

## Chapter 5.8

### The Babirusa

#### **(*Babyrousa babyrussa*)**

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#### **Status and Action Plan Summary**

Status categories 4 - 5 (vulnerable or endangered), according to subspecies.

The babirusa is known only from Sulawesi (*B. b. celebensis*), some of the Togian Islands (*B. b. togeanensis*), the Sula Islands and Buru (*B. b. babyrussa*). Two extinct forms, one fossil and one recent (*B. b. bolabatuensis*), have been found in South Sulawesi. The species is therefore presumed to have been more widely distributed on Sulawesi in earlier times, but by the middle of the last century they were reported to occur only in the east and north-east parts of the island and to have disappeared from the whole of the south-western peninsula. Currently, babirusa are known only from the northern peninsula, central and south-eastern parts of the Sulawesi mainland, and from three of the larger Togian Islands Archipelago. Reports obtained in 1990 indicate that babirusa also survive on Buru and two of the Sula islands, Mangole and Taliabu, but that they may now be extinct on Sulawesi (formerly Sanana). However, there is no doubt but that babirusa are seriously threatened over most of their remaining range by deforestation and hunting pressure; the latter being particularly intense in parts of northern Sulawesi where there is commercial trade in the meat of these animals (Blouch, 1990; Budiarmo *et al.*, 1991).

Much of the available information on the natural history and biology of this species is anecdotal or derived from the study of captive specimens. Distribution and status surveys in all parts of its range are required as a matter of high priority, with a view to the development of management plans for its enhanced future protection and the establishment of additional reserves in key areas, such as Buru, Mangole and the Togians. The possibility of relic populations of *B. b. bolabatuensis* surviving in remote locations in south Sulawesi should be investigated, and the taxonomic relationships of the central and south-eastern Sulawesi populations, which are unknown at present, need to be assessed. The first longer-term field study of the species' behaviour and ecology has been initiated recently in northern Sulawesi, and such studies should be continued and extended to other parts of the species' range in the near future. Particular emphasis should be placed on obtaining a proper understanding of its habitat preferences, population sizes and densities in different habitats, and the nature and extent of factors, such as hunting pressure, deforestation and agricultural encroachment, which are negatively influencing the distribution and numbers of surviving populations. Although there are large numbers of *B. b. celebensis* being maintained and bred in zoological collections at present, the captive

population is extremely inbred. Priority should therefore be given to the acquisition of additional, wild-caught founders of this subspecies, and to the development of properly structured breeding programmes for the more threatened Togian subspecies, *B. b. togeanensis*, and, especially, the golden or hairy subspecies, *B. b. babyrussa*.

## Introduction

*B. babyrussa* is the sole living representative of the subfamily Babyrousinae, and is generally considered to be in an isolated position with regard to the other living suids. Being endemic to Sulawesi, it also has a very limited geographical distribution. This island has long been isolated by water from mainland Asia, the strait never having been narrower than about 25 miles during Pleistocene times. Since the fossil record is confined to Pleistocene material from Sulawesi and from Buru, the hypothesis has been put forward that Babyrousa has developed since Oligocene times along a separate evolutionary line (Thenius, 1970; Groves and Grubb, this vol.). This concept is fully supported by chromosome data; although the babirusa has a diploid chromosome number of 38, as in most other suids, five pairs of babirusa autosomes (Nos. 6,12,14,15 and 17) have no direct equivalents in *Sus* species (Bosma, 1980; Bosma and de Haan, 1981; Bosma *et al.*, 1991).

In any event, there is no doubt that the babirusa is one of the world's most bizarre mammals, and is certainly one of the most extraordinary suids. Amongst its many peculiarities are that the upper canines of the male emerge vertically from the maxillary alveoli, penetrate through the skin of the nose and then curve posteriorly over the front of the face towards the forehead; a unique feature in mammals. The mandibular canines of the male also grow over the front of the face. The peculiar appearance of the adult male (the canines of the female are either absent or markedly reduced) has led local people to liken its appearance to deer (i.e. '*babi*' = pig and '*rusa*' = deer) and, on some islands, to confer mythical properties to it. The function of these tusks remains unknown. They are quite brittle, and therefore easily broken, and they are rarely used in combat between males (see below).

