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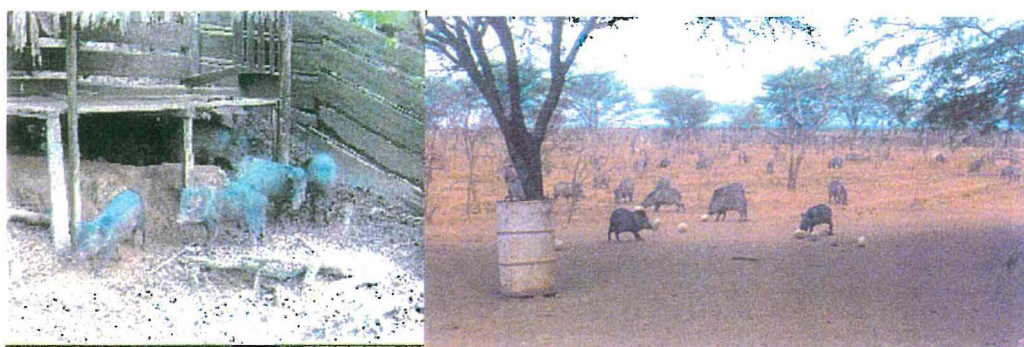
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EXECUTIVE SUMMARY

This is the third annual report of the INCO PECARI project, which aims to contribute to the development of the collared peccary production in Latin America, by covering different topics in relation to intensive captive breeding and management of free or semi-free ranging populations of collared peccaries (CP) in Peru and Brazil. Task I addresses different aspects of captive breeding in order to reduce several factors limiting the productivity of this species under intensive small scale farming conditions in Neotropical forested areas. WP1 concentrates on knowledge of the reproductive physiology of the CP female and the production of diagnostic methods for the detection of different reproductive events in the CP female. The efficacy of an ELISA test for determination of progesterone in faeces has been finally confirmed during 2004. General features of the oestrous cycle and anatomy of the CP have been studied and described, allowing the implementation of reproductive management program to increase productivity. The analysis of vaginal smears, external genital features and estrogen values in blood suggest that females in captivity show a polyestrous reproductive pattern with no seasonal effect in the Peruvian and Brazilian Amazon, and that those are easy tools that can be implemented to monitor female receptivity. The efficacy of pregnancy diagnosis by ultrasonography has been confirmed as an efficient tool for pregnancy determination with a 100% of accuracy since Day 28 of pregnancy. The existence of a fertile oestrous cycle in the early postpartum period has been confirmed by several invasive and non invasive methods and by productive data from CR5 and CR6 farms.

WP2 addresses the crucial keystone to assess the relative nutritional values of non-conventional but locally available foodstuffs in Northeastern Brazil. The traditional way to obtain information on digestibility of food for animals is through an *in-vivo* nutrient digestibility experiment. However, this method is costly and laborious. Therefore, a crucial task of this study was to improve pre-existent regression equations by comparing *in vivo* and *in vitro* (using cow rumen inoculum) digestibility results of seven standard feeds palatable for CP. These equations were subsequently used to estimate *in vivo* digestibility of 13 conventional and non-conventional locally available food resources. Crossing these data with voluntary intake results and nutritional requirements of CP, four experimental diets have been established, two for reproduction animals and two for growing individuals, that are being tested to evaluate zootechnical parameters such as growth and feed consumption rates.

The goal of WP3 is to assess the main health problems of CP under production systems. For that purpose, health data on captive animals are being recovered to build up a data base on the main pathological processes affecting CP under production in different locations. At the moment, reference data on healthy populations of captive CP, such as baseline biochemical and haematological plasma values have been established on CP populations under intensive production systems in the Amazon. Equally, animals are being monitored for morbidity and mortality of disease events. Preliminary data suggest that CP is highly resistant to common to local infectious and parasitic agents. Mortality is higher in juveniles than in other age classes. Nevertheless, this data should be confirmed with a higher number of individuals and farms. So far, very few cases of mortality due to animal pathogens have been identified, traumatism appearing as a main cause of mortality. Serological surveys did not reveal contact with common pathogens. The most relevant pathogenic finding has been the diagnosis of several serovars of *Leptospira spp.* in 65% of the captive population tested

in Peru (n=50). These results suggest that the CP appears as a very resistant species to common diseases of domestic animals. Nevertheless, It can act as a reservoir of diseases and can represent a potential health risk for humans in close contact with the animals and their products. Equally, a serological survey in tayassuids from the Pantanal suggests low circulation of infectious agents among tayassuids sharing the same environment with other domestic animals.

WP4 analyzes welfare management of CP in intensive breeding systems in order to reduce intraspecific aggression and stress within the CP herd kept under production. WP4 attempts to determine physiological and behavioural indices of stress of CP raised in various captive conditions. CR2 works on the conception of a non invasive ELISA technique for determining cortisone levels in faecal samples. This technique has proven to be unsuccessful and CR2 is now working on a modified ELISA technique to determine cortisone in saliva samples. This method has given promising results in domestic pigs. In addition, CR3 observed CP behaviour raised at different densities and described the social structure of a group raised in semi natural conditions. CR6 also recorded ethological data in order to relate social behaviour of CP to reproductive status of the females. Finally, CR6 monitored CP groups before and after a transport and their introduction to a new environment in northern Brazil. Those results will be compared with those from a CP in Bahia submitted to the same situation of transport and adaptation to a new environment during 2005.

In contrast with Task I, Task II addresses the possibility to exploit CP under more natural conditions and at a larger scale. WP5 looks at the ecology of CP herd in semi natural conditions in the Pantanal and in Bahia. The aims and objectives for WP5 are being successfully attained in both sites. In the Pantanal, 2,155 km of trails has been walked and over 100 CP groups have been sighted from the trails. Phenology studies have been pursued for two years and data from 500 baited tracking stations has been collected. Fifty-six CP faecal samples have been collected and macroanalysis shows that CP present seasonal variations in their diet, fruits being the main item in periods of high fruit availability and vegetation being the main item consumed in periods of fruit scarcity. An interactive key using *DELTA software* is being constructed to conduct a detailed analysis at the species level of plants and fruits consumed. A total of 100 plants are being described as well as 25 fruit seeds. The socio-economic study is currently being conducted. Data from hunting registers in seven *fazendas* has been gathered for over a year, and interviews in over 25 *fazendas* have been conducted. In Bahia, 24 samples of CP feces and phenology of 16 tree species are being collected for the studies on feeding ecology. Equally, tracking stations using various species fruits have been set up. In addition, 430 km of transect have been walked for the population analysis. CP have been sighted 21 times during the transects. Densities in this region will be estimated for both quasi-original forest habitats and cocoa *cabruca* agro-forestry system.

WP6 activities pretend to experiment on the production of CP at a larger scale in semi-natural conditions. Eight baiting stations have been established and monitored in the Pantanal and 5 in Bahia, with the purpose to test the potential of different available baits (salt, corn and local available fruits) for attracting free ranging CP herds. Equally, four different kinds of trapping systems have been tested. Different herds were successfully habituated to visit the trapping sites in both areas. In the Pantanal, white lipped peccaries and feral pigs, were equally visiting the baiting sites, apparently displacing CP herds from those areas. Box traps and corral pens were the most successful: corral pens allowed the

capture of 4 CP and 67 white lipped peccaries, suggesting that the method is useful to capture several individuals from the same herd. In Bahia, the corral pen and the drop net system provided promising results. In the Pantanal, current results show that other wild suiforms can be equally captured with the same techniques. Nevertheless, methods tested to survey and monitor the structure and composition of free-ranging CP herds have so far failed, compromising the development of subsequent WP tasks. During 2005, activities will continue in the Pantanal (CR8) and in Bahia (CO1). In order to provide some information on the viability of CP large scale production systems, CO1 and CR3 will collect data on current production performances of a large scale production farm in Bahia, if external fundings are available. Concerning the construction of a SMA computer model to monitor CP populations in the Pantanal, an important number of information concerning CP ecology is being provided by the project. Nevertheless, the model construction is taking more time than expected. Hopefully, a preliminary simplified version of the model will be available for final project meeting.

