Status Survey and Conservation Action Plan

Pigs, Peccaries, and Hippos

Edited by William L. R. Oliver



IUCN/SSC Pigs and Peccaries Specialist Group
IUCN/SSC Hippo Specialist Group

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The World Conservation Union

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Species Survival Commission

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tive animals are of unknown or mixed origin. Very few collections have made any attempt to ascertain, let alone ensure, the genetic integrity of recognized subspecies and regional populations. This is hardly surprising given the present confused state of the species' subspecific taxonomy, and the highly restrictive regulations appertaining to the movement of these animals across international borders; but every attempt should be made to rationalize existing interests and resources devoted to the captive management of these animals, which serve little useful conservation purpose at the present time.

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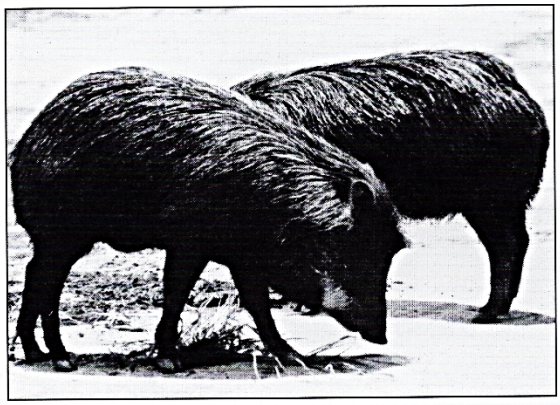
2.3 The White-lipped Peccary (*Tayassu pecari*)

Ignacio J. March

Status and Action Plan Summary

Status categories 2-4 and "indeterminate", depending on subspecies/population.

The white-lipped peccary is not considered seriously threatened over much of its extensive range. However, the available data suggest that most of the remaining populations of two subspecies, *T. p. ringens* and *T. p. spiradens,* of southern Mexico and Central America are threatened to varying degrees, while the former population of *T. p. ringens* in El Salvador is already extinct. Recent data is lacking on the current distribution and status of *T. p. equa-*



William Oliver

White-lipped peccaries, *Tayassu p. pecari.*

torius, which has much the smallest range of the five currently recognized forms; it is apparently confined to the remaining lower altitude forests west of the Cordillera Real in southwestern Colombia and northwestern Ecuador. Recent information is lacking on the distribution and status of white-lipped peccaries in many other continental South American countries, the main stronghold for this species. However, some reports indicate significant, recent population declines in parts of the Amazon Basin and in the dry Chaco of southeastern Bolivia, western Paraguay, and northwestern Argentina. Peccary populations in these areas may now be discontinuously distributed even in virgin forest. The species is also reported to have become extinct in Uruguay about 100 years ago, though it is probably not seriously threatened throughout much of its range elsewhere in central and northern South America at the present time.

The destruction and fragmentation of habitat is undoubtedly the most important threat to this species, though overexploitation by subsistence and commercial hunters has also contributed to its decline in many areas. Priority actions for the white-lipped peccary include: (a) assessments of its current distribution and status in each country, with a view to the development of management plans for the most threatened populations and subspecies and the strengthening of those protected areas which maintain important habitat and populations; (b) promotion of field studies on its habitat requirements, its ranging behavior and its role as a seed predator/dispersal agent; (c) development of projects to encourage self-regulation by subsistence hunters and to control or curtail large scale commercial hunting and trade; (d) development of training courses and workshops on research and management of peccaries; and (e) a thorough review of its generic and subspecific taxonomy at the genetic, as well as the phenotypic, levels.

Introduction

The white-lipped peccary has played an important role in the economic and cultural development of many indigenous peoples in the neotropics and still constitutes an important resource for various tribal and rural groups, both as a source of food and income (Olsen 1982; Donkin 1985). Ecologically it is also important since it is the only large, terrestrial mammal in the neotropics to form large herds, often of more than 100 individuals. In addition, it has a large range which includes or extends into 19 Latin American countries.

Little work has been done on the genetics and geographical variation of *T. pecari,* and a thorough review of its systematics is required to enable a proper re-assessment of its generic and subspecific taxonomy (see Grubb and Groves, this vol.). Five subspecies are recognized at present, but the validity of some of these are in question.

