8 White-lipped Peccaries and Palms on the Ilha de Maracá

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SUMMARY

Studies were made of the population, behaviour and feeding ecology of white-lipped peccaries (*Tayassu pecari*) at the eastern end of the Ilha de Maracá, and of their interactions with palms. Groups of up to 48 individuals were observed, and densities of up to 542 individuals per km^2 were estimated in the rainy season. Populations in the area fell substantially during the dry season. Greatest densities coincided with the masting of the *inajá* palm (*Maximiliana maripa*) and the period of greatest fruit abundance in the forest. During the dry season the *buriti* palm (*Mauritia flexuosa*), which fruits throughout the year, appears to act as the key resource influencing peccary movements. The possibility that the range of these animals increases during the dry season, that the distribution of certain palm species is influenced by peccary activity, and that in turn the large-scale migrations of peccaries are influenced or determined by palm phenology, is discussed.

RESUMO

Foram realizados estudos de população, comportamento e ecologia alimentar de queixadas (*Tayassu pecari*) na parte oriental da Ilha de Maracá, e de suas interações com palmeiras. Grupos de até 48 indivíduos foram observados, tendo-se estimado densidades alcançando 542 indivíduos por km^2 durante a estação chuvosa. As populações na área diminuiram nitidamente na estação seca. Densidades maiores corresponderam com a frutificação da palmeira 'inajá' (*Maximiliana maripa*), e com o período de maior abundância de frutos na floresta. Durante a estação seca, a palmeira buriti (*Mauritia flexuosa*), que frutifica durante o ano todo, parece funcionar como um dos principais recursos influenciando distribuição/movimentação de queixadas. São discutidas as possibilidades de que a área de forragear destes animais aumenta durante a estação seca, que a distribuição de certas espécies de palmeiras é influenciada pela atividade de queixadas, e que as migrações de grande escala deles são, por sua vez, influenciadas ou determinadas pela fenologia das palmeiras.

INTRODUCTION

White-lipped peccaries (*Tayassu pecari*) have an unusual socio-ecology for a tropical forest mammal: individuals form herds with hundreds and possibly thousands of members, and a herd may range over hundreds and perhaps thousands of square

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kilometres (Mayer and Brandt, 1982; Kiltie and Terborgh, 1983; Sowls, 1984; Mayer and Wetzel, 1987). This is rare behaviour for a mammal that inhabits tropical forests (Jarman, 1974; Leuthold, 1977), and probably results in peccaries having unique ecological interactions with plants (Janzen, 1974; Smythe, 1989).

Here, I report some preliminary results from a two-year study of white-lipped peccaries and palms on the Ilha de Maracá. I examine peccary population densities, seasonal movements, feeding and behaviour, consider their ecological relationships with *inajá* (*Maximiliana maripa* (Correa) Drude) and *buriti* (*Mauritia flexuosa* L.f.) palms, and speculate on their interactions with tropical plant communities.

White-lipped peccaries are one of the three species of peccaries (Tayassuidae). They range throughout the wet and dry tropical forests from southern Mexico to northern Argentina (Sowls, 1984; Mayer and Wetzel, 1987; Eisenberg, 1989). Although of economic and ecological importance, we know little of their ecology (see Kiltie, 1980, 1981a, 1981b, 1981c, 1982; Kiltie and Terborgh, 1983; Sowls, 1984). Most of what is known is speculative, inferential or anecdotal in nature: they probably require large areas of undisturbed habitats; they may be migratory; their food resources are probably patchy and widely distributed; their migrations may be related to a fruiting cycle across huge landscapes; and they may require a certain minimal herd size to reproduce successfully (Sowls, 1984; Smythe, 1986, 1987; Mayer and Wetzel, 1987; Bodmer, 1989). The only other large mammal with a similar socio-ecology is the bearded pig (*Sus barbatus*) of Borneo (Caldecott, 1988).

The white-lipped peccary is a key consumer of the fruits and seeds of tropical forest trees (Kiltie and Terborgh, 1983; Bodmer, 1989). They eat both freshly fallen fruits and seeds, and seeds whose exocarps have been consumed by other frugivores (Kiltie and Terborgh, 1983). They co-occur with collared peccaries (*Tayassu tajacu*) over most of their range. However, they are generally bigger (25–40 kg) than the collared peccary (15–25 kg) (Eisenberg, 1981; Robinson and Redford, 1986). There is much overlap in the diet of the two species, but only the white-lipped peccary can break open the seed wall of very hard palm nuts (Kiltie, 1981c, 1982; Bodmer, 1989). Rodents are also capable of gnawing open some of these hard palm seeds (Hallwachs, 1986; Janzen, 1986; Smythe, 1989).