Finally, WP7 analyzed the economic viability of semi-intensive commercial CP farms in the Southern Bahia area. Results obtained indicate that semi-intensive production farms can become an economic alternative in this region if low cost diets based in locally available foodstuffs can be developed for reducing production costs.

1. SCIENTIFIC ANNUAL REPORT

Task I: Development of CP Captive Breeding Farming Systems

WP 1 – Studying the reproductive physiology of the CP

WP 2 – Developing efficient diets from locally food resources

WP 3 – Assessing and improving the health status of the CP

WP 4 – Reducing aggression and stress in captive CP

II- SCIENTIFIC ANNUAL REPORT

A- WP1 : Studying the reproductive physiology of the CP

WP leader: CR2

Participants: CR7, CR5, CR3 and CR6

a.1 - Technical Overview

The activities performed during 2004 in the WP1 have focused on the collection of data on the reproductive physiology of the CP, which one of the main goals of this WP. Activities aiming to improve the reproductive efficiency of the CP under captive conditions have started during 2004 and will continue during the next year.

Currently, all the deliverables of this WP have been or are on the process of being completed. The scientific activities undertaken have been the following:

WP 1.1: ELISA test for determination of sexual hormones in faeces.

The ELISA test developed by CR7 for determination of progesterone in faeces has been used to get data in experiments WP1.1, WP1.2, WP1.3, WP1.4, and WP1.5. Progesterone in faeces samples collected by CR2 from females maintained in CR6 experimental farms has been measured. These samples were obtained at regular intervals from: *i*) females isolated from males, *ii*) females maintained with males, *iii*) pregnant females, *iv*) lactating females at the postpartum period, and *v*) females with a prostaglandin injection at the luteal phase of the oestrus cycle.

During 2003, results from RIA and ELISA tests, showed that progesterone contents in non-pregnant females isolated from males were continuously low. By contrast, progesterone levels of pregnant females were considered normal for this reproductive state. In order to obtain an explanation to this fact, CR2 collected faeces samples in CR6 lab from females isolated from males, and females in continuous contact with males. CR7 analysed those samples and progesterone values in the luteal phase were similar in both groups. These results suggest that the continuous low progesterone values obtained initially in CR5 females isolated from males could be due to problems in the conservation of the samples (although progesterone is not a very unstable compound). Another explanation would be that females could have been in an anoestrus situation due to the isolation from males.

The efficacy of the ELISA test as a method to monitor reproductive activity in the collared peccary will be reported in a paper that is being prepared with results from WP1.2 and WP1.3. This will provide the basis of Deliverable DL 1.1. : Adaptation of an ELISA technique for the detection of sexual hormones in CP faeces.

WP1.2: Study of the oestrus cycle of the CP female.

During this year, CR2 has collected blood and faeces samples during the dry and rainy seasons from adult females in the CR6 farm. Faeces samples have been shipped to CR7 and blood samples analysed in CR2 lab. Oestradiol and progesterone values in blood and progesterone in faeces confirm that females in captivity show a polyoestrous reproductive pattern with no seasonal effect in the Peruvian and Brazilian Amazon. The study of a total of 47 oestrous cycles of 14 captive collared peccary females allowed determining the utility

of vaginal cytology and external genitalia features as diagnostic methods for predicting oestrus and the period of sexual receptivity. Using serum 17 β -oestradiol measurements as a reference, vaginal smears were able to detect 80.8% of the total estruses ; The appearance of external genitalia detected 88.4% of the total estruses. The oestrus was characterized by presence of vaginal mucus, and reddish and tumefacted appearance of external genitalia. Females in oestrus showed increased density of superficial and intermediate cells in vaginal smears. Mating was located on the last third of the oestrous length. Based on 17 β -oestradiol and progesterone values, the oestrous cycle length of the collared peccary ranges between 23 and 32 days.

These data will provide the basis to complete Deliverable D1.2 ("Publication on the sexual cycle of the CP sow"). Results have been presented as communications in several international congresses during 2004. A manuscript has also been submitted to the journal *Animal Reproduction Science* (D1.2a). Another manuscript is in preparation with data obtained exclusively by the ELISA test developed by CR7 in WP1.1. (see appendix 1)

WP 1.3. Pregnancy monitoring by ultrasonography

Pregnancy diagnosis by ultrasonography was developed by CR2 in CR5 and CR6 farms. This study presents the first work through real-time ultrasonography in captive collared peccary females. The ultrasonographic study of 10 pregnant females allowed to diagnose pregnancy, based on the detection of the embryo, on Day 22 in average (n=10). Nevertheless, the earliest definitive pregnancy diagnosis could be performed on Day 18. From a practical point of view, pregnancy diagnosis through ultrasonography can be used as pregnancy diagnostic method with 100% of accuracy on Day 28 of gestation. Foetal measurements of CP fetuses were collected in order to estimate gestational age and predict parturition day: crown-rump-length (CRL), thoracic length and thoracic diameter presented higher correlations with the gestational age. CRL was assumed to be the most practical measurement because, contrary to thoracic foetometry, it was available since the first embryo detection.

The study of serum levels of sexual hormones in pregnant females, allowed to describe the hormonal curve of progesterone and 17 β - oestradiol concentrations in plasma from conception to parturition. The combined detection of both sexual hormones in serum, proved useful to be used as another pregnancy diagnosis tool. The examination of vaginal cytology in 4 collared peccary females showed a pattern of change of the cells of vaginal epithelium between Day 25 and 115 of pregnancy. The external genitalia features showed no pattern of change through pregnancy of the CP.

Blood samples from pregnant females have been shipped to Dr. JF Beckers's lab (Laboratory of the *Physiologie de la reproduction animale*, Université de Liège, Belgium) to try to detect pregnancy-associated glycoproteins (PAGs) to be used for early diagnosis of pregnancy.

Deliverable DL 1.3. (Publication on the pregnancy diagnosis in CP) is being completed by the publication of a paper (in press) in the journal *Theriogenology*. In addition, several communications have been presented in three different international congresses and two more manuscripts about hormonal profiles during pregnancy and about non-invasive diagnosis of the reproductive state of the CP female are in preparation.

WP1.4: Influence of lactation on postpartum oestrus

Serum progesterone and 17 β -oestradiol profiles, and several features of vaginal smears and external genitalia were analysed in 20 animals housed with their piglets during the first postpartum month in CR6 farm. This study allowed confirming the occurrence of an ovulatory and fertile oestrus in the early post-partum period. Sixteen out of the 20 collared peccary females presented a serum 17 β -oestradiol peak (53.4 pg/ml) on Day 7 \pm 1.5 of the post-partum period. Serum progesterone levels increased from Day 10 to 18 post-partum, reaching levels of 30.8 \pm 4.9 μ g/ml. In these cycling females, a pattern of change on the cells of vaginal epithelium was also observed. Nine (45%) females presented sperm cells through vaginal cytology on Day 8.8 \pm 1.3 of the post-partum period, and 6 (30%) became pregnant. Four (20%) females showed no oestrous signs and progesterone and 17beta-oestradiol levels presented basal values.

Productive data of CR6 farm, mainly calving intervals, has been used to confirm the existence of a fertile oestrous cycle few days after calving.

The results from this WP will form part of the Deliverable 1.2. A manuscript has been submitted to the journal *Theriogenology* (D1.2.b), and a communication has been presented at the VI International Conference on Wildlife Management in Amazonia and Latin America (Iquitos, Peru; 5-10 Sept. 2004; Deliverable D1.2e).

