinces of the Lao People's Democratic Republic. *TRAFFIC Bulletin*.

Beccari, O. (1904). *Wanderings in the great forests of Borneo*. Constable and Co., London, UK.

Bell, K., Hopper, K.E., and McKenzie, H.A. (1981a). Bovine A-lactalbumin C and A-, B- and K-caseins of Bali (banteng) cattle, *Bos (Bibos) javanicus*. *Austr. Jour. biol. Sci.* **34(2)**: 149-59.

Bell, K., McKenzie, H.A., and Shaw, D.C. (1981b). Bovine B-lactoglobulin E, F and G of Bali (banteng) cattle, *Bos (Bibos) javanicus*. *Austr. Jour. biol. Sci.* **34(2)**: 133-47.

Berkmüller, K., Evan, T., Timmins, R., and Vene Vongphet. (1995). Recent advances in nature conservation in the Lao PDR. *Oryx* **29(4)**: 253-260.

Bernard, H-U. and Brooke, M. [Eds]. (1991). *Insight Guide: Southeast Asia Wildlife*. APA Publications (HK) Ltd.

Bezuijen, M.R. (1994). *Surveys of the Wildlife Trade at Cau Mong Animal Market, Ho Chi Minh City, Vietnam*. Unpublished report.

Bhumpakphan, N. and Kutintara, U. (1993). Problems upon the survival of wildlife resources in protected areas under the management plan projects. *Journal of Wildlife in Thailand* **3(1)**: 27-42.

Blower, J. and Paine, J. (1991). Burma (Myanmar). Chapter 15 in: Collins, N.M., Sayer, J.A., and Whitmore, T.C. [Eds]. *The Conservation Atlas of Tropical Forests: Asia and the Pacific*, Macmillan Press Ltd., London and Basingstoke, UK.

Blower, J.H., Wirawan, N., and Watling, R. (1981). *Preliminary survey of Sungai Kayan - S. Mentarang Nature Reserve in East Kalimantan*. WWF-Indonesia, Bogor, Indonesia.

Boonratana, R. (1988). Survey of mammals in south Thailand parks. *Natural History Bulletin of the Siam Society* **36**: 71-84.

Brix, P. and Deuve, J. (1963). Note sur les terres salees de la region de Pakcading. *Bull. Soc. Royale des Sciences naturelles du Laos*. Vientiane, Laos.

Caldecott, J. (1988). *Hunting and Wildlife Management in Sarawak*. IUCN, Gland, Switzerland and Cambridge, UK.

Caldecott, J. (1992). Hunting patterns and their significance in Sarawak. Pages 245-260 in: Ismail, M., Mohamed, M., and Omar, S. [Eds]. *Forest Biology and Conservation in Borneo*. Centre for Borneo Studies Publications NO. 2. Yayasan Sabah [= Sabah Foundation], Kota Kinabalu, Sabah.

Canh, L.X. (1995). A report on the survey for large carnivores in Tay Nguyen Plateau, South Vietnam with emphasis on tiger (*Panthera tigris*). Institute of Ecology and Biological Resources, Hanoi and Wildlife Conservation Society, New York, USA.

Collins, N.M. (1991). Sabah and Sarawak (Eastern Malaysia). Chapter 24 in: Collins, N.M., Sayer, J.A., and Whitmore, T.C. [Eds]. *The Conservation Atlas of Tropical Forests: Asia and the Pacific*, Macmillan Press Ltd., London and Basingstoke, UK.

Corbet, G.B. and Hill, J.E. (1992). *The mammals of the Indomalayan Region: a systematic review*. Natural History Museum Publications and Oxford University Press, Oxford, UK.

Cox, R., and Collins, N.M. (1991). Indonesia. Chapter 19 in: Collins, N.M., Sayer, J.A., and Whitmore, T.C. [Eds].

The Conservation Atlas of Tropical Forests: Asia and the Pacific, Macmillan Press Ltd., London and Basingstoke, UK.

Cox, R. and Ha Dinh Duc. (1990). *Survey for Kouprey in the Yok Don Nature Reserve, Dak Lak Province, Vietnam*. Unpublished report, Kouprey Conservation Trust and IUCN.

Davies, G., and Payne, J. (1982). *A Faunal Survey of Sabah*. IUCN/WWF Project No. 1692. WWF-Malaysia, Kuala Lumpur, Malaysia.

Davis, S. and Read, B. (1985). The Status of the North American Captive Herds of the Banteng, *Bos javanicus* d'Alton. *Zoo Biology* **4**: 269-279.

Dobias, R.J. (1982). *The Shell Guide to the National Parks of Thailand*. The Shell Company of Thailand Ltd., Bangkok, Thailand.

Doi, T. (1988). Present status of the large mammals in the Kutai National Park, after a large scale fire in East Kalimantan. Pages 82-93 in: Tagawa, H. and Wirawan, N. [Eds]. *A Research on the Process of Earlier Recovery of Tropical Rain Forest after a Large Scale Fire in Kalimantan Timur, Indonesia*. Occasional Paper No. 14, Research Center for the South Pacific, Kagoshima University, Kagoshima, Japan.

Evans, T. and Timmins, R. (1994). *News from Laos - an informal summary of the January-June 1994 results*. Unpublished report, Wildlife Conservation Society, New York, USA.

FAO. (1982). *Proposed Gyobyu Recreation Area: report on a feasibility study of the Gyobyu Catchment Basin. October 1981 and April 1982*. FAO Nature Conservation and National Parks Project FO/BUR/80/006. Field Report 5/82. FAO, Rangoon, Burma.

FAO. (1983). *Forest Management Project: Lao People's Democratic Republic*. FAO Nature Conservation and National Parks Project FO:LAO/82/006. Final Report. FAO, Vientiane, Laos.

Frank, P.F. (1940). Beschadigingen aan Banteng horens (*Bos banteng banteng* Raffl.). *Ned. Ind. Jager* **10**: 88.

Halder, U. (1976). Okologie und Verhalten des Banteng (*Bos javanicus*) in Java. Eine Feldstudie. *Mammalia depicta* **10**, Verlag Paul Parey, Hamburg and Berlin, Germany.

Hayashi, Y., Otsuka, J.-i., and Nishadi, T. (1988). Multivariate craniometrics of wild banteng, *Bos banteng*, and five types of native cattle in eastern Asia. *Jpn. Jour. Zootech. Sci.* **59(6)**: 660-72.

Harrisson, T. (1961). Prehistoric fauna changes and losses in Borneo. *Malayan Nature Journal* **21st Anniversary Special Issue (Nature Conservation in Western Malaysia 1961)**: pages 89-92.

Hedges, S. (1996) *Asian Wild Cattle and Buffaloes. Status Report and Conservation Action Plan.* [Final Draft] IUCN/SSC Asian Wild Cattle Specialist Group, Gland, Switzerland.

Hedges, S. and Tyson, M. (1996). *Is predation by ajag a threat to the banteng population in Alas Purwo? Review of the evidence and discussion of management options. Preliminary report: January 1996.* Report to the Directorate General of Forest Protection and Nature Conservation, Ministry of Forestry, Government of Indonesia and the IUCN/SSC Asian Wild Cattle and Canid Specialist Groups.