At least 16 species of palms occur on the Ilha de Maracá (Milliken and Ratter, 1989), covering approximately 17% of the area around the Ecological Station (Moskovits, 1985). Palm forests (mostly *Maximiliana maripa*) are common on the high ridges of Maracá, and stands of *buriti* (*Mauritia flexuosa*) are found in poorly drained areas. Although palm seeds and fruit pulp are an important food for many animals and for man, the ecology of most Amazonian palm species is poorly known (Moore, 1977; Kahn and Castro, 1985).

METHODS

STUDY SITE

The study site consisted of a trail system (Figure 23.2, p. 436) located in the forest at the eastern end of Maracá, originally established by Moskovits (Chapter 13) for her studies of *Geochelone* tortoises. The dominant vegetation of the region is tropical evergreen lowland rainforest (Moskovits, 1985; Milliken and Ratter, 1989). The forest is contiguous with the main body of Amazonian rainforest, and supports populations of animals typical of areas undisturbed by Europeans or their descendants (Moskovits, 1985). Hunting in the reserve is illegal. However, unlawful hunting does occur in outlying regions, although hunters avoid the area around the Ecological Station.

STUDY PERIOD

Data from a wet season (12 June to 3 July 1988), and a dry season (23 December 1990 to 30 April 1991), are compared. The former period represents a preliminary survey and the latter the beginning of a two-year study of white-lipped peccary ecology and the animals' interactions with the palm community on Maracá.

PECCARY POPULATION DENSITIES

Peccary densities were estimated using a line transect census method (Davis and Winstead, 1980). Transect lines followed pre-existing trails extending for approximately 50 km in a grid pattern. One line transect usually included a few adjoining trails. However, none were walked more than once during a transect. Upon encountering peccaries I recorded the following: estimated distance to herd, azimuth from the transect line, number, sex and behaviour of adults and juveniles, time and location, total time and total distance (km) walked. In some instances azimuths were unrecorded. Thus I present densities derived using two census methods: King's method which considers only the distance of the animal from the observer; and the Webb method which also requires the azimuth of the animal's location relative to the transect line (Davis and Winstead, 1980). The Webb method is more appropriate if animals are detected before they are flushed. Some researchers (e.g. Ayres, 1986) have shown that the Webb method estimates actual animal populations more accurately than King's method. Generally two people walked the transect lines, but occasionally only one. The assistance of a local guide, and our familiarity with the trail system, helped us to avoid counting groups more than once. Transects were walked between 0700 hrs and sunset (approximately 1800 hrs). Some of the statistical analyses included data collected outside the line transects and information provided by IBAMA employees on the island.

HUNTING SURVEYS

To determine the importance of peccaries to the diet of local people, I interviewed the heads of three of 13 households in a Macuxi Indian village near Maracá in the wet season, and chiefs of two other villages and managers of eight ranches in the dry season.

PALM PHENOLOGY AND ECOLOGY

To ascertain the phenology of *inajá* and *buriti*, we surveyed 50 trees of each species during the 1991 study period: 10 trees were randomly selected from each of five 250 × 10 m transects. The transects were randomly chosen from 34 *inajá* and 18 *buriti* patches (*buritizais*), which were identified within the study region by searching trails and a satellite image of the vegetation of Maracá. I noted fruit availability on the ground in the transects, and incidentally while conducting peccary surveys. I obtained additional information on palm phenology and fruit availability from employees of the Ecological Station, a biological technician who had studied fruit-eating by spider monkeys (*Ateles belzebuth*) on Maracá for two years, and data presented by Moskovits (1985) and Milliken and Ratter (1989). To learn what fruits and fruit parts were eaten by peccaries I watched them feed, noted foraging signs, and recorded fruit and seed abundance on the ground before and after peccaries passed through palm patches.

RESULTS

I searched for peccaries for 108 hours (17 days) in the wet season, and 308 hours (48 days) in the dry season. Thirty-six groups (603 individuals) were encountered during the wet season, and peccaries were seen on 16 of 17 search days. Seventeen of the 34 wet season groups for which there are age data contained juveniles. They formed 7% of the total peccary population (Table 8.1). Only two peccary groups (42 individuals) were seen in the dry season, and neither contained juveniles. It seems that peccaries may have migrated away from the eastern part of the island in the dry season. Local people and employees of the Ecological Station reported that peccaries leave in the dry season and return at the beginning of the wet season (May to June). I analysed only the wet season density data in detail, since few herds were seen in the dry season of 1991.