## Subspecific Taxonomy

Following Groves (1980) and Groves and Grubb (this vol.), three extant subspecies are currently recognized. However, it is possible that some central or southern Sulawesi populations are of a fourth subspecies, *B. bolabatuensis* (Hooijer, 1950), which is known only from Tolian deposits collected from caves and rock shelters in south-western Sulawesi. The (three) living forms are described as follows:

1. *B. b. babyrussa* (Linnaeus, 1758), the 'hairy' or 'golden' babirusa is known only from the islands of Buru and Taliabu, Sulawesi (where it is now extinct) and, probably, Mangole in the Sula Islands. This is the smallest subspecies, and is otherwise characterized by its long and thick body hair, which is colored white, creamy gold, black or gold with a black rump. The upper canines of the males are usually short and slender, with the alveolus forwardly rotated, so that lower canine crosses the upper in lateral view.
2. *B. b. togeanensis* (Sody, 1949), the Togian Islands' babirusa is, as its name suggests, confined to the Togian Archipelago, between the northern peninsula

and central Sulawesi. This is the largest subspecies. It is also characterized by the possession of body hair, though this is less long and dense than in the nominate form. The pelage of the upper parts is also darker than that of the under parts and fawn, brown or black in color. The upper canines of the males are usually short, slender and somewhat rotated forward, and always converge.

3. *B. b. celebensis* (Deninger, 1910) is certainly known only from the northern peninsula and the north-eastern part of mainland Sulawesi, including the offshore island of Lembeh. This is the only subspecies to be maintained in captivity at the present time and is therefore the most familiar. The adult male body size is fairly large (though smaller than that of the preceding subspecies), ranging from 60 and 100 kg. The female is approximately 30% smaller. It is usually considered to be naked, though in reality its body hair is merely short (0.5-1.0 cm), sparse and dark brown in color over gray skin. The upper canines of the males are generally long and thick, and the alveoli vertically implanted, so that upper canine emerges vertically and is not crossed by the lower canine, converging in almost all cases (Groves, 1980).

### Former and Present Distribution

The species appears to have been more widely distributed over the island of Sulawesi in former times than it is now. Two extinct forms, a Pleistocene fossil (*B. b. beruensis*) and one Holocene subfossil (*B. b. bolabatuensis*), described from remains found in caves and rock shelters on the east side of the south-west peninsula (Sarasin & Sarasin, 1905; Dammerman, 1939; Hooijer, 1948, 1950), also indicate that babirusa were the principal large prey species of prehistoric man in some localities in the island (Franssen, 1949; Heekeren, 1949). By the middle of the last century the species was reported to survive in the east and north-east parts of Sulawesi but to have vanished from the whole of the south-western peninsula (Temminck, 1849; Sarasin & Sarasin, 1905), and by the 1930's it was said to be: "being squeezed slowly into the hinterland of Sulawesi" (Heynsius-Viruly and Heurn, 1935).

Babirusa are now definitely known only from the northern peninsula (*B. b. celebensis*), and central and south-eastern Sulawesi, though various recent reports indicate that populations also occur at intervals along the length of the south-western peninsula (H. B. Hasanuddin, J. Clark and A. Kyari, pers. comm.). However, the taxonomic status of the central and the southern Sulawesi populations is not known, i.e. these may represent the otherwise believed extinct form *B. b. bolabatuensis*. The subspecies *B. b. togeanensis* is known only from the Togeian islands of Batudaka, Togian and Talatakoh, where Selmier (1983) estimated that the total population was in the region 500 - 1000 individuals in 1978. The nominate subspecies, *B. b. babyrussa*, is now known only from Buru and from the Sula islands of Mangoli and Taliabu. It also occurred on Sulabesi (formerly Sanana), the only other large island in the Sula Group, but this population is now thought to be extinct (A. Sol and M. Patry, pers. comm.).