WP 1.5. Hormonal control of the oestrous cycle in the collared peccary female

This experiment has started during 2004 with the collection of faeces samples and study of vaginal smears and external genitalia by CR2 in CR6 farms after an injection of an analogue of prostaglandin F2alpha to females in the luteal phase of the oestrous cycle. CR7 have analysed faeces samples to measure progesterone levels before and after the prostaglandin injection. Preliminary results suggest that only two from seven experimental females were responsive to the prostaglandin injection.

WP 1.6. Functional anatomy of the CP female genital tract

This experiment is close to be finished with the publication of a manuscript about anatomical and histological features of the genital tract in the journal *Anatomy, Histology and Embryology* (DL1.4a). Another paper on ovarian features, characterizing ovarian structures by histology and immunohistochemistry, is under submission in a peer-review international journal.

Observations indicate that the female CP has a mean ovulation rate of 2.3 \pm 0.6 follicles and a mean ovum mortality of 0.4 \pm 0.6 oocytes or embryo per pregnancy. The females presented a follicular wave involving the synchronous growth of a group of follicles from which several seem to attain dominance over the others. The presence of antral follicles in pregnant females suggests that a follicular turnover could be taking place during pregnancy. Immunohistochemistry showed that luteal cells from active corpora lutea presented intensive 3b β -HSD activity at advanced stages of pregnancy, suggesting the necessity of the corpora lutea for maintaining the pregnancy of the CP, similarly to the domestic pig. One manuscript is being prepared to be submitted to a peer-review journal on morphology (D1.4b).

Overall reproductive parameters

Reproductive parameters of two collared peccary farms located in Iquitos (Peru) and Belém (State of Pará, Brazil) were monitored and analysed. Taking into account the prolificacy

and number of births per female and year, the reproductive production in Belem was 4.4 newborns per female and year (n=32). Production in Iquitos was 2.1 litters per female and year, and 3.3 newborns per female and year (n=8). This study suggests that CP bred in captivity presents interesting reproductive parameters for the zootechnical development of this species. These data are included in a communication presented at the 6th International Wildlife Ranching Symposium (Paris, France - July 2004; D1.5b).

A PhD thesis (D1.5a) has been defended at the *Universitat Autònoma de Barcelona* (Spain) by Dr Pedro Mayor (CR2), under the supervision of Dr Lopez-Bejar (CR2) and Dr. Jori (CO1), with data gathered from the project. This doctoral thesis has obtained the European label.

a.2 - Problems

- With the extension of the project for 1 year, activities forming WP1.5 have been postponed to be carried out during the last year of the project.
- LH and FSH in serum were tried to measure by CR2 by RIA with kits developed for the porcine proteins, but the results were not successful. No commercial kits are available for this purpose.
- The laptop acquired by CR2 to be used in CR5 and CR6 labs was robbed this year in Brazil when Dr. Mayor was traveling to Peru. The correspondent notification of the crime was performed in a local police station.

a.3 - Outline for the next year

WP1.1.

The next year, CR7 will receive samples to continue experiments of WP1.5. A manuscript about the efficacy of the test is being prepared with data from Experiment WP1.2.

WP1.2.

This experiment will finish with the preparation and publication of different manuscripts. At this moment, 2 communications to international meetings have been presented. Also, a paper is under submission to a peer-review international journal and another one is close to be finished and submitted to another international journal.

WP 1.3.

The efficacy of pregnancy diagnosis by ultrasonography has been demonstrated. A paper about the efficacy of ultrasonography for pregnancy diagnosis and features of the embryo/foetal development is in press in the journal *Theriogenology*. In addition, three communications to international meetings have been presented.

WP1.4.

This study is finished because reproductive data from CR5, CR6 and CR7 farms confirm experimental data demonstrating that a fertile oestrus exists early in the postpartum period of lactating CP females. A manuscript has been submitted to a peer-review international journal.

WP1.5.

This experiment will continue with the study of the efficacy of prostaglandin F2 α to provoke luteolysis in the CP. Further experiments are required to state if the injected dose is insufficient to induce corpora lutea luteolysis or if prostaglandin injection has no effect in the CP female. These activities will be implemented during 2005.

The prostaglandin F2 α dose will be increased to a value similar to the dose used in pigs. This experiment will be performed in CR6 farms and faeces samples to measure progesterone will be shipped to CR2 to be analysed by CR7. After this study, a new one analysing the efficacy of eCG and hCG will be started.

WP1.6.

A manuscript about the functional anatomy of the ovary is being submitted to a peer-review international journal.

B - WP2. Developing efficient diets from locally available food resources.

WP leader: CR3

Participants: CR5 and CR6

The main goal of this WP is to develop efficient diets from locally available feed resources for CP in captivity. This WP is subdivided in 4 clearly identified steps, most of which have been completed. The four expected deliverables from this WP are on the process of being completed.

b.1 - Technical overview

WP2.1. Chemical analysis of the nutrient composition of non-traditional foodstuffs

CR3 and CR5 identified several products potentially useful for feeding CP that were easily available. Among food items tested, agricultural by-products (cassava leafs, hay and meal, passionfruit hulls, papaya tree, banana pulp, banana tree, pineapple hulls, pumpkin, elephant grass), abundant agroindustrial items in the region (cocoa meal, palm oil meal, soya bean meal, wheat meal, fish meal and blood meal) and some abundant natural products in the typical cabruca vegetation of Bahia region in North eastern Brazil (*Genipa Americana* or *Artocarpus heterophyllus*) were selected. Samples from these 20 different food items were analysed for nutrient composition. Deliverable WP2.1 was submitted as a succinct report annexed to the 2003 annual report and lists the nutritional contents of this items in terms of percentage of organic matter, percentage of crude protein, available energy (Kcal/g.), percentage of neutral detergent fiber, percentage of acid detergent fiber and percentage of ashes.

WP 2.2. Determination of food preference order and voluntary intake

All 20 items nutritionally analysed in WP2.1. were supplied to six pen-raised adult collared peccaries together with a standard food (corn grain) in order to establish the voluntary consumption through a double choice test and determine preference order of the different items in the list. This work was performed during 2003 and the results were submitted as an appendix of 2003 annual report. A publication on food preference of captive CP (Deliverable DL2.2), expected for the end of 2005 (month 42), has already been sent to be published in the Proceedings of the VI Congress of Wildlife management in Latin America. A copy of that manuscript can be found in appendix 2 of this report.

WP 2.3. Determination of nutrient digestibility of conventional and non-conventional foodstuffs used by CP.

The goal of this WP task was to determine the real capacity of CP to digest coarse vegetable fiber as it is suggested by some authors in the literature of this species. For that purpose, a selection of 13 different food items was analysed comparatively for *in vivo* and *in vitro* digestibility. Regression equations to compare *in vivo* and *in vitro* digestibility of selected food items have been improved during 2004 until obtaining high coefficients of correlation (R^2). Those results can be seen in the appendix number 2 of this annual report. They allow to estimate more accurately levels of *in vivo* digestibility of several food items through the calculation of percentage of crude protein, crude energy, digestive protein and digestive energy. The correlation coefficients obtained are higher than those previously available in the literature (Strey and Brown, 1989). A written article on digestibility of food

items for CP is under way to be sent for publication in a specialized journal. A summary of this paper can be found in appendix 2 of this annual report. It will provide the basis of DL 2.3. expected for month 24. A copy will be sent to the coordinator once the paper will be published.

WP 2.4. Evaluation of the animal response to the experimental diets

With the data obtained from food preference (WP 2.1 and 2.2), digestibility coefficients (WP 2.3), nutritional requirements described in the literature and tolerance of fiber levels, four experimental diets were formulated to be tested in captive CP, according to seasonal foodstuff availability. During 2004, experimental diets for animals on reproduction were tested in adult breeding specimens kept in semi-intensive conditions, under different densities. There was no statistical difference on average daily consumption of the experimental diets, equivalent to $630 \text{ g} \pm 87 \text{ g}$. Only a total of 16 young were weaned per female considering all the paddocks. Reasons for this poor reproductive performance are being investigated.

b.2 – Problems

Due to lack of space and availability of animals, diets were tested in family groups used for the experiments of WP4, concerning the impact of density of animals in stress and productivity. Due to some behavioural problems (infanticides), reproductive performances of females were much lower than expected (0.65 young/female/year instead of the 1.65 young/female/year expected). This data resulted in a rise of feeding expenses, which reached 57.50 € / weaned young in the highest density paddocks.