In the wet season 21 peccary groups (378 individuals) were encountered on the 121.71 km of transects for which there are azimuth data. I also walked 13.95 km for which there are no azimuth data, from which four peccary groups were observed. The density of peccaries in southeastern Maracá island derived by the Webb method is greater than that obtained using King's method (Table 8.2).

BEHAVIOUR

Twenty-four of the 34 peccary groups observed in the wet season were foraging, six were travelling, two were rolling in clay or sand, and two consisted of females suckling young. Of the two groups seen in the dry season, one was foraging in a *buritizal* (*Mauritia* palm stand) and the other travelling through riverine forest. The spatial arrangement of foraging peccaries differed greatly from that of travelling individuals. Those in the former groups were spatially distant from and frequently beyond each other's view, but they generally moved in the same direction. In

Table 8.1. Population data for 36 white-lipped peccary groups encountered in the wet season (1988) in southeastern Maracá, Brazil

Peccaries	Total no.	Mean no. per group	s.d.
Adults	558	17.0	14.8
Juveniles	45	3.5	2.1
Total	603	18.5	15.6

Table 8.2. The density of white-lipped peccaries on southeastern Maracá, estimated using two methods

Method	Groups per km^2	Peccaries per km^2	Mean no. per group
King's method	7.0	138.8	19.9
Webb method	30.1	542.3	18.0

contrast, members of travelling groups moved in a tightly cohesive unit, lined up in single file. The latter formation created distinctive trails which extended for long distances.

COMMUNICATION

White-lipped peccaries emit a variety of sounds. I briefly describe some of the more frequent noises recorded, their context, and possible function.

Teeth clacking

A very loud, sharp clacking sound made by snapping the teeth together. Peccaries often clacked when they became aware of my presence. The frequency of clacking was highest when the animals were startled, or when they approached us, and lowest when they foraged unaware of our presence. In the latter context clacking was directed by one peccary towards another. The target animal responded by squealing (similar to that made by a frightened domestic pig) and quickly moving away from the clacker. The context of clacking suggest that it functions as an aggressive warning.

Squealing

Described above. Young animals often squealed when startled, or chased by an adult. Adults squealed during confrontations in response to aggressive behaviour from other adults. The context suggested an appeasement or submissive function.

Barking

Similar to the low bark of a dog, this vocalization occurred most often during intragroup feeding interaction. A bark was sometimes directed by an adult towards a juvenile. The juvenile usually responded with a squeal. Adults also barked at one another. The context of the call suggested a mildly aggressive warning, since the receiving animal often ignored the bark.

Whoofing

This sound was the first emitted by a startled animal, before it began clacking. Whoofing sounds were also made during foraging periods. Group members responded to whoofing with a whoof. The whoof seems to serve a 'take notice' function and/or to locate other group members. Whoofing may help maintain group cohesion when the animals forage through thick understorey vegetation.

BIRTHING PERIOD

Two size-classes of juvenile peccaries were evident in the wet season. One consisted of small individuals approximately 30 cm in length. Individuals in the second size class were slightly larger (approximately 45 cm in length). In contrast, adults were approximately 90 cm in length. Local people reported that white-lipped peccaries give birth throughout the year. The two different juvenile size-classes encountered suggest that there are at least two breeding and birthing periods per year. My guide indicated that a female bears young only once a year.

GROUP SIZE

Peccary group counts ranged from 1 to 48 individuals, but there were always animals hidden by vegetation. The most frequently encountered group sizes were 4, 30 and 48 individuals. The data on group size are preliminary and rudimentary in nature. Reliable local people reported seeing groups of over 200 individuals. This estimate is similar to that recorded in the literature (Kiltie and Terborgh, 1983; Sowls, 1984). In this study, counts averaged 18.3 members.

PECCARY FORAGING AND SIGNS

In the wet season, foraging (n = 24) and non-foraging (n = 12) peccaries were seen only in *terra firme* forest. Peccaries furrowed (rooted) huge areas of soil when searching for food. These were fairly distinctive in appearance since the peccaries furrowed and turned over soil and leaf-litter. Rooted areas were most common below trees dropping fruit, around the base of *inajá* palms (fruiting and non-fruiting), near rotting logs, and in *buritizais*. This activity exposed the soil beneath the leaf-litter and eliminated established seedlings by accidentally uprooting them.