Henning, D. (1994). *Report and Recommendations for Lomphat Wildlife Sanctuary, Virachey National Park, and Ratanakiri Province*. Unpublished CEAT/UNDP Envirionmental Consultant's report to Director of the Directorate of Nature Protection, SSE, Cambodia. February 1994.

Hislop, J.A. (1961). Protection of Wildlife in the Federation of Malaya. *Malayan Nature Journal* ***21st Anniversary Special Issue (Nature Conservation in Western Malaysia 1961)***: 136-142.

Hommel, P.W.F.M. (1987). *Landscape-ecology of Ujung Kulon (West Java, Indonesia)*. Privately published doctoral thesis, Wageningen, The Netherlands.

Honacki, J.H., Kinman, K.E., and Koeppl, J.W. (1982). *Mammal Species of the World. A Taxonomic and Geographic Reference*. Allen Press, Inc. and The Association of Systematics Collections, Lawrence, Kansas, USA.

Hoogerwerf, A. (1970). *Udjung Kulon. The Land of the Last Javan Rhinoceros*. E.J. Brill, Leiden, The Netherlands.

Hooijer, D.A. (1956). The valid name of the banteng: Bibos javanicus (D'Alton). *Zoologische Mededelingen Leiden* **34(14)**: 223-226.

Humphrey, S.R., and Bain, J.R. (1990). *Endangered Animals of Thailand.* Sandhill Crane Press, Gainesville, Florida, USA.

IUCN. (1978). *Banteng (*Bos javanicus *(d'Alton, 1832)* Red Data Book data sheet no RDB-1, (2)1F. Code: 19.128.6.2 V. IUCN, CMC, Cambridge, UK.

IUCN. (1985). *Directory of Indomalayan Protected Areas. Malaysia.* [Draft]. Prepared by Protected Areas Data Unit, IUCN Conservation Monitoring Centre, Cambridge, UK.

IUCN. (1987). *Directory of Indomalayan Protected Areas. Thailand.* [Final Draft]. Prepared by Protected Areas Data Unit, IUCN Conservation Monitoring Centre, Cambridge, UK.

IUCN. (1994). *IUCN Red List Categories.* Prepared by IUCN Species Survival Commission and approved by the 40th Meeting of The IUCN Council, Gland, Switzerland, 30 November 1994.

Jellinek, P.J., Avenell, J., Thahar, A., and Sitorus, P. (1980). Infertility associated with crossbreeding of Bali cattle. In: *Proceedings, 2nd Ruminant Seminar, Ciawi, Indonesia*, pp. 79.

Jenkins, D.V. (1971). Animal Life of Kinabalu National Park. *Malayan Nature Journal* **24(3-4)**: 177-183.

Kasetsart University (1989). *Doi Inthanon National Park Management Plan.* Faculty of Forestry, Kasetsart University, Bangkok, Thailand.
Khan, M., and Zainal, Z. (1982). *SSC Wild Cattle Group Species Report. Kuala Lumpur 1982.* Unpublished report.

Laurie, A., Ha Dinh Duc and Pham Trung Anh. (1989). *Survey for Kouprey (*Bos sauveli*) in Western Daklak Province, Vietnam.* Unpublished report IUCN and THe Kouprey Conservation Trust.
Lekagul, B., and McNeely, J.A. (1977) *Mammals of Thailand.* Association for the Conservation of Wildlife, Bangkok, Thailand.

Leng-Ee, P. (1978). The Conservation of Protected Large Mammals in Thailand. Pages 47-60 in: *Wildlife Management in Southeast Asia, Proceedings of the BIOTROP Symposium on animal populations and wildlife management in Southeast Asia. BIOTROP Special Publication* ***No. 8.***

Le Vu Khoi. (unpub. MS). *The status of wild cattle and their conservation in Vietnam.*

Lic Vuthy, Sun Hean, Hing Chamnan, and Dioli, M. (1995). *A brief field visit to Mondolkiri Province to collect data on kouprey (Bos sauveli), rare wildlife and for field training.* Unpublished report to Canada Fund and IUCN.

MacKinnon, J.R. (1982). *Banteng.* IUCN/SSC Wild Cattle Specialist Group Species Information Sheet.

MacKinnon, J.R. and MacKinnon, K. (1986). *Review of the protected areas system in the Indo-Malayan Realm.* IUCN, Gland, Switzerland and Cambridge, UK.

MacKinnon, J.R., MacKinnon, K., Child, G., and Thorsell, J. (1986). *Managing Protected Areas in the Tropics.* IUCN, Gland, Switzerland.

McNeely, J.A. (1975). *Draft report on wildlife and national parks in the Lower Mekong Basin.* United Nations Economic and Social Commission for Asia and the Pacific, Committee for the Coordination of Investigations of the Lower Mekong Basin.
Melisch, R. (1995) Recent threats to a wild Banteng (*Bos javanicus*) population in Cikepuh Wildlife Reserve, West Java, Indonesia. *IUCN/SSC Veterinary Specialist Group Newsletter* **10**:11.

MIDAS. (1993). *Conservation Forest Area Protection, Management, and Development Project. Pre- investment study.* Final report. Volume 7. [Unseen, cited by Srikosamatara and Suteethorn (1995).]

Moran, J.B. (1987). The Indigenous Cattle and Buffalo of South East Asia: their Past, Present, and Future. *Outlook on Agriculture* **16(3)**: 116-123.

Namikawa, T. and Widodo, W. (1978). Electrophoretic variation of hemoglobin and serum albumin in the Indonesian cattle including Bali cattle (*Bos banteng*). *Japanese Journal of Zootechnical Science* **49(11)**: 817-827.

National Research Council. (1983). *Little-Known Asian Animals with a Promising Economic Future*. National Academy Press, Washington D.C., USA.

Neese, H.C. (1976). *The Kouprey (*Bos sauveli*), Report on Survey in Southern Laos: Kouprey along the Laos/Cambodia border area*. Unpublished report to the New York Zoological Society, New York, USA.

Olivier, R. and Woodford, M. (1994). *Aerial surveys for Kouprey in Cambodia March 1994*. IUCN Species Survival Commission. IUCN, Gland Switzerland and Cambridge, UK.

Payne, J. (1990). *Transfrontier protected areas in Borneo: (1) Conservation in the Sabah border regions.* A report submitted to WWF Malaysia and the Government of Sabah. WWF Malaysia, Kuala Lumpur, West Malaysia.

Payne, J., Francis, C.M., and Phillipps, K. (1985). *A Field Guide to the Mammals of Borneo.* The Sabah Society, Kota Kinabalu and WWF Malaysia, Kuala Lumpur, Malaysia.

Payne, W.J.A., and Rollinson, D.H.L. (1973). Bali cattle. *World Animal Review* **7**: 13-21.

Peacock, E.H. (1933). *A Game-book for Burma and Adjoining Territories*. Witherby, London, UK.