Former and Present Distribution

White-lipped peccaries are confined to the Neotropical Region, from southeastern Mexico in the north, through Central America and northern and central South America, as far south as Entre Rios in northern Argentina and Rio Grande do Sul in southern Brazil (Sowls, 1986). Over this range it inhabits lowland forests at sea level to lower montane forests at maximum recorded altitude of 1900 m on the eastern slopes of the Andes in Peru (Osgood 1914). The species has also been reported at altitudes of 1500 m in Venezuela (Röhl 1959), Panamá (Anthony 1916), and in Atitlan, Guatemala (Alston 1879), although there have been no recent, verified records at altitudes of <800 m.

Its distribution is somewhat more restricted than that of the more adaptable collared peccary, *T. tajacu*, with which it is almost everywhere sympatric, but it has a much larger range than the Chacoan peccary, *Catagonus wagneri*, with which it is also sympatric over the latter species' restricted distribution in the Gran Chaco.

Recent data on the distribution and status of *T. pecari* is lacking or inadequate for many of the 19 countries in which the species has been recorded. Nonetheless, it is clear that its former range has been severely reduced and fragmented during recent decades. Available data on its present range in each country/region, and the status of the five currently recognized subspecies may be summarized as follows:

1. *T. p. ringens:* southern Mexico (Oaxaca, Chiapas, and Yucatan Peninsula), Guatemala, Belize, El Salvador (extinct), Honduras, and northern Nicaragua.

   In Mexico this subspecies has probably been extirpated from the more northerly states of Veracruz and