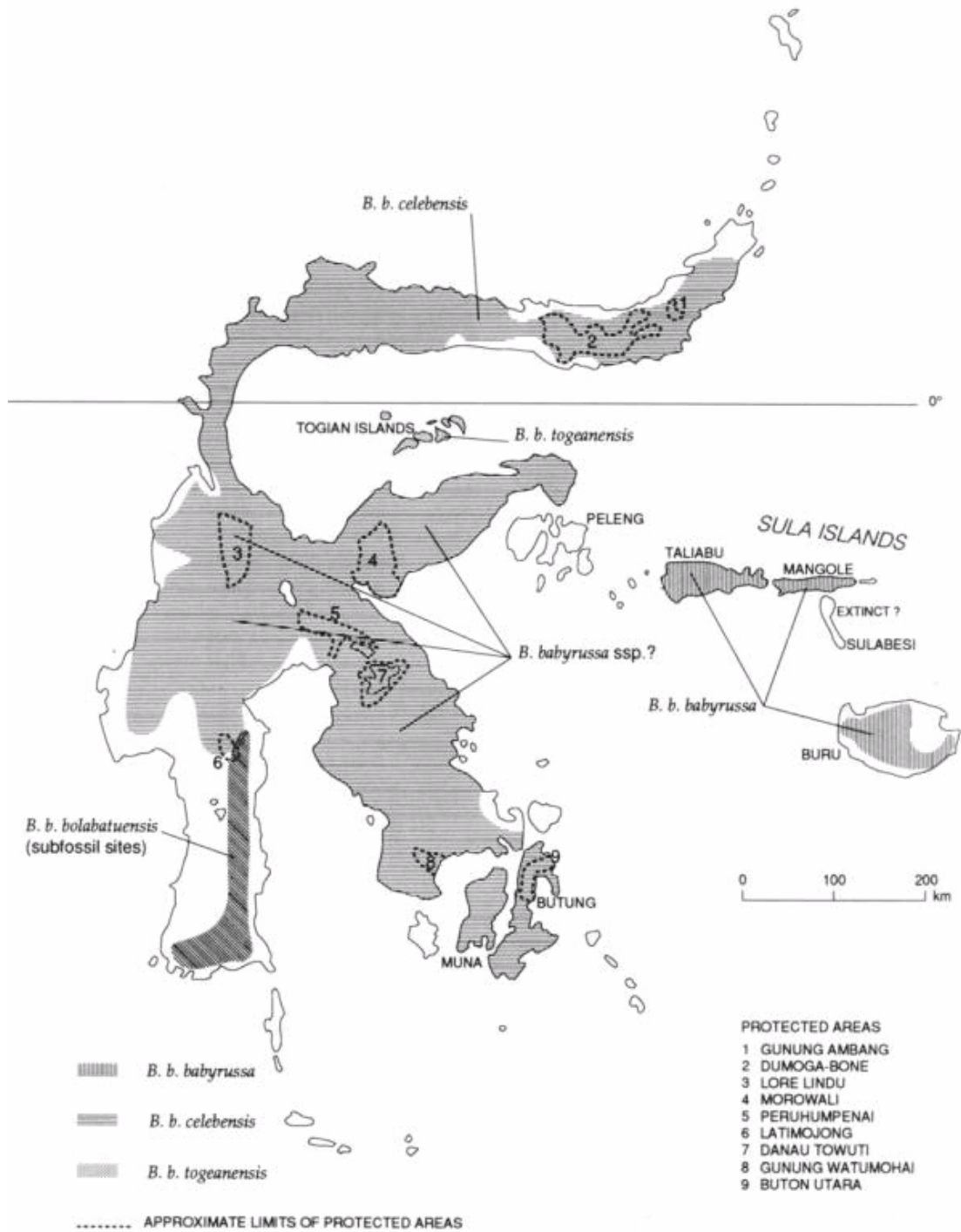


Fig. 16: Approximate known range of native and introduced populations of babirusa, *Babirusa babyrussa* ssp.