Reasons for this low reproductive success are being investigated since it is not clear if they are from nutritional or behavioural origin.

b.3 - Outline for the next year

All the tasks in this WP have been now completed except for WP4. Activities concerning the evaluation of the animal response to the experimental diets will continue during 2005. Experimental diet will be tested on young individuals to gather information on the ability of this diet to increase growing performances in young CP. Equally activities concerning the monitoring of breeding groups fed with experimental diets will continue during 2005. A paper on the digestibility of roughage by CP will be produced to complete DL2.3. ("Report on digestibility of locally available foodstuffs for CP").

C - WP3. Assessing and improving the health status of the CP.

WP leader: CR5

Participants: CO1, CR2, CR3 and CR6

The collared peccary is a species under the process of domestication with the purpose of becoming new source of protein for several countries in the neotropics. Despite the knowledge of its biology and management in captivity, it is fundamental to study the pathological processes that affect CP in captivity and to establish normal reference values that can be used subsequently as health indicators in routine veterinary control of farms under production. In addition, the high concentration of CP individuals under the production and the movement and exchange of animals between farms are predisposing factors for the emergence of unexpected or unknown diseases for this species.

c.1 - Technical overview

This workpackage is lead by IVITA (CR5) in Peru, with the participation of other in Brazil, Peru and Europe. CR5 should stock the information provided by the other partners in an interactive data base of the main findings concerning the health status of CP under production in different project locations. CO1 is providing information on health status of natural populations of CP and local sympatric species, that share the same environment.

WP 3.1. Analysis of CP mortality and morbidity in intensive farming systems.

Evaluation within the different farms of the project will continue and activities integrating the project consortium will carry on. CR5 has been monitoring several farms in the Peruvian and Brazilian Amazon for the evaluation of morbidity and mortality in CP farms. Nevertheless, mortalities have so far been still very low. Preliminary data suggest that mortality is higher in more intensive systems and that mortality is higher in juveniles than in other age classes. Nevertheless, this data should be confirmed with a higher number of individuals and monitored farms. So far, very few cases of mortality due to animal pathogens have been identified, traumatism and accidental intoxications appearing as main causes of mortality. To complete this task, biochemical data from CP under captivity have been established, particularly concerning hepatic and renal functions. Blood was collected from 31 individuals and biochemical values such as blood proteins, cholesterol, hepatic enzymes, urea and creatinine were determined. No differences were detected when comparing different sexes. Values are similar to those described in the literature in other locations.

The clinical database conceived by CR2 has been completed at the beginning of 2004 and is available at the project web site.

WP 3.2. Determination of the prevalence of parasitism in CP reared in captivity.

After studying parasite loads during the previous years of the project, this year was dedicated to the study of prevalence and identification of blood parasites. A total of 50 individuals from different farms from the Peruvian Amazon were collected by CR5. Classical diagnostic methods for detecting heamoparasites such as the fine blood smear, thick blood smear (*Plasmodium* spp) or microhematocrit centrifuge technique (filariae and flagellates) were used. All animals sampled appeared negative to the different diagnostic methods implemented.

WP 3.3. Testing comparative efficiency of commercial drugs to reduce parasitic load in captive CP.

The efficiency of some other products, in this case natural products, should be tested in captive CP and compared with results from commercial drugs obtained during 2003 such as Ivermectine or Doramectine. Nevertheless, this task could not be implemented due to important financial delays from the project funds during 2004.

WP 3.4. Serological survey of diseases in CP raised in quasi-natural conditions.

The sera of more 98 specimens of CP from different farms in Loreto and Pucallpa provinces, were tested against *Leptospira* spp in the Peruvian Amazon. Animals were tested for the presence of 22 different serovars of *Leptospira* spp. by the technique of microscopic agglutination test which is the reference standard test for the serological diagnosis of leptospires. 65% of the individuals tested resulted positive to the presence of antibodies against some serovars of leptospira, particularly to the serovar *Varillal 010*. Animals did not show any signs of disease. This work provided evidence that CP can act as apparent asymptomatic carriers of *Leptospira* spp.

In the Brazilian Pantanal, CO1 is undertaking a serological survey of free ranging collared peccaries from the Pantanal and other sympatric suiforms such as the white lipped peccary or the feral pig has started by the end of 2004. So far, 4 serum samples from CP, 67 from white lipped peccaries and 200 from feral pig are being tested for brucellosis, foot and mouth disease, hog cholera, leptospirosis and pseudorabies. Eleven WLP are also being tested for endoparasites by flotation technique. So far, only exams against presence of hog cholera o brucella antibodies have been performed: Only 4 WLP have showed antibodies against brucellosis. All animals tested have so far showed no positive reaction to none of the mentioned infectious agents.

c.2 – Problems

Economic restrictions caused by the delay on the arrival of the third intermediate payment, has been the main limitation to the implementation of the programmed activities for 2004. Mortality in captive CP is low. This is a good advantage for this species but subsequently the amount of information recovered from farms in the Peruvian Amazon, concerning the causes of mortality of CP in captivity is limited.

Moreover, the exchanges of information within the consortium through the use of the interactive data base established at the beginning of 2004 have been inexistent.

CR4, as a WP leader should emphasize this activity during 2005, in order to recover the maximum of information from other partners in the consortium concerning the health status of CP. Equally, other partners are welcome to provide information to CR4 or to the coordinator in order to build up a reference data base on the main health problems affecting CP under different production schemes.

c.3 - Outline for the next year

WP 3.1. Analysis of CP mortality and morbidity in intensive farming systems.

Evaluation of morbidity and mortality within the different farms of the project will continue and activities integrating the project consortium will carry on. Contact between partners will be instrumental to recover information relative to the morbidity and mortality of CP in captivity and other CP health reference values.

Data on mortality issued from autopsies will be compiled during 2005, to produce a publication on the pathology of CP under production with the contribution of several partners of the consortium.

WP 3.3. Testing comparative efficiency of natural and commercial drugs to reduce parasitic loads in captive CP.

Commercial and natural products for the control of parasites in CP should be tested during in CP kept in captive conditions during the following year. Those should be necessary to compile a written report on recommendations in the use of anthelmintic drugs, which should be the basis of DL 4.2. expected before the end of the project.

WP 3.4. Serological survey of diseases in CP raised in quasi-natural conditions

Serological surveys in the Pantanal by CO1 and in the Amazon by CR4 should continue during 2005. They should provide information on the role of captive and free ranging CP as vectors and reservoirs of pathogens of clinical and economic importance for the health of other sympatric wildlife, domestic animals and human beings.

D - WP4. Reducing aggression and stress in captive CP.

WP leader: CR3

Participants: CR2, CR3 and CR6

d.1 - Technical overview

The commercial success of an intensive breeding system requires optimal growth and reproduction rates and minimized health problems. The improvement of these parameters implies the welfare of the animals. Animal welfare decreases when breeding conditions are inadequate because those generate stress. These biologic perturbations can be evaluated by physiological measures (glucocorticoid levels, weight) and behavioural indicators. Laboratory research (CR2) and behavioral recordings (CR3 and CR6) are in progress to develop tools, allowing to improve animal welfare among farmed CP.

WP4.1. Testing an ELISA technique for determining cortisone levels in faeces.