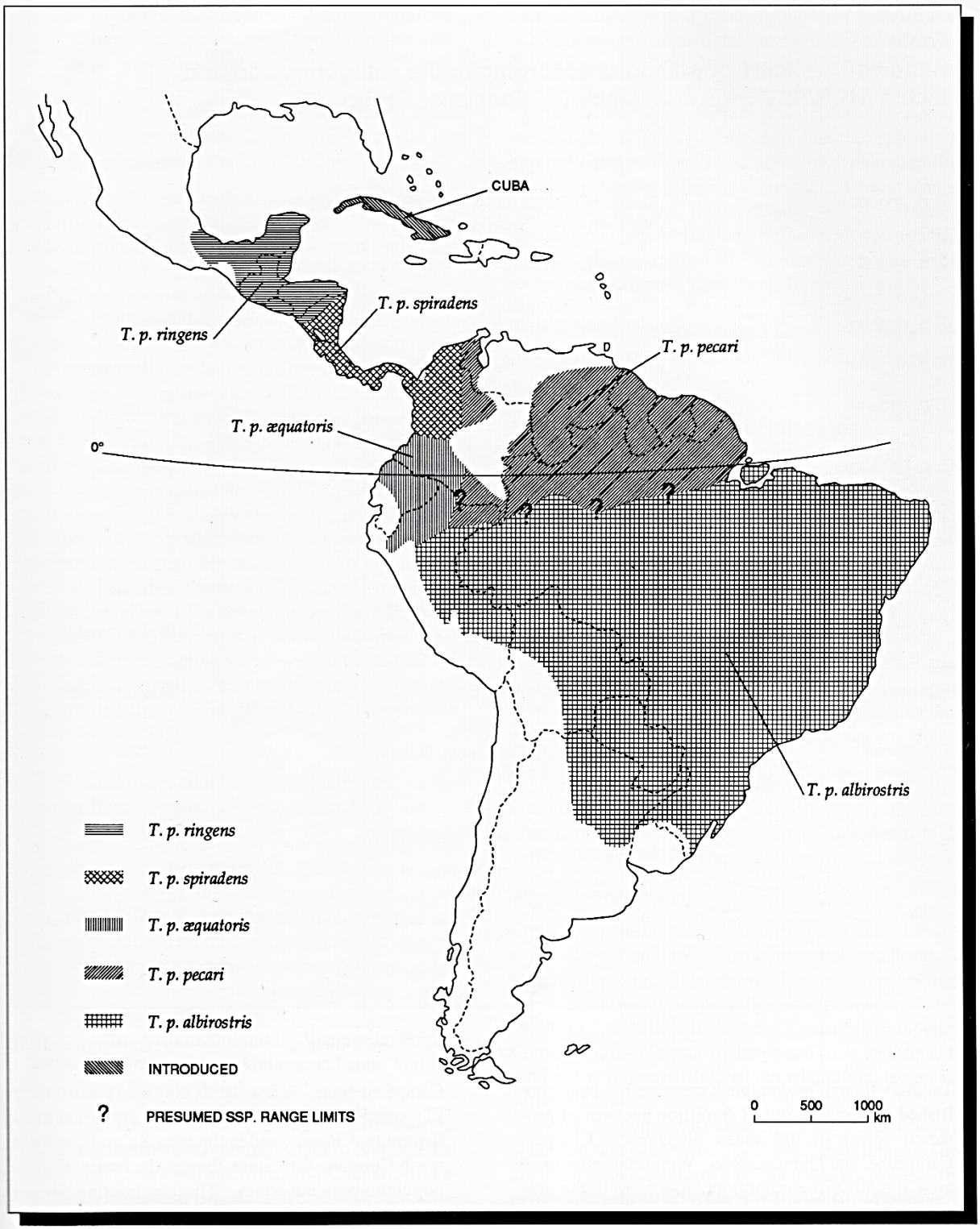


Figure 2. Approximate limits of known range of the white-lipped peccary (*Tayassu pecari* ssp.). Modified after Mayer and Wetzel 1987.

Table 3
Status of *T. pecari* populations according to the categories adopted by the IUCN/SSC Pigs and Peccaries Specialist Group

Subspecies	Country (Region)	Status Category
T. p. ringens	Mexico (El Ocote Reserve, north of Quintana Roo, and Sian Ka'an Reserve)	5
T. p. ringens	Mexico (Lacandona Rainforest,Chiapas; Oaxaca and Campeche)	3 - 4
T. p. ringens	Guatemala (Peten)	2 - 3
T. p. ringens	Belize, Honduras, Nicaragua (north)	Indeterminate
T. p. ringens	El Salvador	Extinct
T. p. spiradens	Nicaragua	Indeterminate
T. p. spiradens	Costa Rica (north)	5
T. p. spiradens	Costa Rica (south)	4
T. p. spiradens	Panama	Indeterminate
T. p. spiradens	Colombia (northwest)	Indeterminate
T. p. equatorius	Colombia (southwest), Ecuador (northwest)	Indeterminate
T. p. pecari	Colombia (east), Venezuela, Guiana, Surinam, Brazil (north)	1 - 2?
T. p. albirostris	Brazil, Peru (east), Bolivia, Paraguay, Argentina (north)	1 - 2?
	Uruguay (north only?)	Extinct

?=Insufficient information

Tabasco, though its continued presence has been confirmed in a total of over 1.5 million hectares of protected forest in the states of Oaxaca, Chiapas, Campeche, and Quintana Roo. Within this combined area, the most important populations are in the proposed biosphere reserve of Los Chimalapas (>4,000 sq. km) in Oaxaca, the Lacandona Rainforest in Chiapas (which includes the Montes Azules Biosphere Reserve (>3,000 sq. km), and in the recently established Calakmul Biosphere Reserve (>7,000 sq. km) in Campeche State. A few herds may also persist in the El Ocote Reserve (350 sq. km) and in the region of La Sepultura, Chiapas, and in the Sian Ka'an Reserve in north Quintana Roo State, though the future of these populations is uncertain. The neighboring Mayan Reserve in the Department of El Peten in Guatemala is perhaps the single most important area for this subspecies at the present time. It is also thought to occur in one or more reserves elsewhere in Guatamala, and in some reserves in Belize, Honduras and northern

Nicaragua, but recent data from these areas are lacking. White-lipped peccaries, formerly of this subspecies, are now extinct in El Salvador.

2. *T. p. spiradens:* southern Nicaragua, Costa Rica, Panama, and northwestern Colombia (areas west of the Cordillera Central and Cordillera Oriental).

   Both *T. p. ringens* (north only) and *T. p. spiradens* occur in Nicaragua where a total area of 1451 sq. km of largely undisturbed rainforest are currently protected (FAO/PNUMA 1989). Nicaragua is therefore a potentially important stronghold for this species in Central America, although their present status and the consequences of this country's years of strife and guerilla warfare on their populations are not known. In Costa Rica, the subspecies has been recorded in the Corcovado National Park (437.4 sq. km; pers. obs.) in the Osa Peninsula, the Orosí Reserve Forest (101.5 sq. km), the Caño Negro Wildlife Refuge (99.7 sq. km) and the Tortuguero National Park (189.5 sq. km) (A. Carr, pers. comm.). It probably also occurs in La Amistad Biosphere Reserve which extends across the southern border into Panama. However, its status in the latter area, and in other reserves in Panama is unknown, though the subspecies is now extinct on Barro Colorado Island. *T. p. spiradens* was formerly known from northwestern Colombia (areas west of the Cordillera Central and Cordillera Oriental); information on the present distribution and status of this subspecies in Colombia is lacking.