### Habitat, Ecology and Behavior

The babirusa inhabits tropical rain forest on the banks of rivers and ponds abounding in water plants. Whereas in the past the animal has tended to occur in low lying areas near coasts, recent anecdotal and survey reports indicate that it is now confined mostly to the interior, on higher and less accessible ground.

In common with most of the other suids, babirusa are omnivorous. The species' intestinal tract is similar to that of the domestic and wild pig (*Sus scrofa*) in many ways (Flower, 1872; Mitchell, 1905, 1916; Langer, 1973, 1988), although its enlarged stomach diverticulum has led to the spurious suggestion that this may be involved in rumination. However, all the available evidence shows that this is not the case (Macdonald, 1991). Whether the diverticulum is actually a food storage chamber or an enlarged 'acid bath' is now being investigated, along with other studies of the species' digestive physiology. Except in mud and swampy ground, babirusa do not exhibit the rooting behaviour typical of other suids, but this is associated with its lack of a rostral bone in the nose. From observations of both wild and captive individuals they are known to consume a wide variety of leaf, root, fruit and animal material, though detailed studies of their diet in the wild still need to be carried out. Their jaws and teeth are reported to be strong enough to crack very hard nuts with ease (Peters, 1985), and adult babirusa have been observed to catch and eat small mammals. In captivity, adults of both sexes will also sometimes attack and cannibalize infants born to other individuals.

The available information suggests that babirusa are social, with groups or troops of up to eight individuals having been observed in rainforest, especially around water, communal wallowing areas and salt licks (Valentijn, 1726; Desmarest, 1820; Selmier, 1983; Macdonald *et al.*, 1989; Patry and Capois, 1989; M. Patry, pers. comm.). No detailed accounts of group structure have been published, though field studies currently underway in Sulawesi are expected to shed light on this, and whether the species is territorial (M. Patry and L. Clayton, pers. comm.). Recent video film of wild animals has shown that they may associate with the sympatric warty pigs (*Sus celebensis*) and that, contrary to Jennison (1927), they are active during daylight hours (Selmier, 1983; Patry and Capois, 1989).

Nests built in the wild are reported to be similar to those of the other wild pigs (Deninger, 1910). Babirusa shelter from the rain under bitten off branches of leaves, though nests have also been found in volcanic rock caves (Selmier, 1978). Sleeping nests tend to have little or no padding on the ground, being essentially 'babirusa-sized depressions', and all babirusa flushed out of such nests were solitary (Selmier, 1983). Nests built by sows for farrowing are up to 3 m long and 25 cm deep, and are layered with branches torn from trees and bushes (Guillemard, 1886; Selmier, 1978).

Captive babirusa may become sexually mature as early as five to ten months of age (National Research Council, 1983), and have lived as long as 24 years (Mohr, 1960). However, it is likely that the age of sexual maturity in the wild is influenced by the level of nutrition and that animals are unlikely to breed until they are more than one year old. Estrus cycle lengths of between 28 and 42 days have been recorded, and captive females generally re-cycle within 3 months post-partum (Chaudhuri *et al.*, 1990; P. Vercammen and P. Immens, pers. comm.). Estrus lasts 2-3 days, and the female is not receptive to males at other times (Macdonald, Leus and Vercammen, unpubl. data). Gestation length is usually 155-158 days, though up to 171 days has been reported (Heinroth, 1908; Reinhard and Frädrieh, 1983; Bowles, 1986; Vercammen, 1991). The normal litter size is one or two, but a low incidence of triplet births has been recorded both in captivity and in the wild, and four fetuses have been reported in utero in a wild female (Patry, 1990). Although the gestation is six weeks longer than that of *S. scrofa* (+ 114 days), neonate babirusa are smaller in size and

seem to be no more developed as a consequence of the longer time spent in the uterus. The young are uniformly brown in color, rather than striped, as in all other wild suids with the exception of the warthog, *Phacochoerus* spp.