Of the two herds encountered in the dry season, one foraged in a *buritizal* and the other was travelling through riverine forest. During this season, peccary rooting was seen only in *buritizais*, and every *buritizal* (n = 18) had been rooted by January. From January to March 1991, I found fresh rooting three times in one *buritizal*, and twice in another. These observations suggest that peccaries selectively searched for *buritizais*. However, there are reports of peccaries feeding in other low, wet areas in the dry season (J. da Silva, pers. comm.). I visited one *buritizal* almost daily during the peak *buriti* mast, when many trees had 30–90 freshly fallen fruits below their crowns. Indirect evidence (tracks, teeth-marks on fruit, and faeces) and actual sightings indicated that tapirs (*Tapirus terrestris*), tortoises (*Geochelone carbonaria* and *G. denticulata*), agouti (*Dasyprocta agouti*), paca (*Agouti paca*), and brocket deer (*Mazama americana*) fed daily on the fruit pulp, but perhaps because of their low densities they consumed little of the amount available. However, when a peccary herd foraged in the *buritizal* they stayed for approximately four hours, and consumed the pulp from almost every fruit in their path. They did not appear to eat the seeds at this time.

PALMS

The phenologies and habitat distribution of *inajá* and *buriti* differed. *Inajá* occurred in dense patches (n = 5, mean density = 20.4/2500 m^2, s.d. = 7.9), and as solitaries, in *terra firme* areas and river levees. Large patches were common on gently sloping hillsides adjacent to *buritizais*. In January 1991, most trees were in the early stages of flowering. By March and April, 74% (37) of the 50 *inajá* trees surveyed were in flower, 10% (5) had green fruit, and 16% (8) were non-reproductive. *Inajá* trees and patches mast synchronously. Generally, fruit-drop peaks from June through August, and fruit-fall ends in September (G. de Oliveira, pers. comm.). However, in 1987, Latham (in Milliken and Ratter, 1989) noted ripe *inajá* fruit falling from August to October in eastern Maracá. Thus the timing of the *inajá* mast appears to vary slightly between years, but in general it occurs soon after the onset of the wet season.

I observed white-lipped peccaries consuming *inajá* seeds. They and perhaps collared peccaries are probably the only terrestrial vertebrates on Maracá capable of cracking *inajá*. The other ungulates cannot crack open hard seeds (Bodmer, 1989), the rodents gnaw them open (Smythe, 1986), while the local monkey species are probably incapable of cracking mature seeds (G. da Silva, pers. comm.).

Buriti occurred in dense patches (n = 5, mean density = 62.4/2500 m^2, s.d. = 40.2). These were restricted to seasonally inundated areas, but patches were common throughout the forest. The *buriti* mast peaked in January and February 1991. By late March and April 90% (45) of the 50 trees surveyed were non-reproductive, 4% (2) had ripe fruit, 2% (1) had green fruit, and 4% (2) were in flower. Moskovits (1985) reported that *buriti* drops ripe fruits throughout the year. My observations indicate a peak in fruit fall at the end of the dry season. According to Moskovits (1985), *buriti* flowers and fruits synchronously within a patch (*buritizal*), but asynchronously between patches. I observed synchronous flowering and fruiting between patches of *buriti*.

Peccaries ate the pulp off the *buriti* fruit but dropped the seeds undamaged. According to local hunters they consume only seeds that have germinated. As the herd moved through the *buritizal* the peccaries trod *buriti* seeds into the moist soil incidentally.

Table 8.3. Numbers of family members of hunters of peccaries around the Ilha de Maracá, and the number of white-lipped peccaries killed per hunt and per month

Hunter number	No. of family members	Peccaries killed/hunt	Peccaries killed/month
1	7	4	8
2	5	2	4
3	6	3	3
Total	18	9	15

HUMAN HUNTING OF PECCARIES

No peccaries were killed in the dry season of 1991. The three men interviewed in 1988 regularly hunted peccaries in the wet season, and two obtained most of their meat from this species. The hunters killed an average of three peccaries per hunt, and five per month (Table 8.3). They reported no sex bias in the killing of peccaries. Hunting frequency varied in relation to success. For example, one man hunted for four full days per week during unsuccessful periods, and only once per two weeks when successful. The other hunted for half a day approximately once per week. The men believed white-lipped peccaries were more common five years ago. Gold prospectors also hunted peccaries extensively, with a former prospector reporting kills of over 50 peccaries during single hunts.