3. *T. p. equatorius:* southwestern Colombia and northwestern Ecuador (west of the Cordillera Real) only.

   This subspecies is reported to occur only in the southwest corner of Colombia, in Cauca and Narino Provinces, and in the neighboring provinces of Esmareldas, Manabi and Pinchicha in northwestern Equador. It therefore has by far the smallest range of any of the currently recognized forms of *T. pecari*, but its present status in these areas is not known.

4/5. *T. p. pecari*: eastern Colombia, Venezuela, British Guiana, Suriname, French Guiana, and areas north of the Amazon River in Brazil.

   T. p. albirostris: eastern Peru, eastern Bolivia, Paraguay, northern Argentina (south to Santiago del Estero and Entre Rios) and (formerly) Uruguay, to central and southeastern Brazil.

The Amazon Basin remains by far the most important stronghold for these subspecies. The increasing destruction and fragmentation of this region are the focus of international attention and concern not least because only 4.28% of this region have been declared as protected areas. Nonetheless, large populations of this species still exist in this region, and it occurs in most of the larger and many of the smaller parks and reserves on both sides of the Amazon River. The latter also represents the approximate southern and northern limits of the respective distributions of these two subspecies, neither of which can be regarded as seriously threatened over all of their extensive ranges at present (although the southern subspecies, *T. p. albirostris*, is extinct in Uruguay where it was last recorded in 1890 (C. Gastelmundi, pers. comm. to W. Oliver)).

The approximate distribution and current status of the five subspecies are summarized in Fig. 2 and Table 3.

Habitat, Ecology, and Behavior

There have been relatively few studies conducted on this species, and many aspects of its behavior, ecology, habitat requirements, population biology and status remain poorly known. However, Sowls (1984) has provided a useful summary of most of the available information, much of which originates from the studies of Kiltie (1980, 1981 a, b, c, 1982) and Kiltie and Terborgh (1983) on the ecology of the species in the rainforests of the Peruvian Amazon. Barreto and Hernández (1988) have also undertaken a study of its feeding habits and behavior in tropical rainforest in Venezuela, and an evaluation of the species' status and habitat in southern Mexico was conducted recently (March 1990).

The majority of habitat records for the species are from humid tropical forests, though it also occurs in various drier habitats including dry savannas in Venezuela, the xerophitic areas of the Chaco and the tropical dry forest of Costa Rica (Wetzel and Lovett 1974; Mayer and Brandt 1982; Vaughan 1983; Sowls 1984; D. Janzen and S. Cornelius, pers. comm.). According to Sowls (1984) *T. pecari* is restricted to a narrower climatic range than *T. tajacu*. The optimal habitat for *T. pecari* appears to be lowland rainforests, especially in well conserved areas (>300 sq. km) where it reaches its greatest abundancy. Conversely, its tolerance to deforested areas appears to be minimal as it is easily hunted out where it no longer has sufficient cover.

White-lipped peccaries usually frequent areas close to water and will even visit coastal beaches to forage. They are omnivorous, but have a strong tendency towards frugivory (Husson 1978; Kiltie 1981b, 1981c). Their diet is comprised mostly of fruits, seeds and roots, but they will also take invertebrates, small vertebrates, fungi and carrion. More than 40 plant species have been recorded in their diet (March 1991) and the species may play an impor-

tant role in the ecology of neotropical forests as a major disperser and predator of seeds—this role being reminiscent of, and perhaps analogous to, that of bearded pigs, *Sus barbatus,* in the tropical forests of Southeast Asia (Caldecott *et al.* this vol.). Its tendency to form large herds may also have important consequences on the composition of ground plant communities and the drainage of surface water merely as a result of their intense rooting activity and the compaction of soil caused by the passage of large herds.

White-lipped peccary herds often exceed 100 individuals, though groups of as few as 5 to more than 200 individuals have also been observed (Mayer and Brandt 1982; March pers. obs.). It is possible that in certain seasons, large herds divide into smaller groups according to the distribution and abundance of food, though the more frequent reporting of smaller groups in some areas is probably correlated with increased hunting pressure.