In captivity, sows produce young at all times of the year (Plasa, 1990), and may produce two litters within a 12-month period. However, since it seems likely that diet or other seasonal factors would normally influence inter-birth intervals, wild litters may be produced less frequently. Females, which are normally quite docile in captivity, become exceedingly aggressive to their keepers and other babirusa from shortly before parturition to about two weeks after the young are born (Dittoe, 1945; Reinhard and Frädriich, 1983; Peters, 1985; Anggawijaya *et al.*, 1985).

### **Threats to Survival**

Adult babirusa have few, if any, natural predators, though pythons (*Python reticulatus* and *P. molurus*) and Sulawesi civet (*Macrogalidea musschenbroeckii*) may predate younger animals (Whitten *et al.*, 1987). Indeed, given the small litter size, babirusa appear unadapted to a high rate of predation; a consideration evidently supported by MacKinnon (1979) who suggested that, having evolved in a more or less predator-free environment, babirusa were especially vulnerable to hunting pressure. However, hunting by humans with nets, spears and dogs has undoubtedly been an important factor since prehistoric times (Guillemard, 1886; Franssen, 1949) and that continued, hunting pressure now constitutes an increasingly important threat to the remaining populations of these animals in some areas (Blouch, 1990; Budiarmo *et al.*, 1991; L. Clayton, pers. comm.; M. Patry, pers. comm.). The market hunting practiced by the Christian community in north Sulawesi is concentrated on the warty pig, *S. celebensis*, but some babirusa are also taken. Budiarmo *et al.* (1991) counted 295 babirusa among 2,612 wild suids they recorded in a survey of hunters and markets in four areas of North Sulawesi. This relatively small proportion (11.3%) of the total wild pig harvest is caused, at least in part, because babirusa reportedly now live further from human habitations than the warty pigs. Additionally, they fetch no more in the market place, giving hunters little incentive to go after them (Blouch, 1990 and pers. comm.). Nonetheless, babirusa skulls are openly sold in tourist areas south of the Lore Lindu National Park and in large department stores in Jakarta.

In recent years large-scale commercial logging operations have also posed a major and increasingly serious threat to this species (Smiet, 1982). The loss and degradation of habitat has already resulted in the dramatic diminution in the known range of this species and the recent extirpation of some populations, e.g. in parts of north Sulawesi and on Sulabesi (Selmeir, 1978; Clayton, in prep.; M. Patry, pers. comm.). Babirusa are one of the first animals to become locally extinct after logging or land opening, which not only deprives them of their moist forest habitat but may also increase their exposure to hunting pressure by immigrant settlers and their dogs (Whitten *et al.*, 1987).

Little is known about the susceptibility of this species to natural or introduced diseases (Munro *et al.*, 1990), though many babirusa on the Togian islands reportedly died during an epidemic skin disease in the early 1970's (Selmeir, 1983). The increased likelihood of babirusa in formerly remote and inaccessible areas being exposed to virulent (insect- or livestock-borne) diseases to which they have no natural

resistance may, therefore, pose a potentially serious threat to this species, as it does to some other threatened suids (Oliver *et al.*, Chapter 5.2, this vol.).

### **Conservation Measures Taken**

The babirusa was accorded full protection under Indonesian law in 1931, and the legislation relating to babirusa and nature conservation in general in Indonesia was summarized by Dammerman (1950) and by Setyodirwiryo (1959). Since 1978 *B. babyrussa* has been categorized as 'vulnerable' in the IUCN Red Data Book (IUCN, 1978), and listed as 'endangered' by the United States Department of the Interior since 1980 (USDI, 1980). The species has also been included on Appendix I of CITES since 1982, although international trade in this species is not thought to have been an important issue in recent times.