WP4.1 is conducted by CR2 with samples collected locally by CR3 and CR6. So far attempts to detect cortisone in faecal samples using a modified ELISA technique have failed due to the presence of some compounds in CP faeces that interfere with cortisone detection. To face this problem, CR2 works along two different strategies using the domestic pig as a model. Once validated, those techniques will be tested with CP samples collected by CR3 and CR6:

- (1) modifying the analysis technique. In that sense CR2 is working with the Veterinary Faculty of Zaragoza (Spain) in the detection of cortisone in saliva samples from pigs, since this technique has worked in a variety of species. Results are encouraging and the technique is being validated. This test could fill the gap of obtaining a non invasive technique for the detection of physiological stress in CP under production.
- (2) looking for a different indicator of stress such as the detection of plasma acute phase proteins (APPs). Those proteins appear as useful indicators of stress in pigs. Nevertheless, this technique requires blood samples and is therefore more invasive than techniques based on faecal or saliva samples. On the other hand, preliminary results suggest that APPs increase only when stress is associated with tissue damage. To confirm this issue, CR2 is conducting a test in pigs psychologically stressed but without tissue damage, in order to determine the validity of this technique as a general stress indicator.

WP 4.2. Study of the influence of high density and visual barriers in the levels of stress

This experiment is in its final phase. Individual social status of CP and social interaction within the group has been analysed in three different densities. The results suggest that densities of 0.02 individuals/m² or higher are inadequate to breed CP in captivity, due to the outcome of aggression displays, infanticide and competition for food. The experiments performed by CR3 suggests that the optimal number of feeders / animal in a CP production unit should be at least of one feeder/ 4.5 adult animals. This work has provided interesting results, allowing the presentation of two communication in national congresses, the submission of a written paper and the subject for an MSc thesis to be presented in January 2005. With the publication of this results, DL4.2 will be completed in 2005.

WP 4.3. Definition of CP ethogram, with special attention to behavioral indices of stress.

CR6 conducted new analysis on data previously collected to provide information on the comparative behaviour of CP groups in normal and stressful situations, social relations in captive CP, biometric analysis of growing CP under the influence of several commercial foods. Many of this results have been presented in national and international congresses or allowed the production of on going scientific publications.

Since the group of animals studied by CR6 in Belem was very frequently managed, It did not show very marked signs of stress when submitted to supposedly stressful situations, the methodology implemented with those animals will be repeated with animals from CR3 and results will be compared in order to detect eventual behavioural differences.

In 2004, CR6 also initiated to collect data in order to relate social behaviour of captive CP to the reproductive cycle of females from several groups. Colpocytological examination is used to define the phase of the cycle of each adult female and social interactions are recorded using a camcorder. Data collection is still in progress.

New analyses were conducted in order to compare the growing curve of captive CP from Belém to animals from other experimental farms in French Guiana and other states of Brazil. Weight data from each location were analysed using the Von Bertalanffy growth model.

Information from WP4.3 is providing an excellent basis for the compilation of a written report about the ethogram of captive CP (DL 4.3), before the end of the project.

d.2 – Problems

The main difficulty encountered by CR2 has been the fact that cortisone appears to be very difficult to be reliably analysed in CP faeces. Further, APPs are of interest but apparently only with stress associated to tissue damage, and need to be evaluated in blood, with the disadvantages of other invasive techniques (restraint, blood extraction, etc.)

The main problem met by CR3 was the delay in the construction of shelters because of internal problems and due to the bureaucracy of the UESC, having delayed the assignment of a civil servant to the realization of this task. The problem is now solved and studies will normally continue during the next year.

CR6 facilities were overcrowded with CP during the first semester of 2004 which limited the management of the animals. The problem was solved in June when 50 animals were donated to the first private farm of CP in northern Brazil. As explained in the last management report, WP4 leader moved from CR6 to CR3 region. On one hand, this new situation makes more difficult the supervision of data collection realized for WP4 in Belém. On the other hand, this new situation should facilitate the compilation of scientific publications by WP4 participants from CR3 and CR6.

d.3 - Outline for the next year

WP4.1. Testing an ELISA technique for determining cortisone levels in faeces.

CR2 work plan for next year is to finish the validation of the detection of cortisone in saliva for domestic pigs and to validated with CP samples from the project. This would allow the project to provide a non invasive ELISA technique to detect cortisone in CP, in order to complete DL.4.1. (A non invasive Elisa kit for cortisone determination in faeces).

WP 4.2. Study of the influence of high density and visual barriers in the levels of stress

CR3 plans to finalize data collection of the shelter phase in April of 2005. CR3 is preparing two manuscripts dealing with the optimal stocking rates of CP. They should be used to complete DL 4.2 (Publication on stress and aggression in captive CP).

WP 4.3. Definition of CP ethogram, with special attention to behavioral indices of stress.

CR6 will collect behavioural data during the transfer of CP from CR3 to the new experimental farm and analyse both data sets from Ilhéus and Belém. Behavioural data on social relations and reproduction will be analysed. A synthetic publication on the behaviour of captive CP will be submitted.

Equally, with data gathered from CP animals kept in captivity by CR3 and CR6 will be used to compile DL.4.3. (Report on the ethogram of captive CP).

Task II:

Experimental exploitation of wild CP herds living under quasi-natural conditions.

WP 5 – The ecology of natural populations of CP under quasi-natural conditions

WP 6 – Experimenting innovative schemes of CP harvest under quasi-natural conditions.

TASK II. Assessment of experimental exploitation of wild CP herds living under quasi-natural conditions.

Task II examines exploitation of quasi-natural populations that are compatible with traditional activities -cattle ranching and cocoa plantations- but give an extra value to private lands rich in biodiversity. If these areas have an additional economic value, they are more likely to be respected and conserved. Therefore, the project will experiment locally adapted CP ranching systems, that allow the exploitation of CP populations to a larger scale than the intensive breeding farms approached by Task I. The potential of CP exploitation will be assessed and compared in two different areas of Brazil: The Brazilian pantanal and Northeastern region of Bahia. Scientific and technical objectives of this Task II are the study the CP ecology under quasi-natural conditions (WP5) and the experimentation of innovative scheme of CP harvest under quasi natural conditions (WP6)

Expected outputs are a better knowledge of the keystone and limiting resources for the CP productivity of wild CP populations and the establishment of innovative exploitation systems of CP production on a larger scale and a more natural environment (quasi natural conditions) than the production systems approached in Task I.

E - WP5. The ecology of natural populations of CP under quasi-natural conditions.

WP leader: CR4

Participants: CR4, CR8, CR3

The goal of WP5 is to examine the possibilities of ranching CP in Brazil by conducting ecological and socio-economic conditions studies in two representative landscapes in Brazil, the Pantanal of Mato Grosso do Sul State and the Atlantic Forest of Bahia State. Ecological studies examine how keystone and limiting resources influence the population dynamics, habitat use, and feeding ecology of CP. The ecological information will then be combined with socio-economic analyses to make recommendations for the feasibility of ranching peccary populations in the study areas.

e.1 - Technical overview

In the Pantanal, most of the research took place in two properties found in the Pantanal of Nhecolandia, representative of 20% of the Pantanal landscape: the CR8 Pantanal field station ranch, Fazenda Nhumirim and Fazenda Manduvi, a neighbouring private estate. In Bahia, research takes place in 4 private properties once dependant on cocoa economy and searching for alternative economic activities.

WP 5.1. Determination on the population structure and production of CP in different habitats.

Population structure is addressed through 3 different topics: Population analysis, habitat use and structure of the herds.

a) Population analysis

In the Nhumirim study area 1755 km have been walked. Twenty-three species of mammals have been recorded on the transects. CP groups were sighted through out the year (6,55 groups / 100 km of transect), regularly throughout the year. Densities were estimated at approximately 5.5 ind/km². Therefore biomass of CP in the Nhumirm area is of 99 kg/km².