DISCUSSION

WHITE-LIPPED PECCARIES AND PALMS

In 1988, eastern Maracá had the highest densities of peccaries ever recorded (see Kiltie and Terborgh, 1983; Sowls, 1984). These densities, observed during the wet season, correlated with the masting of *inajá* and the time of greatest fruit abundance on eastern Maracá (Moskovits, 1985; A. Nunes, pers. comm.). I caution that the data on peccary densities were derived from a local area over a short time period and may not represent overall densities. Since I was limited to a few pre-existing trails, it is likely that I counted some herds more than once during the course of the study. Davis and Winstead (1980) discuss this and other problems associated with the line transect method of estimating animal densities.

The predictability of the *inajá* mast may influence the direction and timing of peccary movements, since it provides a relatively reliable cue to the location of superabundant food. In the dry season *buriti* appeared to replace *inajá* as the key resource influencing peccary movements. Many palm species mast abundantly on a yearly basis, but non-palm tree species (dicotyledons) often fluctuate yearly in their production of fruit, sometimes skipping a year or more (Leigh *et al.*, 1982; Kinnaird, 1990; Ribeiro, 1991). The irregular fruiting of dicotyledons in tropical areas, coupled with the scattered dispersion of conspecifics (Leigh *et al.*, 1982), may make most dicotyledonous species unreliable cues for mapping foraging paths.

However, non-palm fruits constitute a significant portion of a peccary's diet (Bodmer, 1989). These are probably encountered incidentally as herds travel between palm stands.

The dry season is a time of fruit scarcity on Maracá (pers. obs.; Moskovits, 1985), as it is in other neotropical areas (Foster, 1982). Many frugivores may starve during this period (Foster, 1982). Since peccaries occur in large herds they rapidly deplete food patches (e.g. *buriti*). For example, the herd observed foraging in the dry season consumed most of the *buriti* fruit on the ground within hours of entering the patch. A peccary herd therefore probably increases its range in the dry season, since *buritizais* are widely dispersed throughout the forest. This hypothesis is supported by work performed by Ayres (1986) and Bodmer (1990), who noted that in the dry season peccaries expanded their range into seasonally flooded forests. In contrast, during the wet season a herd probably reduces its range since fruit availability is greater. This hypothesis is bolstered by the high density and great frequency with which peccaries were observed in eastern Maracá in the wet but not the dry season.

Peccaries incidentally buried *buriti* seeds after consuming the pulp. Seed burial can provide a good micro-habitat for germination, and reduce or eliminate predation on the buried seeds by insect larvae (Smythe, 1989). In addition, seeds buried by peccaries may avoid being eaten or carried by agoutis or pacas into unsuitable habitats. Since *buriti* palms occur only in well-defined patches, one would presume that *buritizais* are the best places for seeds to germinate. This relationship appears to be true for *bussú* (*Manicaria saccifera* Gaertn.), another Amazonian palm whose distribution is restricted to low seasonally inundated areas (Ribeiro, 1991).

In *terra firme* forests soil-furrowing by peccaries may benefit seeds falling onto rooted areas, since soil disturbance plays an important role in the establishment of tree species in tropical forests (Putz, 1983). For example, black palm (*Astrocaryum standleyanum* L.H. Bailey) seeds can germinate on the forest floor but they require burial for roots to penetrate the soil (Smythe, 1989).

PECCARIES AND PALM DYNAMICS

Peccaries may be of critical importance to forest dynamics, because they are the only surviving neotropical terrestrial vertebrates to form huge herds which forage over immense areas. This foraging strategy results in peccaries consuming many post-dispersal seeds (Kiltie, 1981b), including those scatter-hoarded by agoutis and those dropped by arboreal frugivores (Kiltie, 1981b; Kiltie and Terborgh, 1983).