The adaptive significance of forming large herds in this species is not clearly understood, though Kiltie and Terborgh (1983) have suggested it is primarily a predator defence strategy. In any event, the formation of these large herds also predetermines the need to preserve relatively extensive and continuous tracts of habitat, particularly as the movements of these herds are likely to be strongly influenced by the pattern of food dispersion (Sowls 1984). Kiltie and Terborgh (1983) estimated that in the Amazon region of Peru, these herds travelled up to 10 km per day, were able to cross wide rivers without difficulty, and had a home range of 60 to 200 sq. km. From calculations based on hunting data in this region, Bodmer *et al.* (1988) obtained a local density for the species of 1.3 individuals per sq. km, representing a biomass of 43.2 kg/sq. km. In the Matto Grosso of Brazil, Schaller (1983) estimated a density of 1.6 animals per sq. km.

The social behavior of white-lipped peccaries is similar to that of *T. tajacu* in most respects, except for its tendency to form large herds. In common with *T. tajacu*, they have a rich repertoire of vocalizations which have a role in agonistic and reproductive behavior, and also possibly in the cohesion of herds in dense vegetation. They use smell to communicate and engage in reciprocal rubbing of the dorsal scent gland, as does the collared peccary. Unlike the latter species, white-lipped peccaries have not been observed marking their territories with their scent glands, at least in captivity.

Captive animals reach sexual maturity between one and two years of age. Although distinct reproductive seasons have been suggested, it is probable that these peccaries breed throughout the year, with a peak in the most favorable months. In Peru, Kiltie and Terborgh (1976) observed mating during July and August, while in Chiapas, Mexico, mating has been recorded from April to November (March and Cuarón 1987). Roots (1966) recorded a gestation period of 156 to 162 days in captive animals. As in the collared peccary (Byers and Beckoff 1981), the modal litter size is two, and it is probable that the dominant males are responsible for most litters.

Threats to Survival

Widespread and increasing deforestation and intense hunting pressure are the main reasons for the increasing diminution and extinction of many populations of this species. In most Latin American countries, the progressive destruction of habitat for agriculture and cattle ranching as well as timber extraction, has already accounted for much of the species' former habitat. It has been calculated that by the end of this century, Latin American forests will be reduced to roughly 366 million hectares, approximately half of the estimated original forest cover of 693 million hectares (Wolf 1987). Owing to their habit of forming large herds, white-lipped peccaries require relatively extensive and continuous areas of habitat in order to obtain sufficient resources throughout the year. The loss and fragmentation of their habitat also exposes them to increased hunting pressure by facilitating their location by hunters who can kill many individuals in a large herd during a single encounter.

White-lipped peccaries are exploited by sport, subsistence and commercial hunters, and they are killed for their hides as well as for meat. They have been identified as the single most important source of meat for the Mundurucú tribe in Brazil (Murphy 1960), the Guayakí in Paraguay (Cadogan 1973) and the Mayan Lacandones of Chiapas (March 1987), as well as for many other indigenous groups who hunt them for purely subsistence purposes (Hames 1980). In many countries (e.g. Mexico and Guatamala) subsistence hunters operate in most reserves and national parks, and there is no doubt that hunting pressure is increasing over the species' range as a whole as a result of the continuing immigration of people to forested areas. The species has also been affected by militarization and war in several Central and South American countries, where army personnel and guerilla groups are often heavily dependent on wild game and can kill large numbers of peccaries, often with automatic weapons.

Despite the lack of knowledge about the species, several countries permit sport hunting of white-lipped peccaries. In Mexico, for example, sport hunting was permitted until at least 1990 in Campeche State; in Costa Rica it was possible to get a permit for up to 5 animals per season until 1986. In Argentina and Paraguay, sport hunting is quite commonplace, and is controlled to only a very limited extent (A. Taber, pers. comm.). However, sport hunting

is of relatively minor significance in comparison to the large scale commercial exploitation of the species for meat and, especially, for hides (see Bodmer et al. this vol.).

Conservation Measures Taken

This species occurs in numerous protected areas throughout its extensive range, though it is far from certain that the existing network of protected areas is adequate to ensure the survival of representative populations of all currently recognized subspecies or of sufficient size to maintain viable populations of these animals in many of the smaller nation states, especially in Central America. It is also doubtful if many of these reserves are large enough to allow the formation of large herds of this species.