Pfeffer, P. (1965). Esquisse ecologique de la Reserve de Baluran (Java Est). *La Terre et la Vie* **112**: 199-215.

Prater, S. (1965 and 1971). *The Book of Indian Animals*. [2nd edition, 1965; 3rd edition, 1971]. Bombay Natural History Society, Bombay, India.

Puri, R.K. (1992). *Mammals and Hunting on the Lurah River: Recommendations for Management of Faunal Resources in the Cagar Alam Kayan-Mentarang. Preliminary Report.* WWF/NRM Project, Jakarta, Indonesia.

Rabinowitz, A., Schaller, G.B. and Uga, U. (1995). A survey to assess the status of Sumatran rhinoceros and other large mammal species in Tamanthi Wildlife Sanctuary, Myanmar. *Oryx* **29(2)**: 123- 128.

Read, B. (1994). *Banteng (*Bos javanicus*) International Studbook, 31 December 1994*. St. Louis Zoological Park, Forest Park, St. Louis, Missouri 63110, USA.

Read, B., Morris, D., Loskutoff, N. and Ellis, S. (1994). *Prepatory Document for the Bovid Conservation Assessment and Management Plan: Participants' First Draft, 20 April 1994*. IUCN/SSC Captive Breeding Specialist Group.

Salter, R.E. (1983). Summary of currently available information on internationally threatened wildlife species in Burma. *FAO Nature Conservation and National Parks Project. Field Document 7/83 Fo: BUR/80/006*. FAO, Rangoon, Burma.

Salter, R.E. [Compiler] (1993). *Wildlife in the Lao PDR. A Status Report*. IUCN, Vientiane, Lao PDR.

Salter, R.E., Bouaphanh Phanthavong, Sivannavong Sawathvong, Sanxay Souriyakan and Khamphay Louanglath. (1990). *An assessment of the current status of kouprey and other wild cattle in southern Laos*. Unpublished report, Forest Resources Conservation Project, Lao/Swedish Forestry Cooperation Programme, Vientiane, Laos.

Santiapillai, C. (1990a). *Status, Distribution and Conservation of Wild Cattle in Thailand*. Unpublished manuscript. WWF-Asia Programme, Bogor, Indonesia.

Santiapillai, C. (1990b). *Status, Distribution and Conservation of Wild Cattle in Laos*. Unpublished manuscript. WWF-Asia Programme, Bogor, Indonesia.

Sayer, J.A. (1981). *A Review of the Nature Conservation Policies of the Royal Forest Department, Thailand*. FAO, Rome, Italy.

Siregar, M.G. and Superjata, I.M. (1975). A half century existence of Bali cattle in South Sulawesi. *Majalah Ilmiah Universitas Udayana* **9**: 13-21.

Srikosamatara, S., Siripholdej, B., and Suteethorn, V. (1992). Wildlife trade in Lao P.D.R. and between Lao P.D.R. and Thailand. *Natural History Bulletin of the Siam Society* **40**: 1-47.

Srikosamatara, S. and Suteethorn, V. (1994). Wildlife Conservation along the Thai-Lao Border. *Natural History Bulletin of the Siam Society* **42**: 3-21.

Srikosamatara, S. and Suteethorn, V. (1995). Populations of gaur and banteng and their management in Thailand. *Natural History Bulletin of the Siam Society* **43**: 55-83.

Srikosamatara, S. and Suteethorn, V. (unpub. MS.). *Population estimates of gaur and banteng using dung and mineral lick distribution in Thung Yai and Huai Kha Khaeng Wildlife Sanctuary, western Thailand.* Manuscript under review.

Sumardja, E.A. (1983). *Banteng.* IUCN/SSC Wild Cattle Group Species Information Sheet.

Thornback, J. (1983). *Wild cattle, bison and buffaloes, their status and potential value.* IUCN Conservation Monitoring Centre, Cambridge, UK.

Tun Yin. (1967). *Wild Animals of Burma.* Rangoon Gazette, Rangoon, Burma.

Tun Yin. (1993). *Wild mammals of Myanmar.* Forest Department, Myanmar. [Unseen, cited by Srikosamatara and Suteethorn (1995).]

WCMC. (1989). *Directory of Indomalayan Protected Areas: Vietnam.* [Draft]. Prepared by Protected Areas Data Unit, World Conservation Monitoring Centre, Cambridge, UK.

WCMC. (1991). *Conservation Areas of Indonesia.* [Final draft, September 1991]. Compiled by A.J. McCarthy, World Conseravtion Monitoring Centre, Cambridge, UK in collaboration with the Directorate General of Forest Protection and Nature Conservation (PHPA), Ministry of Forestry, Republic of Indonesia, and IUCN-Commission on National Parks and Protected Areas.

Watling, R.J. (1991). *Fauna and Flora for Indonesian National Parks.* Final report of The World Bank National Parks Management Project (Contract No: 02/DJ-VI/TN/CONT/89), New Zealand Department of Conservation, ANZDEC Consultants Ltd and PT Sanga Kanaka Consulindo Indonesia. Banyuwangi, JATIM, Indonesia.

Westing, A.H., and Westing, C.E. (1980). *Endangered species of Vietnam.* Unpublished report.

Wharton, C.H. (1957). An Ecological Study of the Kouprey. *Novibos sauveli* (Urbain). *Monographs of the Institute of Science and Technology*, **Monograph 5**, Manila, Philippines.

Wharton, C.H. (1968). Man, Fire and Wild Cattle in Southeast Asia. *Proceedings of the Annual Tall Timbers Fire Ecology Conference* **8**: 107-167.

Wilson, D.E. and Reeder, D.M. (1993). *Mammal Species of the World: a taxonomic and geographic reference.* Second edition. Smithsonian Institution Press, Washington, USA and London, UK. [Note the first edition of *Mammal Species of the World...* was edited by Honacki et al. (1982).]

Wirawan, N. (1985). *Kutai National Park management plan 1985-1990.* WWF/IUCN Project No. 1687. Report No. 10. WWF-Indonesia, Bogor, Indonesia.

Witkamp, H. (1932). Het Voorkomen van Eenige Diersoorten in Het Landscap Koetai (Borneo). *Trop Natuur* **21**: 169.

Yasuma, S. (1994). *An Invitation to the Mammals of East Kalimantan.* Tropical Rain Forest Research project JTA-9(a)-137, Japan International Cooperation Agency and Directorate General of Higher Education, Republic of Indonesia. *PUSREHUT Special Publication* **No. 3**.