In the Manduvi area, a total of 400km were walked during two field expeditions in 2004. Encounter rates were very low (0,75 groups observed per 100 km transect) and therefore, it was not possible to estimate densities. Comparative results show that their densities do vary greatly from one region to another in the Pantanal. This has been also confirmed by results from other researchers in the South Pantanal. However contrarily to sympatric species such as the white lipped peccaries (WLP) or feral pigs (FP), CP remain in their territory throughout the year, and are often observed in the same areas

In Bahia, a total of 32 km divided into 28 trails have been opened. All of the different types of habitats present in the study areas are represented on the trails. During 2004, a total of 430 km have been walked. Thirteen species have been recorded on the transects. CP have been sighted from the transect 21 times this means 1 group / 20.4 km of transect walked. Densities will be estimated using the "DISTANCE sampling" method provided a sufficient number of observations are obtained.

b) Habitat use

In the Nhumirim study, areas with three different vegetation characteristics were defined, according to the proportions of open or thick forest. The Manduvi area was considered as one single area of flood plains with small forest patches. Comparison of CP encounter rates suggests that tree cover appears as a determining factor. This was particularly obvious in Fazenda Manduvi where the very few observations of CP were made. The Southeast Bahia study area presents a great variety of forest patches and cocoa *cabruca* agro-forestry system. Habitat use is being analysed through sightings of CP on transects at several scales.

c) Group size, age structure, sex ratio and fecundity of groups

In the Pantanal, CP herds varied between 7-12 individuals. However when foraging, herds spread out into groups of 1 to 4 individuals. Group size does not seem to vary in between the different areas of the Nhumirim study site, which seems to be a difference between other sympatric suiforms such as the FP or WLP. Usually a group of CP was composed of various adults, 1 or 2 large juveniles and 1 or 2 small piglets. The CR4 field researcher never observed more than two small piglets within a group even though the group contained several adult females. Breeding appeared to be seasonal and births were usually registered between October and June, based on the observation of the small piglets and the two birthing events witnessed by the field researcher.

In Bahia, CP herds observed were larger including a range between 3 and 22 animals (n=21). This value should be confirmed by larger number of observations.

WP 5.2. Determination of keystone and limiting resources for CP in different habitats

Determination of keystone species has been done through analysis of faecal material of CP and the monitoring of fruit tracking stations.

a) Feeding ecology

The diet of the CP is being investigated through macroscopic and micro-histological analysis of fecal samples, collected during previous years and stored in 70% alcohol. 56 CP feces are being analysed at the CR8 laboratory in Corumbá. Results from the macro analysis suggests a seasonal variation in resource use. During periods of highest fruit availability (October-March) fruits were the most frequently encountered item in the diet of

CP, while during periods of low fruit availability (April to September) vegetable material was most frequently encountered. One item, classified as WHT was extremely important in the CP diet during the height of the dry season when resources are most scarce. Identification of the plants consumed will be conducted through microhistological analysis of feces. This will provide further clues on habitat use of the animals. In order to conduct the micro-analysis, an interactive key using the DELTA software is being built up so that the observer can compare the anatomical characteristics of epidermal cells of each plant part found in the feces to the series of illustrated characteristics displayed by the key. The interactive key automatically identifies plant species, therefore enabling the observer to rapidly and accurately identify plants consumed by the animal whose feces have been collected. This tool is in the process of development. So far a total of 46 gramineae have been photographed and identified..

In Bahia, 24 faeces samples have been obtained by CR3 since October 2002. A phenological study of fruit trees is being conducted to help determine keystone and limiting resources. Over 16 species of trees, which are distributed within the cacao cabruca and Atlantic forest, have been already described. The partial results obtained confirmed that CP are mainly frugivorous (more than 65% of total residuals found in the feces samples).

b. Fruit baited tracking stations

Fruit baited tracking stations were conducted in Bahia for the four monitored properties. Conducting studies have been done with no difficulty adopting the same technique developed by CR4 in the Pantanal during 2003. A total of 22 stations have been placed throughout the study area in 4 different sites and have been checked 158 times (79 morning checks and 79 afternoon checks), recording the different animal species visiting the baited sites. A more detailed analysis using the habitat variables, and a detailed analysis of fruits consumers will provide important insights on CP ecology within the community of frugivores.

WP 5.3. Determination of potential for harvesting CP in different ecosystems

Analysis of the economics and cultural use of current peccary harvests was achieved through an exploratory hunting survey, interviews, hunting registers and collection of skulls from hunted animals during the first two years of the project. To conduct the interviews over 400 km were driven through out the region. Over 35 interviews from 25 different fazendas from the Nhecolandia region have been conducted. Since June 2004 interviews are also being conducted in the Rio Negro region by other researchers (Earthwatch) using the same interview sheet as CR4.

To assess quantitatively hunting practices registers were distributed in 7 neighbouring fazendas. Data from these hunting registers are being collected once a year at a minimum in each fazenda.

Skulls were collected for 2 years between November 2002 and November 2004. So far over 100 feral pig skulls and around 10 white lipped and collared peccary skulls have been collected.

Results suggest that CP are rarely hunted in the Nhecolandia region, compared to the FP. This introduced species appears without doubt an extremely important animal within the local culture compared to CP.

e.2 – Problems

Density calculation: habitats in the Pantanal, even in the Nhecolandia region are very heterogeneous, and offer different visibility and therefore a different probability of detection for CP according to the thickness of forest cover. Since visibility is lower in forested areas it is possible that less observations will be made therefore skewing the results. To ensure homogeneity between different habitats, only observations made within 10 meters from each side of the trail were considered. This fact renders calculations for the estimation of densities more difficult than expected. At the moment, new manners to analyse density data, which take into account this visibility variation are being investigated.

In the Manduvi property, CR3 could not estimate densities due to a very low number of CP sightings. To complete a comparative analysis with other areas of the South Pantanal, data from the Rio Negro region gathered by an external team of researchers (Earthwatch Institute) will be integrated in the analysis.

Observation of CP groups, structure and composition in forest cover is difficult to evaluate. As described for the Pantanal, individuals generally disperse and the herd disaggregates in small groups of few individuals. Moreover, sex of individuals composing the herd is difficult to evaluate. Observation of the entire herd in open areas appears more reliable. Nevertheless, this substantially reduces the number of valuable observations. The capture and tagging of some individuals of the herd should be helpful for recovering more information concerning the CP herd.

In the coordinators opinion, results from the survey in suiform utilization in the Pantanal (WP5.3) might be skewed by the fact that hunting is legal for FP and illegal for CP (answers to the questionnaire, skulls recovered). Moreover, damage of suiforms into local crops should be also considered in the survey. This facts should be taken into account before further data collection or interpretation of results.

e.3 - Outline for the next year

WP 5.1. Determination on the population structure and production of CP in different habitats.

In the Pantanal, preliminary results concerning CP densities and habitat use will be completed with results from other areas such as Fazenda Rio Negro. Estimation of densities using the “Distance sampling” method will be completed. In Bahia, density studies will continue and 450 Km of transect will be walked. If sufficient data are gathered densities will be estimated using the same method.

In Bahia, CR3 will also complete the description of microhabitat use (in the peak of the dry season and in the peak of the wet season, respectively). Information on habitat use will also be gathered from the habitat description and the fruit baited tracking stations study. Observations concerning the structure of CP groups in the Bahia region will continue.

WP 5.2. Determination of keystone and limiting resources for CP in different habitats

In the Pantanal, CR4 will continue analysis of vegetation items on faecal samples. Macro analysis of faeces will be conducted in Fazenda Manduvi to complete the survey in the Nhecolandia area. Microhystological analysis will provide further clues on habitat use: a total of 834 microhistological slides (2 slides/collected sample) will be prepared. The interactive key to be used in the identification of fruit seeds will be completed with the collaboration of Earthwatch Institute researchers.

In Bahia region, the phenology data collection will continue during 2005. Fruit tracking stations will to be conducted and a more detailed analysis using habitat variables and results from tracking stations will provide important results on CP ecology in the *cabruca* vegetation.