Concerns about the large number of peccary hides of both species of *Tayassu* in international trade (Broad 1984) led to their recent (1986) inclusion on Appendix II of CITES (Bodmer *et al.* 1988 and this vol.). This measure is of considerable significance for future regulation and control of this trade, which is potentially more damaging to *T. pecari* than to *T. tajacu* in terms of the species' susceptibility to commercial hunting pressures.

Captive Breeding

White-lipped peccaries are widely maintained in captivity in their countries of origin, but very rarely elsewhere, mainly because of the stringent veterinary restrictions placed on the movement of live animals into countries with a significant domestic pork industry. The species has been bred infrequently in captivity (Roots 1966; McDonald and Lasley 1978; Frädrich 1986), and little attempt has been made to develop cooperative breeding programs for this species in zoos in their countries of origin where replacement stock may be obtained relatively easily.

The most notable exceptions to this are the captive breeding of *T. p. albirostris* at the School of Agriculture, University of São Paulo in Piracicaba City (Brazil), the Santa Cruz Zoo (Bolivia), and the West Berlin Zoo (Germany), and the pioneering program for the locally threatened subspecies, *T. p. ringens* in the Regional Zoo of Chiapas (Mexico). The São Paulo University project was started in 1986 and currently (August 1991) comprises 34 individuals, all of which (including the founder stock) are captive-bred (S. Nogueira-Filho, pers. comm. to W. Oliver). The West Berlin stock, which comprised 18 animals in February 1991, is derived from 5 wild-caught (in Paraguay) founders, obtained at intervals between 1979 and 1985 (H. Frädrich, pers. comm.). By comparison, the breeding program for *T. p. ringens* in Chiapas was started in 1985 with 5 wild-caught pairs and comprised a total stock of 26 individuals by the end of January 1991.



Ignacio March

Part of a herd of white-lipped peccaries, *T. p. ringens*, at the Tuxtla Regional Zoo, Chiapas, Mexico.

On at least two occasions, captive *T. pecari* and *T. tajacu* have produced F1 hybrids which were reared to maturity (Zuckerman 1953; Sowls 1984), though it is not known whether these hybrids were fertile.

Additional Remarks

Given that this species is a relatively large-bodied mammal of some ecological importance (as a major seed predator/dispersal agent), as well as being of considerable socio-economic importance to local people, it is a potentially ideal "flagship" species for tropical forest conservation projects. It is also of significance that it is the only large terrestrial mammal to form large herds in neotropical forests and that it inhabits a broad spectrum of forest types: this predetermines the need to conserve substantial tracts of forest with all that implies in terms of the maintenance of representative diversity in these areas. Thus, the development of conservation plans targeted on this species should not only help to ensure the enhanced future management of an important local resource, but also help to ensure the survival of diverse other, more immediately threatened species.

Conservation Measures Proposed: An Action Plan

Although this species is not yet seriously threatened throughout it extensive range, there is concern about its continuing decline in some regions. However, the rate,

severity and magnitude of this decline, or the actions needed to reverse this trend, are not always apparent owing to the paucity of accurate information in most countries on its present status and future management needs. Any actions intended to clarify this situation must therefore assume a high priority. By the same token, there are many aspects of its biology which are poorly known at present, but which are highly relevant to its future conservation, as well as the wider issues surrounding these animals; the latter includes subsistence and commercial hunting, and national and international trade, which are discussed in more detail elsewhere (see later text, sections 2.5 and 2.6).

Objectives

1. To promote the effective conservation of representative populations/subspecies of these animals and their habitats in each country/region/biome, with particular reference to the currently most threatened populations and subspecies.

2. To obtain more basic and applied information on the species with a view to the development of practical management strategies on a sound conservation basis.

3. To initiate and improve routine monitoring of peccary population status, trends and levels of human utilization for subsistence and trade purposes.

4. To enable the rational and sustainable utilization of peccary by subsistence hunters wherever appropriate (i.e. where this is not in conflict with ultimate survival prospects of that population).

Priority Projects

1. Assess and monitor the status and habitats of the most threatened populations (e.g. in Mexico, Costa Rica, and Panama).

2. Elaborate, supplement and disseminate existing data on the distribution, status and habitat of the species throughout its range.

   Literature and questionnaire surveys need to be conducted to assess the current distribution, status and priority management needs of this species on a country-by-country basis, in order to promote field surveys in selected areas and to develop management recommendations relating to particular populations, protected areas or other conservation issues.