Annex 1

Location and size of wild banteng sub-populations (source: Hedges, 1996)

Indonesia: Java and Bali

West Java

Ujung Kulon NP	An official estimate of 752-826 in 1985 (Anon., 1985d) and MacKinnon *et al.* (1986) suggest that there may be more than 1000 however these figures were not based on rigorous surveys. There is no doubt that the sub-population is substantial, and widespread in the park, but its current status is unknown. Comparing the density of banteng sign in Ujung Kulon, Alas Purwo, and Baluran, and using banteng density in Alas Purwo as a guide suggests that the Ujung Kulon sub-population is more likely to be in the 200-500 range (Hedges & Tyson pers. obs.).
Cikepuh GR & Cibanteng NR	No more than 50 (Amir & Wind, 1977); maybe as many as 150 in 1986 (Ashby & Santiapillai, 1988); the latest official (PHPA) report gives a sub-population of about 300 in 1992 (Melisch, 1995). Reportedly introduced to the area (Thornback, 1983); but Ashby and Santiapillai consider the sub-population to be of wild origin.
Bonjonglarang Jayanti NR	A small sub-population of 'wild-type' banteng in 1986 (Ashby & Santiapillai, 1988); current status unknown.
Cimapag area	Possibly still occurred in the late 1970s but no recent information was available (Amir & Wind, 1977); current status unknown.
Leuweung Sancang NR	Minimum of 40 (Amir & Wind, 1977); reportedly contained a 'purebred' sub-population of about 200 banteng in 1986 (Ashby & Santiapillai, 1988); current status unknown.
Panajung Pangandaran NR	An estimated 60 in 1977 but this had declined to approximately 10 in 1986 (these animals are very likely to be hybrids descended from a banteng bull and introduced domestic stock) (Hoogerwerf, 1970; Ashby & Santiapillai, 1988); current status is unknown.
Cikamurang area	Possibly still occurred in the late 1970s but no recent information was available (Amir & Wind, 1977); current status unknown.
Tegal Waru area (north coast)	Possibly still occurred in the late 1970s but no recent information was available (Amir & Wind, 1977); current status unknown.

East Java

Kediri area	Small numbers reported in the 1970s (Amir & Wind, 1977); current status unknown.
Coastal area south of Blitar	Small numbers (approx. 12) in 1988 (Ashby & Santiapillai, 1988); current status unknown.
Coastal area south of Malang	Small numbers (approx. 6) in 1988 (Ashby & Santiapillai, 1988); current status unknown.
Meru Betiri NP & environs	More than 65 in 1986 (Ashby & Santiapillai, 1988); 124 (Anon., 1989); current status unknown.
Alas Purwo GR (Banyuwangi Selatan)	An absolute minimum of 262 in 1990 (Anon., 1990), certainly more than 300, possibly up to 600 in 1990/91 (Watling, 1991), and an absolute minimum of 323 in 1992 (Anon, 1992). In December 1995 an absolute minimum of 119 banteng occurred in Alas Purwo, with an estimated maximum of 180; the sub-population was declining rapidly as a result of predation by Asiatic wild dogs (*Cuon alpinus*) and habitat deterioration (Hedges & Tyson, 1996).
Baluran NP	An absolute minimum of 251 and an estimated maximum of 350 in February 1996 (based on a combination of simultaneous sighting-transects and vantage point counts, S. Hedges, unpublished data).

Maeleng area	Banteng move into this area from Baluran NP during the dry season but it is not known whether any remain throughout the year (S. Hedges, unpublished data).
Bali (West Bali)	
Bali Barat NP	Probably about 30 but they are very likely to have interbred with domestic females (Watling, 1991).
Buleleng area	About 39 (PPA, 1976 cited in Amir & Wind, 1977); current status unknown but if any remain they are very likely to have interbred with domestic stock.
Jembrana area	About 22 (PPA, 1976 cited in Amir & Wind, 1977); current status unknown but if any remain they are very likely to have interbred with domestic stock.
Current status in Java and Bali	**Uncertain but probably a total of between 750 and 1200, possibly up to 1600, on the two islands in 1996. Only 6 sub-populations are thought to be larger than 50 banteng. (The only recent credible estimates are those for Baluran and Alas Purwo.)** Previous figures include: at least 700 to > 1000 (Ashby & Santiapillai, 1988); almost 2000 on Java and 30-40 on Bali (Thornback 1983, citing MacKinnon, 1982 & Sumardja, 1983); a maximum of 1500 (Amir & Wind, 1977).
Indonesia: Kalimantan	**N.B. Information about banteng distribution in Kalimantan is of too poor quality to enable sub-populations (*sensu* Resolution Conf. 9.24 Annex 5) to be delimited; the following information simply indicates areas from which there have been recent reports of apparently wild banteng (see Hedges (1996) for further details).**
East Kalimantan	
Sungai Kayan - Sungai Mentarang NRs	Although banteng appear to be present in this large complex of protected areas (including Ulu Sembakung and Ulu Kayan proposed NRs) and the surrounding country their current status is unclear. Blower *et al.* (1981) reported that banteng were particularly common in the extensive alang-alang grasslands of the upper Sungai [= river] Bahau area. Skulls of banteng were seen in longhouses at Longnawan and along Sungai Bahau, and tracks were seen along the Iwan river in March 1991 (T. O'Brian pers. comm. to Srikosamatara & Suteethorn, 1995). Recent sightings of banteng have also been reported by many local people at Long Tua (115°40'E 3°10'N) and along the upper reaches of Sungai Bahau (many banteng reportedly occur in the area) (Puri, 1992; E. Meijaard pers. comm. to S. Hedges, 1994).
PT Alas Helau concession area	Banteng are listed in a 1994 EIA report from this 330,000 ha concession (116°20'-117°10'E 1°30'-2°05'N) (E. Meijaard pers. comm. to S. Hedges, 1994).
Merapun area, along Sungai Kelai	Recent sightings reported by locals (117°09'E 1°39'N) (E. Meijaard pers. comm. to S. Hedges, 1994).
PT DSN concession, Sungai Telen	Recent sightings reported by the manager of this concession (E. Meijaard pers. comm. to S. Hedges, 1994).
Lower reaches of Sungai Berau	Banteng are listed in a March 1994 EIA report from the 70,000 ha PT Rejosaro Bumi concession (E. Meijaard pers. comm. to S. Hedges, 1994).
Hutan Kapur Sangkulirang prop. NR and environs	Reported present by MacKinnon (cited in WCMC, 1991). The current status of banteng in the area is unclear but there have been many recent reports of the presence of 'many' banteng in the Sungai Menubar area, the Sungai Karangan area (117°43'E 1°20'N), and the Sangkulirang area (117°36'E 1°40'N). One informant had recently killed several banteng in the Sangkulirang area. Banteng are also reported in a July 1994 EIA report produced by the 67,500 ha PT Daisy Timber concession (E. Meijaard pers. comm. to S. Hedges, 1994 & 1995).