WP 5.3. Determination of potential for harvesting CP in different ecosystems

The survey on utilization of CP and other sympatric suiforms will continue in a larger number of properties by the inclusion of results from the Rio Negro area, provided by the collaboration of Earthwatch Institute. Results from the socio-economic study and its implications on the potential for ranching CP in the Pantanal and in Bahia will be completed, analysed and discussed in DL 4.3 (Preliminary results on potential for harvesting CP in two different ecosystems), as soon as results will be available.

F - WP6. Experimenting innovative schemes of CP harvest under quasi-natural conditions.

WP leader: CO1 (CIRAD EMVT)

Participants: In Pantanal, CO1 (CIRAD) and CR8 (EMBRAPA)
In Bahia, CR3 (UESC)

The goal of this WP is to examine the technical feasibility of CP ranching as an alternative of small scale production, developed by Task I of the project. In that sense, the project intends to experiment on innovative extensive CP production schemes that can be implemented within private lands such as cattle ranches from the Pantanal and/or abandoned cocoa plantations in Bahia State. For that purpose, WP activities have been focused so far on the capture and monitoring of free ranging CP herds. Results obtained in the Pantanal suggest that CP exploitation alone does not seem productive. Nevertheless, the same capture effort allows the possibility to develop joint exploitation of several sympatric species that cohabitate with CP and that offer an even higher potential for exploitation, such as the feral pig (*Sus scrofa*) or the white lipped peccary (*Tayassu tajacu*).

On the other hand, despite WP6 activities were initially based on free ranging populations, it seems necessary to start looking at the possibility of exploiting large populations of CP born in captivity for large scale production. Prospective activities in that subject have led to the identification by CR3 of a farm with the largest stock of CP under production known to date in Brazil and a deeper analysis on this production system will be undertaken during 2005, if the expected supplemental funds are available.

f.1 - Technical overview

- In the Pantanal, activities have continued in the same study areas
 - Fazenda Nhumirim, CR8 research station in the Nhocolandia area where WP5 is also being implemented and
 - Fazenda Campo Lourdes, representative of the Rio Negro area, where CO1 undertakes its research activities with the support of the Regional Park of the Pantanal.
- In Bahia, CR3 selected Fazenda Teimoso, a property representative of the predominant Cabruca vegetation in the South eastern are of Bahia state.

WP 6.1. Set up effective trapping devices for the capture and management of CP herds.

In Fazenda Nhumirim, four baiting stations have been created and regularly maintained since December 2003 by CR8. Habituation of the animals was facilitated by the offer of potable water during the dry season. Box traps allowed the capture of 4 CP within 3 months.

In Fazenda Campo Lourdes, four baiting sites were maintained and monitored by CO1. With exactly the same trap effort, corral traps allowed the capture of 67 WLP and 4 CP, meaning that capture success was 17 times higher for WLP than CP. No feral pigs was captured. 50% of the peccaries were captured in the same trap (52% of WLP and 100% of CP) and 91,55 % of the animals were captured in the early morning. Corral traps allowed the capture and management of several individuals at the same time. Once in the trap,

animals were physically restrained and chemicals were no longer necessary for short manipulations (less than 10 minutes).

In Fazenda Teimoso, CR3 monitored 6 different baiting sites and compared the success of several baits. Corral traps and drop nets were tested allowing the capture of one individual respectively.

A substantial amount of information on the capture of CP is being gathered, allowing the compilation of D6.1. A draft of the document has been written to be sent to WP6 partners and will be completed and amended during 2005.

WP 6.2. Modification of herd structure to increase CP productivity.

a) Evaluating animal abundance

Animal abundance was estimated in CO1 working site in order to interpret capture success and be able to compare capture results between different areas. A total of 218 Km of transects were walked on horse back. Data recovered were species observed, time of observation, group size, group composition and behavior. Among sympatric suiform species, WLP was more commonly observed, encompassing 13% of the observations. FP was observed with a frequency of 11% and CP was only observed with a frequency of 6.5%.

In Fazenda Nhumirim, this work has been made available by CR4 in WP5.

In Fazenda Teimoso (Bahia), 156 Km have been already walked. Information obtained so far, only allows the confection of a list of mammals present in the property and their frequency of observation during transect walks.

b) Monitoring herds by radio telemetry

Due to the mortality registered in CP equipped with radio collars during 2003, the efficiency of radio ear tags commercialized by the Swiss firm Wegner® was tested during 2004. No reference concerning the use of ear tags in CP had been found so far in the literature.

In Fazenda Nhumirim, four animals were equipped with radio tags by CR8, between August and September 2004. Another three animals were equipped with ear transmitters by CO1 in Fazenda Campo Lourdes. Except for one individual which could be followed during 4 months allowing the collection of 27 localizations, all the other animals lost their tags after 1 week of being marked, suggesting that ear transmitters are neither a suitable technique for monitoring CP herds. Those localizations will only give a rough estimation of CP home range in the Campo Lourdes area during the end of the dry season, which gives a value of 1.3 Km² surface (Minimum Convex Polygon). This value is comparable to other home range areas for CP found in the literature and to previous WP6 results in Fazenda Berenice.

Since capture of WLP proved very easy, 4 individuals were equipped with radio collars and monitored during 6 months. The model of collar used by the project (Telonics Mod 500, 570 grs.) appears more suitable for WLP than for CP, suggesting that weight of the radio collar might be a limiting factor for CP.

In Fazenda Teimoso, two animals of 15 and 19 Kg were captured respectively. Nevertheless, none of them was "collared" since they were judged too light in weight for the 570 gr available collar.

WP 6.3. Enrichment of the habitat to increase the carrying capacity for CP.

Two grain feeders were set up by CO1 in Campo Lourdes to test their potential of attraction among CP herds. Unfortunately, relative humidity in this property was much higher than in Nhecôlandia (Fazenda Berenice), compacting corn grains at the exit of the barrel and thus, collapsing corn distribution. As a result the experiment was abandoned.

On the other hand, the difficulties experimented in the capture and monitoring of CP herds did not allow a regular survey of grained and natural herds as expected to compare the herd structure in both situations. Under this circumstances, it is highly unlikely that this WP task will lead to some results nor to the completion of D6.2.(Report of different crop enrichment methods to improve the productivity of CP)

WP 6.4 Monitoring the impact of harvesting on the CP demography.

Jose Carlos Chaves received a new training session during three months at CO1 in Montpellier with funding from another EC project (ALFA) between January and April 2004. Some progress has been made by CR8 on gathering geographic information from Fazenda Nhumirim and the representation of different vegetation types within the model. In Bahia, a SIG data base on Fazenda Teimoso has been also built up by CR3. So far, sufficient information exists to start building a model in Fazenda Nhumirim. Nevertheless, the first prototype of the model has not yet been build up as expected, basically due to technical difficulties of the CR8 in representing the complex reality of the Pantanal in a virtual manner.

f.2 – Problems

a) Due to the high degree of innovation of this WP, and the lack of experience in working with free ranging CP, this WP6 has encountered several technical difficulties.

In the Pantanal, an important degree of competition between CP and other suiform species (FP, WLP) has become evident. In areas where all species are present, CP is often chased from baiting sites (by FP or WLP) due to its lighter weight and the lower size of its herds. While this situation is probably an advantage in terms of an eventual exploitation of suiform species in the Pantanal, it renders the capture and study of CP much more difficult than expected.

b) As suggested by CR4 in WP5, monitoring the structure and composition of CP herds under forest cover is difficult due to low visibility and desegregation of the herds. Telemetry equipment should have been a useful tool to improve the collection of herd data. Nevertheless, the material (ear tags and radio collars) purchased by the project (ear tags and radio collars), has not worked as expected. This was a necessary risk, since no references on the use of ear tags on CP were found in the literature and the use of 570 g. radio collars did not lead to satisfactory results. Those are results that will be useful to future research on captive CP.

c) Concerning the construction of the computer model using SMA tools, the CR8 candidate has experimented some difficulties in collecting the necessary ecological and geographical information and in translating the complex reality of the Pantanal into a more simplified virtual representation. The first difficulty seems now almost overcome since CR8 has

managed to collect this highly dispersed information from different project and non project partners. The evolution of the model will now depend on the ability and skills of the CR8 candidate in the field of ecological modelling.

f.3 – Solutions

Capture operations by CR8 will continue in specific areas of Fazenda Nhumirim where competitive species are less abundant. The continuity of capture activities in Bahia should also provide more data on CP herds in areas without suiform competition.