3. Strengthen existing protected areas which maintain important populations and habitats of this species.

   This must include the enforcing of protective legislation, improving the infrastructure of these areas, and promoting the training of personnel and wildlife managers (see below). Particular problems which need to be addressed include regulation or prevention of subsistence hunting within designated protected areas, and coordination between neighboring nations for better protection of this species. For example, subsistence hunting still occurs in most parks and reserves in Mexico and Guatamala, including the recently gazetted Mayan Reserve (c. >8,000 sq. km) in the Department of El Peten in Guatemala (perhaps the single most important protected area for the threatened subspecies, *T. p. ringens*).

4. Continue existing studies, and promote further comparative studies of the population dynamics, home range and ecology of selected populations/herds.

   Priority should be given to the promotion of applied research on this and other peccary species in Latin American universities, and in research and breeding centers; this would also facilitate the generation of information relevant to local/national needs and issues.

5. Develop studies and projects focused on the regulation (rather than prohibition) of subsistence hunting.

   White-lipped peccaries are an important socio-economic resource for many ethnic groups and rural settlers and the desired regulation of this activity requires the active participation of those people; in some situations it could be integrated with forestry management plans. A model program has already been implemented in Peru (Bodmer 1988b), which is intended to ensure its optimal utilization through the active monitoring and management of peccary populations and the establishment of hunting quotas.

6. Implement and enforce measures aimed at reducing or eliminating large scale commercial hunting for trade (see recommendations in sections 2.5 and 2.6).

7. Develop conservation-education programs in rural areas, and training courses and workshops for wildlife managers and reserve staff.

   Education programs are important in rural areas to disseminate information on conservation of peccaries (their ecological and socio-economic importance, existing utilization levels, legal and conservation status and future management needs, etc.), and other wildlife species. These programs should be specifically targeted at subsistence hunters and reserve staff, as well as the wider rural communities.

8. Research on captive breeding and reintroduction.

   The lack of sufficient data on the biology of *T. pecari*

greatly hinders the development of projects for its management, conservation and sustained use. Research in captive animals could provide much valuable information on the life-history, reproduction, and other aspects of the biology of these animals. This research should also address the possibility of reintroducing or translocating animals as a means of restoring populations of this species where necessary.

9. Conduct a thorough review of the generic and subspecific taxonomy of this species, assess its regional variation and enhance protection of any threatened forms.

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2.4 The Chacoan Peccary (*Catagonus wagneri*)

Andrew B. Taber

Status and Action Plan Summary

Status category 5 (Endangered).

Although still widely distributed through its limited geographical range, the Chacoan peccary is now seriously threatened. Its numbers are declining and populations are becoming increasingly fragmented. Destruction of its habitat is accelerating, and hunting for human consumption continues uncontrolled. The evident scarcity of Chacoan peccaries in the few national parks within its range is particularly worrying. Under existing conditions there is little hope for recovery and the trend is downwards. The total population size is unknown, but probably several thousand persist in the dry Chaco of Argentina and Bolivia and an estimated 5,000 individuals survive in Paraguay.

Priority conservation actions recommended for this species are: (1) investigate the feasibility of establishing a new national park where a substantial peccary population still exists; (2) establish private reserves on land where significant numbers of peccaries survive; (3) enforce regulations against hunting both inside and outside national parks and reserves; (4) establish and enhance existing environmental education programs to increase local awareness of conservation problems and the value of native wildlife, using the Chacoan peccary as a flagship species; (5) strengthen wildlife services in Argentina, Bolivia and Paraguay so that populations can be monitored and hunting controlled; (6) continue efforts to breed Chacoan peccaries in captivity; (7) investigate the feasibility of translocating wild caught animals from areas being deforested, to the parks; and (8) continue research on the status of wild populations, aspects of the ecology and behavior of the species relevant to its conservation, and human hunting patterns in the Chaco, so that effective management recommendations can be made.

Introduction

The existence of the Chacoan peccary or *"tagua"* was first reported in 1975 making it one of the most recently discovered large mammals (Wetzel et al. 1975). The species is endemic to the dry Chaco of western Paraguay, southeastern Bolivia and northern Argentina; it is one of the hottest and driest regions of South America. The Gran Chaco, of which the dry Chaco forms a part, is an enor-