To date, approximately 12,000 sq km of land on Sulawesi has been formally declared as wildlife protection areas, and a further 20,000 sq km within the distribution of this species have been proposed as wildlife reserves of one form or another, but await formal gazetting. Populations of mainland babirusa occur in a number of these national parks, nature reserves, hunting reserves and protected forests in Sulawesi (Table 10), some of which areas have been designated specifically for their protection. However, babirusa are patchily distributed and/or still subject to hunting pressure in many of these areas (e.g. Dumoga-Bone). Efforts are being made by the parks service to educate local people and to control animal poaching and timber cutting within the existing protected areas, but chronic lack of financial resources, pressure from an expanding human population and insufficient up-to-date information seem to combine with other factors to make much of the protective legislation ineffective at a local level (Blouch, 1990; Clayton, in prep.). In some cases, the amount of suitable habitat remaining within these areas is also considerably less than the designated size of the reserves (Basjarudin, 1971; Olivier & Watling, 1977; Wind, 1984; MacKinnon and MacKinnon, 1986). As yet there are no national parks or other wildlife reserves within the range of or *B. b. babyrussa*, though relatively large areas have been designated for protection in north-central Taliabu (700 sq km) and west Buru (1,450 sq km), but these have yet to be formally gazetted. Similarly, there are as yet no wildlife reserves in the Togian Islands, though the whole archipelago has been proposed for future protection.

### **Captive Breeding**

Babirusa have been maintained and bred in captivity at intervals since the early 19th Century, and perhaps for much longer. Quoy and Gaimard (1830), for example, recorded that the Rajahs of Celebes often kept and raised babirusa to present them as diplomatic gifts. In 1820, the first pair of animals to arrive in Europe was maintained at the Menagerie du Jardin des Plantes in Paris, where a male piglet was produced in March 1821 (Boitard, 1851). During the ensuing 150 years the small captive zoo population fluctuated in number but never exceeded 20 individuals. These included three *B. b. babyrussa* - 2 from the Sula Is. and 1 from Buru - being maintained at Amsterdam Zoo from 1915 to 1925 (Mohr, 1960). However, as a result of the extremely successful breeding of this species at Surabaya Zoo, Java, since the early

1970's, there has been a dramatic increase in the captive population which, by the end of 1989, stood at 68 (36 males, 29 females + 3 unsexed) in four Indonesian zoos, 50 (25 males, 25 females) in eleven European collections and 13 (7 males, 6 females) in 3 zoos in the U. S. (Plaza, 1990). The latter author states that these animals were derived from 13 (7 males, 6 females) wild-caught founders, though this is almost certainly incorrect. Unpublished Indonesian sources describe the stock as descended from a wild-caught pair obtained in 1968 (Matur, 1989), while other reports suggest that this stock is entirely derived from 4 (2 males, 2 females) of 5 wild-caught individuals from the vicinity of Poso, north-central Sulawesi, acquired by Surabaya Zoo in 1975 (S. Soebakir, pers. comm. to W. Oliver). There is also a possibility of a contribution to the world zoo population from 11 animals said to have been brought from Sulawesi to Jakarta in 1977.

In any event the present stock is highly, perhaps chronically, in-bred. In addition, there is increasing concern about the difficulties relating to the useful dispersal of surplus stock in some collections, particularly in Surabaya, which was maintaining 49 babirusa (37% of the total captive population) on 31.12.89. Fortunately, these animals are evidently able to live amicably in large groups, though overcrowding has resulted in high levels of infant mortality and, hence, a greatly reduced rate of recruitment (pers. obs.; Plaza, 1990).