Kutai NP and environs	Formerly abundant (IUCN, 1978); reported by Wirawan (1985) and Doi (1988). Recent sightings have been reported from the Karangan Luar area (117°32'E 0°21'N) by a local informant (E. Meijaard pers. comm. to S. Hedges, 1994). [Witkamp (1932) reported that banteng in the Kutai area had interbred with domestic cattle.]
Menamang area	Banteng reported by local people in 1994 (E. Meijaard pers. comm. to S. Hedges, 1994).
Muara Kaman area	November 1994 sightings of banteng and feral buffalo reported by local people (E. Meijaard pers. comm. to S. Hedges, 1994).
Senyiur (along Sungai Kedang Kepala)	2 seen by a boatman in November 1994 (E. Meijaard, pers. comm. to S. Hedges, 1994).
Upper reaches of Sungai Ratah	Many banteng occur in the upper reaches of the Sungai Ratah: they are usually encountered in groups of 6-10 animals, and they are frequently hunted by Punan, Kahayan, and other local ethnic groups. Feral banteng and feral zebu cattle (*Bos taurus*) also occur in the area and interbreeding reportedly takes place; apparently the true wild banteng tend to occur in the surrounding mountains (R. Sözer pers. comm. to E. Meijaard, 1995).
PT ITCI concession	Reports from very plausible informants in 1994 (E. Meijaard pers. comm. to S. Hedges, 1994).
PT Timberdana concession	Banteng were listed in a 1994 EIA report (E. Meijaard pers. comm. to S. Hedges, 1994).
PT Taman Daulat Wananusa consession	Banteng reportedly occur (E. Meijaard pers. comm. to S. Hedges, 1995).
Central Kalimantan	
Muara Tuhap and eastwards	From Muara Tuhap eastwards to the border with East Kalimantan: banteng occur and are often seen close to the border, many tracks had been seen recently by a local informant. A banteng had been shot and killed by local police recently (late 1994 or early 1995) according to an informant (E. Meijaard pers. comm. to S. Hedges, 1995).
Benangin area	Banteng are regularly seen in the Benangin area (along the Sungai Teweh) (E. Meijaard pers. comm. to S. Hedges, 1995).
Ulu Kapuas - Ulu Barito area	Banteng still occur in the Sungai Joloi area (a tributary of the Sungai Busang) but they are very rarely seen according to local informants. Banteng were seen recently in the upper Sungai Sirat area (S. Sirat is a tributary of the upper Sungai Kapuas, and is close to S. Pinang) (E. Meijaard pers. comm. to S. Hedges, 1995).
Lampung area	Banteng tracks are apparently seen fairly often; one informant reported that a friend of his had once seen a group of about 30 banteng while he was out hunting (E. Meijaard pers. comm. to S. Hedges, 1995).
South of Nanga Pinoh	Recent reports (E. Meijaard pers. comm. to S. Hedges, 1995).
Tanjung Puting NP	Extinct? (Ashby & Santiapillai, 1988).
West Kalimantan	
Sedang Kipang, Sungai Cina	Recent reports (E. Meijaard pers. comm. to S. Hedges, 1995).
Current status in Kalimantan	**Unknown but apparently still widespread in East Kalimantan in the mid-1990s.** Previous figures include: several thousand (Thornback, 1983 citing MacKinnon, 1982); and 'small scattered herds in a few localities' (MacKinnon & MacKinnon, 1986).
Brunei	Extinct (Payne *et al.*, 1985).
Current status in Brunei	**Extinct.**

Malaysia: Sarawak

Thought to be probably extinct (Payne *et al.*, 1985); however they were reported by Labang (cited by Caldecott, 1988).

Current status in Sarawak — **Unknown in 1996, presumably low numbers.**

Malaysia: Sabah

East coast lowlands

Between S. Sugut and S. Labuk	Common at the beginning of the 1980s, herds of 30-40 were seen (Davies & Payne, 1982); current status unknown.
Kabili-Sepilok VJR	Reportedly present (IUCN, 1985); current status unknown.
Kulamba WR	Several tens of individuals (Anon., 1985b); listed as present by Bernard and Brooke (1991).
Lower reaches of S. Segama and S. Kinabatangan	Common at the beginning of the 1980s, herds of 30-40 were seen (Davies & Payne, 1982); current status unknown.
Tabin WR	At least 50 (IUCN, 1985); current status unknown.
Tanjung Labian lowlands	During the early 1980s herds of 30-40 were thought to occur in this area which is close to Tabin WR (Davies & Payne, 1982).

South-east Sabah

Ulu Segama CFR & Danum Valley	Numbers of banteng within this large commercial forest reserve had reportedly declined (IUCN, 1985), but banteng were still present in 1993 (M. Heydon *in litt.* to S. Hedges, 1994). Banteng were reported present within the Danum Valley Sabah Foundation Conservation Area (which lies within Ulu Segama CFR) by Bernard and Brooke (1991). Their current status is unknown.

Central Sabah

Upper reaches of S. Kinabatangan	Present at the beginning of the 1980s (Davies & Payne, 1982); current status unknown.

Western Sabah

Mount Kinabalu Park	Reported by Jenkins (1971) but not recorded in this area by Davies and Payne (1982); current status unknown.
Upper reaches of Sungai Padas	Still present south of Gunung Lumaku in 1990 according to local people, but they had been eliminated from all other parts of SW Sabah (Payne, 1990).

Protected areas for which longitude and latitude are unavailable

Silabukan VJR	Banteng occurred in the early 1980s (Davies & Payne, 1982); current status unknown.
Tanjung Linsang proposed reserve	Banteng occurred in the early 1980s (Davies & Payne, 1982); current status unknown.

Current status in Sabah — **Unknown in 1996.**

Previous estimates: approximately 300-550 at the beginning of the 1980s (Davies & Payne, 1982).

Thailand

North and north-west Thailand

Doi Chiang Dao WS	Banteng have been extirpated by hunting (MIDAS, 1993).
Doi Khuntan NP	A few banteng were reported to occur in the park (Dobias, 1982); their current status is unknown.
Salawin WS	Banteng were listed by Sayer (1981) but Bhumpakphan and Kutintara (1993) reported the presence of gaur only, not banteng. The continued presence of banteng is thought to be