Seed predators can alter tree species composition, dispersion and density (e.g. Janzen, 1969, 1971, 1983; Hubbell, 1980; Smith, 1987). Peccaries feed on germinated *buriti* seeds which have avoided destruction by other seed-eaters, so they must therefore influence the community dynamics of the forest. These peccaries are also the only ungulates that eat the seeds of *Iriartea deltoidea* Ruiz & Pav., *Socratea exorrhiza* (Mart.) Wendl. and *buriti* palms (Kiltie, 1981c, 1982; Kiltie and Terborgh, 1983; Bodmer, 1989). They also eat the seeds of many other species of palms, including *Oenocarpus* sp., *Phytelephas* sp. and *Astrocaryum murumuru* Mart. var. *macrocalyx* (Kahn & Millán) Henderson (Kiltie and Terborgh, 1983; Bodmer, 1989).

The selective pressure exerted by herding animals on plants differs from that of solitary or small-group-forming seed predators (Janzen, 1974, 1976, 1986; Kiltie and Terborgh, 1983; Hallwachs, 1986). Herding animals may be responsible for the evolution of synchronized mast-fruiting in tropical plant species (Janzen, 1976). Theoretically, seed predators in large groups are more likely to locate and destroy most, if not all seeds produced by small isolated patches of trees (Janzen, 1976). Trees in large patches are more likely to swamp seed predators with more seeds than they can eat (Janzen, 1974, 1976). Interestingly, *inajá* occurs in large conspecific patches, as does *buriti.*

The extirpation of peccaries from Santa Rosa National Park in Costa Rica appears to have had repercussions on some plants. For example, Hallwachs (1986) found that the fruits of *Hymenaea courbaril* L. (Leguminosae) remained untouched for months beneath trees, until dispersed or eaten by agoutis. She suggests that if white-lipped peccaries still inhabited the park they would have quickly consumed most, if not all, of the fruits. Similarly, Smythe (1989) found that *Astrocaryum* seeds remained beneath parent trees for months or years on Barro Colorado Island (BCI), Panama, slowly being eaten by collared peccaries and gnawed open or scatter-hoarded by agoutis. If white-lipped peccaries still occurred on BCI they would probably quickly consume most seeds.

HUNTING OF PECCARIES

In areas adjacent to Maracá, peccaries provided Amerindians with much of the meat they consumed. This is also true in other regions of Amazonia, both for indigenous and non-indigenous peoples (Dourojeanni, 1985; Redford and Robinson, 1987; Vickers, 1988). Unfortunately, extensive and intensive hunting by gold prospectors adjacent to the reserve threatens the peccary population. The species is probably extinct in El Salvador, and rapidly being extirpated throughout the neotropics (Sowls, 1984; Stearman, 1989). In fact the white-lipped peccary may be the most threatened large mammal of the neotropics (Smythe, 1987), yet there is no mention of it in the IUCN *Mammal Red Data Book* (Thornback and Jenkins 1982).

CONCLUSION

Peccary densities correlated with changes in fruit production, which in turn were correlated with seasonal rainfall. Peccaries were abundant in the 1988 wet season when *inajá* masted and other fruits were abundant. In the 1991 dry season peccaries declined in abundance, perhaps because most tree species stopped fruit production. *Buriti* continued producing fruit in the dry season and these were eaten by peccaries, but *buritizais* have a dispersed distribution. This dispersion pattern, coupled with an extreme decline in the availability of other fruit species, may have forced peccaries to increase their foraging range.

The foraging range of peccaries probably decreases in the wet season when fruit is abundant. However, fruit production in tropical forests can vary greatly between years. In poor fruit production years (wet and dry season), peccaries probably increase their foraging range. They may even abandon their normal home range. Herds may have seasonal, yearly and possibly multi-year ranges. This hypothesis may explain peccary disappearance from areas where they were common for years, and the belief that peccary migrations have no pattern. Population decline resulting from outbreaks of disease is an alternative explanation.

Peccaries are rapidly disappearing, yet their ecology and natural history remains relatively unknown. Peccary extinction (or population extirpations) could have significant ecological repercussions for a tropical forest community, since seed predators exert selective pressures on plant populations. Since peccaries consume the seeds of many tree species, their extinction would alter the dynamics of tropical forests.

Extensive and intensive hunting by gold prospectors near the reserve, and in some areas of the island, poses a significant danger to the white-lipped peccary population of Maracá. Perhaps a more serious threat is the rapid progression of the agricultural frontier along the eastern edge of the reserve. If forest conversion continues, Maracá will eventually be isolated from the contiguous Amazon forest. Since we do not know peccary home range sizes, we cannot be sure that Maracá is sufficient in area to support a population. Peccary extirpation would have a serious impact on local indigenous peoples since they obtain much of their meat from this animal.

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