### **Additional Remarks**

The babirusa is considered by the Indonesian authorities and a proportion of the general public to be species of particular patrimonial interest and especially worthy of protection. Evidence for this is found in various unpublished reports in Indonesia, which have suggested that it is second only to the rhinos as most the important wild mammal in the country, and in observations that it has potential as a 'flagship species' for conservation interests. The babirusa has been selected as the emblem of the Lore Lindu National Park, and the species is frequently referred to in staff training and conservation materials produced by the PPA (Forestry Department) and PHPA (Forestry and Nature Conservation Department). In recent years, it has also been increasingly featured in children's text and coloring books in Indonesia.

### **Conservation Measures Proposed**

#### **An Action Plan**

The bizarre appearance of this species, coupled with its high degree of taxonomic uniqueness, has attracted comment in the scientific community for 500 years, and it has been a treasured resource to local people for much longer. Recent and current research is rapidly adding to our understanding of its biology (Macdonald, 1991), though basic information on many aspects of its ecology and behaviour is still lacking. The species' shyness and the relative remoteness of its distribution has limited earlier academic studies, but anthropological research has indicated that there is also an extensive local knowledge of these animals which is almost entirely unreported. Its potential importance as a classic indicator of forest disturbance has also been recognized only very recently and this factor, together with need for recent and more detailed information about its present distribution, threats to its survival, and

various aspects of its biology, must be reflected in the structure and priorities of any future management and research initiatives.

### **Objectives**

1. To determine the present distribution and relative population sizes of the species throughout its known range.
2. To assist the establishment of a network of protected areas to safeguard the survival of representative populations of all subspecies of babirusa and, where necessary, promote the establishment of captive populations of these subspecies as a safeguard to their survival.
3. To promote further research into the systematics, biology, conservation status and future management needs of the species in order to better ensure its long-term survival.
4. To promote interest and awareness amongst local people and visitors of the need to conserve this unique natural resource.

### **Priority Projects**

1. Conduct field status surveys in selected priority areas, including the Togian Is., the Sula Islands and Buru, with a view to the development of management recommendations/plans for the enhanced protection of two or more representative populations of the least known, but potentially most threatened subspecies, *B. b. togeanensis* and *B. b. babyrussa*, respectively.
2. Assist the relevant governmental authorities in their efforts to establish national parks in the Togian Islands, the Sula Islands (Taliabu and Mangole) and Buru, and such other of those islands where the animals occur and should be better protected in future.
3. Conduct surveys in selected areas of central, southern and south-eastern Sulawesi to assess the distribution, conservation and taxonomic status of relic populations of animals, which may represent extant examples of *B. b. bolabatuensis* (Hooijer, 1950).
4. Assess and implement options for the development of properly structured captive breeding programmes for the most threatened subspecies, *B. b. babyrussa* and *B. b. togeanensis*.
5. Promote efforts to introduce fresh blood-stock from the wild into the captive population of *B. b. celebensis*, assist the useful placement of surplus, captive-bred stock in Indonesian collections (including the possibility of reintroducing some of these animals), and promote development of integrated, in-country management and conservation-education projects with the support of the international zoo community and other relevant bodies.

6. Investigate subsistence hunting methods and levels of utilisation of this species throughout its range, in order to determine its cultural and economic importance to local people and to enhance future monitoring and regulation.
7. Investigate current methods and levels of commercial trade (intra- and inter-island) in the flesh and other products of these animals within Indonesia, with a view to the enhanced future monitoring, regulation and/or prohibition of this trade.
8. Investigate the species' ecology in representative habitats, its habitat preferences, and the reasons for its apparent inability to survive in disturbed areas.
9. Conduct further research into the social and reproductive behaviour and physiology of the babirusa, with particular reference to group size and composition, and factors relating to age of puberty, reproductive cycles and litter size.
10. Investigate the species' natural diet and its digestive physiology, with a view to an understanding of its dietary requirements, the function of the gastric diverticulum and the animal's ability to digest cellulose and other fibrous material.

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