	unlikely (B. Stewart-Cox *in litt.* to S. Hedges, 1994; Bhumpakphan *in litt.* to S. Hedges, 1995).
Mae Yuam Fang Khwa WS	Banteng may still have occurred in the early 1980s (Humphrey & Bain, 1990) but they are no longer thought to occur (Bhumpakphan *in litt.* to S. Hedges, 1995).
Doi Inthanon NP	The last banteng was probably shot in 1975 (Kasetsart University, 1989).
Doi Pha Muang WS	Listed by IUCN (1987); but banteng not reported by (Srikosamatara & Suteethorn, 1995).
Om Koi WS / Mae Tuen WS	These two contiguous sanctuaries rank among the most important banteng sites and represent one of the eight largest effective conservation units in Thailand (Brockelman & Baimai, 1993). It is estimated that there are about 50 banteng in these two sanctuaries (most are in Om Koi WS) but poaching pressure is high (Srikosamatara & Suteethorn, 1995). However Bhumpakphan doubts if the combined total of gaur and banteng is more than 50. More than 10,000 domestic cattle also occur in these protected areas and compete with the wild bovines as well as presenting a significant disease risk (Bhumpakphan *in litt.* to S. Hedges, 1995).
Mai Ping NP	Separated from Om Koi and Mae Tuen by a reservoir: an estimated 30 banteng were believed to be in the park in 1990 but numbers may have declined since (Bhumpakphan, *in litt.* to S. Hedges, 1995).
Sri Satchanalai NP	An estimated 5 banteng in 1994 (M. van de Bult pers. comm. to Srikosamatara & Suteethorn, 1995).
Doi Suthep-Pui NP	No banteng occur; hunting eliminated large mammals 20 years ago (Elliott & Beaver, 1992; Srikosamatara & Suteethorn, 1995).
Lansang NP	Possibly still contained banteng in the early 1980s (Humphrey & Bain, 1990); but no banteng were reported by Dobias (1982).
Ramkhamhaeng NP	Banteng occurred (Dobias, 1982); current status is unknown.
Northern central and north-east Thailand	
Phu Luang WS	Possibly still contained banteng in the early 1980s (Humphrey & Bain, 1990). A 1993 Thai Royal Forest Dept. report also lists banteng for this area (Srikosamatara & Suteethorn, 1995); but they no longer occur according to B. Stewart-Cox (*in litt.* to S. Hedges, 1994).
Phu Kradung NP	Banteng were reported in the area in the 1970s (Humphrey & Bain, 1990); but they have subsequently been extirpated (Bhumpakphan *in litt.* to S. Hedges, 1995).
Nam Nao NP & Phu Khieo WS	Nam Nao NP was the only area in the Petchabun range which was thought to harbour significant numbers (Lekagul, cited in Thornback, 1983); the park is contiguous with Phu Khieo WS and the two area are thought to contain about 20 banteng but poaching pressure is high (Srikosamatara & Suteethorn, 1995).
Namtok Chatakan NP	Banteng were possibly extirpated as long as 20 years ago (Srikosamatara & Suteethorn, 1995).
Phu Phan NP	Banteng were listed by Sayer (1981) but they have now been been extirpated from the area (Srikosamatara & Suteethorn, 1995).
Sap Lanka WS	Banteng were reported in the 1920s but have not been reported recently (Srikosamatara & Suteethorn, 1995).
South-western central Thailand	
Khlong Lan NP	A Royal Forest Department report (1993) mentions banteng in the western part of the park and 'small numbers' of banteng are still thought to occur (Srikosamatara & Suteethorn, 1995).
Mae Wong NP	Banteng used to be common in this area (before the 1950s) but there have been no recent reports (Srikosamatara & Suteethorn, 1995).

Huai Kha Khaeng WS & Thung Yai Naresuan WS	Leng-Ee (1978) reported that there were about 200-300 in these two reserves. Reported to be the major stronghold of the species in Thailand, with most of the estimated national sub-population of 500 occurring here at the beginning of the 1980s (Humphrey & Bain, 1990). A systematic survey has been made of these protected areas and it was estimated that about 290 banteng occurred in Huai Kha Khaeng and Thung Yai in 1994 (with the majority in Huai Kha Khaeng) (Srikosamatara & Suteethorn, 1995 & unpub. MS).
Sri Nakarin NP	Probably extinct: a remnant sub-population was listed by Sayer (1981) and Dobias (1982) but a 1992 Forest Research Institute report only lists gaur (Srikosamatara & Suteethorn, 1995).
Umphang WS	Banteng have probably been extirpated (Srikosamatara & Suteethorn, 1995).
Sai Yok NP	Banteng have been reported in this area recently (they probably occur in the southern part of the park) but they are thought to be prone to extirpation (Prayurasiddhi, 1987b; Forest Resources Institute, 1992). Bhumpakphan and Kutintara (1992) report gaur but not banteng; and Bhumpakphan *in litt.* to S. Hedges, (1995) thinks that only a very few banteng are likely to remain in the SE part of this park (which is separated from Erawan NP by a road).
Erawan NP	Part of a complex of protected areas which includes Sri Nakarin, Huai Kha Khaeng, and Thung Yai Naresuan; banteng were reported by Dobias (1982), Prayurasiddhi (1987b), and Bhumpakphan and Kutintara (1993).
Salak Phra WS	Banteng were more numerous than gaur Wiles (1980). However Srikosamatara and Suteethorn (1995) report that banteng have been extirpated from the area as a result of poaching, the inundation caused by the Sri Nakharin dam, and the construction of a road across the sanctuary.
Chaloem Rattanakosin NP	Banteng declined dramatically in the area after the beginning of the 1970s (Sayer, 1981; Thornback, 1983). Prayurasiddhi (1987b) does not report banteng and their current status in the area is unknown.
<u>Southern and south-eastern central Thailand</u>	
Khao Chamao - Khao Wong NP	A single herd of 20-30 was reported from the area (Sayer, 1981; Dobias, 1982); and a small number of banteng still occurred in the area in November 1994 (Srikosamatara & Suteethorn, 1995).
Khao Soi Dao WS & Khao Kitchakut NP	Prayurasiddhi (1987b) reports banteng from Khao Soi Dao and MIDAS (1993) reports that gaur and banteng mainly occur in the northwest part of the sanctuary. In Khao Kitchakut both gaur and banteng are reported by Dobias (1982) but Prayurasiddhi (1987b) reports only gaur. It was thought that about 20 banteng may still survive in these two areas and the contiguous Khao Ang Ru Nai WS in 1994 (Srikosamatara & Suteethorn, 1995).
Khao Ang Ru Nai WS	Contiguous with Khao Soi Dao WS and Khao Kitchakut NP; Prayurasiddhi (1987b) reports the presence of banteng; and aerial surveys conducted during 1991-92 located banteng on two occasions. A herd containing 22 individuals was seen in the NW part of the WS in 1993 (Bhumpakphan *in litt.* to S. Hedges, 1995). Thought to contain between 20 and 40 banteng in 1995 (the sub-population is shared with Khao Soi Dao and Khao Kitchakut) (Bhumpakphan *in litt.* to S. Hedges, 1995; Srikosamatara & Suteethorn, 1995).
Pang Sida NP & Tap Lan NP	Banteng were reported by Sayer (1981) and a small sub-population is believed to remain: a rough estimate of about 10 banteng has recently been given for these two areas although they are thought to use the Pang Sida area more than Tap Lan (Srikosamatara & Suteethorn, 1995). Some doubt about the presence of banteng was expressed by B. Stewart-Cox (*in litt.* to S. Hedges, 1994).
Huai Sala WS	Banteng were reported in 1981 (Srikosamatara & Suteethorn, 1995).

Khao Phanom Dongrak WS	Information obtained from hunters suggests that they were present in the early 1980s (B. Stewart-Cox *in litt.* to S. Hedges, 1994). Prayurasiddhi (1987b) reports the presence of banteng and they are listed by IUCN (1987). A small group were reported along the Thai/Cambodian border in this area in both 1990 and 1991. It is thought that about 20 banteng may remain in the Phanom Dongrak range (Srikosamatara & Suteethorn, 1995) (see Table 19.2).
Yot Dom WS	Banteng were reported from this area in 1991 (Srikosamatara & Suteethorn, 1995).
Phu Chong Nayoi NP	A Thai National Parks Division report (1988) mentions the presence of banteng in this area and in 1990 there was a report of 3 banteng in the northern part of the park (Srikosamatara & Suteethorn, 1995).
Northern peninsular Thailand	
Mae Nam Phachi WS & Kaeng Krachan NP	Banteng were apparently common around the summit of Phanom Thung (Sayer, 1981; Dobias, 1982). Banteng were detected during a January 1995 survey of Kaeng Krachan (Bhumpakphan *in litt.* to S. Hedges, 1995) (Also see Prayurasiddhi, 1987b; TISTR, 1992). In Mae Nam Phachi WS banteng have been reported by MIDAS (1993); and a small sub-population, roughly estimated at 25 animals is thought to remain in these two contiguous areas (Srikosamatara & Suteethorn, 1995).
Southern peninsular Thailand	
Khlong Nakha WS	Banteng were not reported from this sanctuary following a 1994 visit (Srikosamatara & Suteethorn, 1995). (See Khao Sok NP.)
Khlong Saeng WS	Banteng are very rare in this area. Two individuals were seen by the WS staff on 31 December 1994, and at least 2 banteng were poached in 1993 (Bhumpakphan *in litt.* to S. Hedges, 1995). (See Khao Sok NP.)
Khlong Yan WS	No information available (Srikosamatara & Suteethorn, 1995). (See Khao Sok NP.)
Sri Phangnga NP	Banteng may well occur along the border with Khao Sok NP and Khlong Saeng WS (Srikosamatara & Suteethorn, 1995). (See Khao Sok NP.)
Kaeng Krung NP	In 1994 a park worker reported that banteng occurred near the park headquarters which is near the proposed Kaeng Krung Dam site (Srikosamatara & Suteethorn, 1995). Banteng still occur in this area and during the dry season they reportedly feed in the surrounding agricultural land, and are occasionally shot (Bhumpakphan *in litt.* to S. Hedges, 1995). (See Khao Sok NP.)
Khao Sok NP	Banteng may still occur (Santiapillai, 1990a citing information from J. MacKinnon); this was thought unlikely by Stewart-Cox (*in litt.* to S. Hedges, 1994). A very small sub-population may survive, but hunting pressure from a nearby village may already have led to their extirpation. It is roughly estimated that 30 banteng may still occur in the Khlong Nakha WS, Khlong Saeng WS, Khlong Yan WS, Khao Sok NP, Sri Phangnga NP, and Kaeng Krung NP complex of contiguous protected areas (Srikosamatara & Suteethorn, 1995).
Khao Luang NP	Banteng were reported from this area at the end of the 1980s (Boonratana, 1988; Bhumpakphan *in litt.* to S. Hedges, 1995); but banteng were not reported by MIDAS (1993). In 1995 Bhumpakphan saw banteng horns obtained from Khao Luang and Tai Rom Yen NPs; if banteng are still present these areas would be at the southern limit of the species range in peninsular Thailand (Bhumpakphan *in litt.* to S. Hedges, 1995).
Khlong Phraya WS	MIDAS (1993) reported banteng but the area is too small to support a viable sub-population of the species (Srikosamatara & Suteethorn, 1995).
Khao Phanom Bencha NP	Banteng may still occur (IUCN, 1987); but they were not reported by Boonratana (1988) and their presence is thought unlikely by B. Stewart-Cox (*in litt.* to S. Hedges, 1994). The area is in any case too small (50 km^2) to support a

	substantial sub-population of wild cattle (Srikosamatara & Suteethorn, 1995).
Khao Pra Bang Khram WS	Gaur were reported in the area until early 1970 (V. Thongthao & P. Round pers. comm. to Srikosamatara & Suteethorn, 1995).
Khao Banthad WS	MIDAS (1993) reports that banteng and gaur were probably extirpated by poaching.
Protected areas for which longitude and latitude are unavailable	
Mae Taeng WS	Banteng may still have occurred in the early 1980s (Humphrey & Bain, 1990). Note; this area does not appear on the list of Wildlife Sanctuaries in Thailand (Bhumpakphan *in litt.* to S. Hedges, 1995).
Current status in Thailand	**Unknown in 1996. It was estimated that a total of about 470 banteng remained in 1994 and only 1 or 2 sub-populations were thought to contain 50 or more animals; there were no banteng outside of the protected areas; and the trend was believed to be downwards as a result of hunting and habitat loss (Bhumpakphan *in litt.* to S. Hedges, 1995; Srikosamatara & Suteethorn, 1995).** Previous figures include: at least 2300-2500 in 1970 (Srikosamatara & Suteethorn, 1995), fewer than 500 (Lekagul & McNeely, 1977), 500-1000 (Leng-Ee, 1978), about 200 (Khan & Zainal, 1982), and about 500 (Santiapillai, 1990a citing information from J. MacKinnon).

Lao PDR

Lao PDR north of 16°30'N	Recent (1988-1990) work reported by Salter (1993) revealed that banteng were still present in many parts of northern and central Lao PDR (north of 16°30'N) according to villagers. Banteng were reported near (within half a day's walk) to 61 of the 191 villages where interviews were conducted.
Protected areas	Banteng were reported to occur in and around the following National Biodiversity Conservation Areas (NBCAs): Phou Dene Dinh, Phou Loeuy, Nam Et, Nam Xam, Phou Khao Khoay, Nam Poui, Nam Kading, Khammouane Limestone, and Phou Xang He (Salter, 1993). Banteng were also reported to occur in Nakai-Nam Theun NBCA; but they are now locally extinct, presumably due to high levels of hunting (Evans & Timmins, 1994).
Southern Lao PDR (south of 16°30'N)	Recent (1988-1990) work reported by Salter *et al.* (1990) and Salter (1993) revealed that banteng were still present in many parts of southern Lao PDR (south of 16°30'N) according to villagers. Banteng were reported near (within half a day's walk) to 98 of the 137 villages where interviews were conducted.
Protected areas	Banteng were reported to occur in and around the following National Biodiversity Conservation Areas (NBCAs): Phou Xiang Thong, Dong Hua Sao, Xe Piane, Dong Ampham, and Xe Bang Nouan; close to Bolovens Northeast proposed NBCA; and in and around Phou Kathong, Xe Khampho, and Bolovens Southwest proposed NBCAs (Salter *et al.*, 1990; Salter, 1993).
Current status in Lao PDR	**Unknown in 1996 but banteng were apparently widely distributed in the country at the beginning of the 1990s; the number of banteng in the country is thought to be declining, largely as a result of hunting.**

Vietnam

South of 15°N	
Mom Ray NR	Banteng listed as present in WCMC (1989); but their presence is considered very unlikely by Le Vu Khoi (*in litt.* to S. Hedges, 1991).
Kon Ha Nung area	Banteng listed by MacKinnon and MacKinnon (1986), but their presence is seriously doubted by Le Vu Khoi (*in litt.* to S. Hedges, 1991).

Sathay & Kontum Plateau (W of 108°E)	Banteng occurred in the late-1970s (Westing & Westing, 1980); and were still thought to occur in the early-1990s (Le Vu Khoi, unpub. MS). Current status unknown.
Suoi Trai NR	7 banteng in 1993 (Le Vu Khoi, unpub. MS).
Tieu Teo area	About 70-90 banteng in the early 1990s, the largest remaining sub-population of banteng in Vietnam (Le Vu Khoi, unpub. MS).
Yok Don NP	During March to April 1987 3 groups of banteng were seen by Vietnamese scientists, the largest group contained 30 animals (Le Vu Khoi *in litt.* to S. Hedges, 1991). Abundant signs of banteng were encountered during April 1989. Banteng, including 1 group of more than 20, were seen on 4 occasions during 12 days in the forest (Lauric *et al.*, 1989). In October 1990 fresh tracks of small herds of banteng were found on 4 occasions during 5½ days in the field (Cox & Ha Dinh Duc, 1990). Between 35 and 45 banteng were still thought to occur in 1993 (Le Vu Khoi, unpub. MS).
Green Forest (Dak Lak Province)	Reported by Canh (1995).
Lam Dong Province	Banteng still occurred in this province, including the Nui Bi Doup area, in the the early 1990s (Canh, 1995; Le Vu Khoi, unpub. MS).
Bu Gia Map NR	Banteng were still present in the early 1990s (Le Vu Khoi, unpub. MS).
Nam Bai Cat Tien NP	Banteng were repported present by WCMC (1989) and Canh (1995), but Le Vu Khoi (unpub. MS) does not include this NP within the banteng's current range.
Current status in Vietnam	**Unknown in 1996 but in 1990-1993 an estimated 200-300 banteng remained in Vietnam and only 1 sub-population was thought to contain more than 50 animals (this estimate was based on field visits and interviews with local people, including hunters (Le Vu Khoi, unpub. MS)); the number of banteng in Vietnam is thought to be declining as a result of hunting pressure.**

Cambodia

East of the Mekong River

Virachey NP & environs (The 'Hondrai Sou' area)	Banteng were present in the 1970s (McNeely, 1975); and they still occurred on the Vietnamese side of the border in the early-1990s (Le Vu Khoi, unpub. MS).
Lomphat WS & environs	Banteng were seen close to Lomphat WS during aerial surveys in March 1994 (Olivier & Woodford, 1994).
Phnom Prich WS & eastwards to the border with Vietnam	Banteng were seen during the March 1994 aerial surveys (Olivier & Woodford, 1994).
Phnom Nam Lyr WS	Banteng may occur because they were reported from the Vietnamese side of the border in 1993.
Snoul WS	May occur because they were present on the Vietnamese side of the border in the early-1990s.

Northern and western Cambodia

Dongrak mountains & Preah Vihear Protected Landscape	No recent reports but banteng were reported along the Thai-Cambodian border in 1990 and 1991 (in the [Thai] Phanom Dongrak WS & Yot Dom WS area) (Srikosamatara & Suteethorn, 1995).
Kulen-Promtep WS	No recent reports but banteng may occur (based on their distribution in Thailand).
Angkor Protected Landscape, Phnom Kulen NP, & environs	Banteng occurred in the mid-1970s (McNeely, 1975).
Banteay Chmar Protected Landscape & environs	May occur (based on their current distribution in Thailand).

Roniem Daun Sam WS, Simlaut Multiple-Use Area, & Phanom Samkos WS	No recent reports but banteng may still occur based on their current distribution in Thailand
Current status in Cambodia	**The number of banteng in Cambodia in 1996 is unknown but it is thought to be small and declining alarmingly (based on the results of aerial surveys in 1994, field visits by WPO staff in 1995, interviews with local people including hunters, and the number of trophies seen for sale or on display - see Hedges (1996) for further details).** Wharton (1957) estimated that there were 5000 banteng in Cambodia.

Myanmar

Northern Myanmar	
Pidaung WS	No longer thought to occur according to Salter (1983); but banteng were reported by Tun Yin (1993).
SW Kachin State and adjacent areas of eastern Sagaing Division	Still occur (Su Su Oung & Khin Than Win pers. comm. to S. Hedges, 1995; Su Su Oung *in litt.* to S. Hedges, 1995).
Kyatthin WS	Still occurred in small numbers in the early 1980s (Salter, 1983).
Shwe-U-Daung WS and adjacent parts of Mandalay Division and NW Shan State	May still have occurred in the early 1980s (Salter, 1983); reported by Tun Yin (1993) and Su Su Oung and Khin Than Win (pers. comm. to S. Hedges, 1995).
Central Myanmar: Shan Plateau	
Sedawgyi Dam catchment area	Signs seen in 1983 (Salter, 1983).
Nyaunggyat area	Reported by locals (Salter, 1983).
Western Myanmar	
Alaungdaw Kathapa NP	Reported by locals (Salter, 1983).
SW Sagaing Division	Still occur (Su Su Oung & Khin Than Win pers. comm. to S. Hedges, 1995; Su Su Oung *in litt.* to S. Hedges, 1995).
Shwesettaw WS & surrounds	A remnant sub-population reported (Salter, 1983).
Southern central Myanmar: Pegu Yoma region	
Pegu Yoma prop. NP / Elephant Range	Signs seen in 1983 (Salter, 1983).
Border of Pegu & Rangoon Divisions	Still occur (Su Su Oung & Khin Than Win pers. comm. to S. Hedges, 1995; Su Su Oung *in litt.* to S. Hedges, 1995).
Gyobyu Reservoir area	Reported by locals, apparently moved into the area during the monsoon season (FAO, 1982; Salter, 1983).
Central Irrawaddy Division	Still occur (Su Su Oung & Khin Than Win pers. comm. to S. Hedges, 1995; Su Su Oung *in litt.* to S. Hedges, 1995).
Southern Myanmar: Tenasserim region	
Pakchan proposed NR	Signs seen in 1983 (Salter, 1983).
Current status in Myanmar	**An unknown number in 1996; banteng numbers are believed to be declining, largely as a result of hunting.** Previous estimates: 1980/81 Forest Dept. questionnaire surveys suggest that the total number of banteng in the country was a 'few thousand' but these figures were 'based entirely on guesswork' (Salter, 1983:39); about 3000 in the mid-1990s (Forest Dept. figures provided by Su Su Oung & Khin Than Win pers. comm. to S. Hedges, 1995).

Annex 2

Biological Criteria for Appendix I

Wild banteng (*Bos javanicus*) should be included in Appendix I because they are known to be in trade and because they meet the following biological criteria.

A. **The wild population is small** [i.e. it is unlikely to be more than 8000 and is quite possibly fewer than 5000 animals (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 and inferred from the information summarized in Sections 2.4 and 2.5; and projected from the information on trade levels and habitat loss/degradation presented in Sections 2.7. 3.3, 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. all sub-populations contain fewer than 500 individuals, and only 8 or 9 are thought to contain more than 50 individuals (see Section 2.3)]

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

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

a decrease in area or quality of habitat,

[a decrease in the area of banteng habitat is clearly revealed by the data summarized in Section 2.5; a further decrease in area and/or quality is projected from the information presented in Sections 2.7 and 4.2.2]

and **levels of exploitation.**

[inferred and projected from the information in Sections 2.3, 2.4, and 3.3]