For monitoring radio collared CP herds with a higher degree of success (as it occurs with WLP), we recommend to radio collar only animals with a weight higher than 20 Kg. Animals with a lower weight should not be collared unless lighter equipment is available. The possibility exists to fix the ear tags in neck collars so they can still be used differently. Costa Rican scientists have claimed a higher degree of success in monitoring radiocollared CP by the use of harnesses.

CO1 has given support on SMA modeling to CR8 through two different training periods in France. This support should be instrumental in this process of construction of the model. CO1 scientists are still available during 2005. Nevertheless, the evolution of the model will largely depend on the ability and the initiative of Jose Carlos Chaves (CR8) to contact different partners from the project in the Pantanal to recover scientific and ecological information and in his skills to integrate it in a viable SMA computer model.

f.3 - Outline for the next year

WP 6.1.

There are still a lot of activities that could be developed around this topic. Unfortunately, money is running out and CO1 collaboration with our main partner in the Pantanal through FFEM (French Global Environnemental Fund) is getting to an end in May 2005 and with it, CO1 logistic support in the Pantanal.

CR8 activities are dependant on their ability to manage the remaining funds from the INCO project during the last year of the project. If CR8 manages to justify enough money in the next financial report, capture activities should continue in order to equip a larger number of animals with VHF transmitters.

In Bahia, baiting and capture activities will continue in Fazenda Teimoso. A different method (drop net) should be tested in addition to the corral traps.

WP 6.2.

Monitoring CP by radio telemetry should continue in the Pantanal (CR8) and in Bahia (CR3). Data gathered during 2004 should be sent to CR8 for analysis with a copy to CO1. A maximum of information should be recovered on the structure and composition of CP herds in both sites.

In Bahia, a large scale commercial farm will be visited and the composition, structure and sex ratio of the 450 animals herd will be analysed, if external funds are available.

WP6.3.

No activities will be developed in this WP task during 2005. Deliverable D6.3 will not be completed due to lack of data.

WP6.4.

If CR8 is able to manage his funds in a way of continuing field activities in 2005, it will be possible to gather enough geographic and ecological data to build up an SMA model based on Fazenda Nhumirim experience. Equally, data gathered by CO1 can also be used for the Rio Negro area. On the other hand, CR8 and CR4 have developed a collaboration with other researchers working on CP ecology in the Rio Negro area. The PhD student from CR8 should get in contact with all those actors to develop this model based on the ecological and geographic information available from the Nhocolandia area and/or Rio Negro areas. Efforts should be maximized during 2005 in order to build up a functional prototype of the model that could be presented to the final meeting in the Pantanal in August 2005.

Task III: Analysis of the Viability of CP Exploitation System

WP 7 – Economic viability of the different CP exploitation.

TASK III: Analysis of the viability of CP exploitation systems

The goal of this task was to compare the technical, economical and ecological outputs of the different CP production methods in order to provide the CP industry with the most relevant, and locally adapted, options of profitable exploitation keeping in mind the environmental dimension and the conservation of the species. Production in the farms had to be estimated and farm business analysis, compared and discussed. A lifetime profile of costs and returns for the different farming systems had to be built up.

G - WP7: Economic viability of the different CP exploitation systems

WP leader: CR8

Participants: CO1, CR3

The final aim of WP7 is to provide recommendations about the most profitable system of CP exploitation in the different ecological and socio-economic backgrounds in the areas chosen by the project. This work had to be performed by a CR8 socio-economist with sector experience and market analysis skills (CR8).

Unfortunately, the persons involved with this task of the project in Embrapa Gado de Corte have decided to abandon project activities during 2004, after having undertaken very few activities on this subject. All the activities concerning this WP have been performed by CR4 in the area of Bahia.

g.1 -Technical overview

WP 7.1.Elaborate the typology of different farming and ranching systems approached by the project.

CR8 elaborated a data sheet to be completed that was sent to different partners during the first year of the project. Nevertheless, no effort has been made by CR8 to recover this information. Currently, no scientists from CR8 is being involved with this activity. Under the current situation, the probability of obtaining D7.1. related to this task is highly unlikely.

WP 7.2. Analysis and comparison of different exploitation schemes.

In that case, CR4 has performed an interesting analysis on the economic viability of CP farming in the Northeastern coast of Bahia. This research shows that CP production can represent an economic alternative for rural dwellers in the Southern Bahia region. Main identified investment costs were for purchasing the animals and building up the facilities. Among variable costs of production, feeding cost were by far the most important. This analysis provided the basis of an oral communication that was presented in an international Congress on wildlife management in Amazonia and Latin America held in Iquitos in September 2004. The written communication of this work can be found as the only report of this WP7.

WP 7.3. Study of the market possibilities for CP products.

Activities on this subject have been limited to revision of literature on this subject during 2003. However, no activity on market study has been initiated during 2004 and the coordinator is not aware that this situation will change in 2005.

g.2 – Problems

The main problem in this WP has been the lack of commitment of CR8 (Embrapa Gado de Corte) in undertaking the activities originally programmed in this WP7, for which CR8 was appointed as a WP leader in the contract signed with the European Commission.

During our last visit to Brazil in May 2003, Embrapa Gado de Corte claimed that they were retiring from the INCO project leaving all the responsibility to Embrapa Pantanal. Nevertheless, the later institution was not appointed nor has the skills to undertake socio-economic studies. In that sense, the whole input in this WP is being furnished by the socio-economic studies performed by CR4.

g.3 - Outline for the next year

CR3 has started an economical comparative analysis of three different kinds of CP production systems according to the systems of production and the number of breeders available, distinguishing between intensive, semi-intensive and extensive breeding systems. This can provide a basis of typology of different CP production systems according to the models addressed by the project. Compared data will be hypothetical but solidly based on the existing breeding systems addressed in Task I of this project (intensive), and in Task II (semi-intensive or extensive). Data from the Bahia semi-intensive farm will be gathered during the next visit that CO1 and CR4 will perform in April 2005.

From here to the end of the project, data will be comparatively analysed in order to determine which one is in theoretical terms the most profitable system of CP production in economic terms. Hopefully, this eventually provide the basis for WP7.2.: Recommendations for future developments of the CP industry.

2 – MANAGEMENT ANNUAL REPORT

2.1 – Overview of collaboration between partners during the period

2.2 – Meetings

2.3 – Scientific Exchanges

2.4 – Outlines for 2005

MANAGEMENT ANNUAL REPORT

2.1 - Overview of collaboration between partners during the period

Scientific exchange between partners of different countries and institutions, in terms of human resources, still appears as one of the strong points of this PECARI project.

Collaboration is strong in most of workpackages, involving several partners:

In WP1, fluid scientific cooperation between CR2 (UAB), CR7 (MNHN) and the partners from Peru and Brazil, has been instrumental for the outcome of a PhD thesis on the reproduction of the CP, resulting in an important number of publications.

In WP4, a large number of interactions also exists in the Eastern part of Brazil between CR6 (UFPA in Amazonia) and CR3 (UESC in Bahia). As a result of this important exchange, Dr. Yvonnick Le Pendu, initially working at CR6, has been employed as a permanent staff by CR3 since 2004.

In WP5, collaboration with CR8 is important and leading to an important number of collaborations in the Pantanal, particularly with external partners such as Earthwatch Institute and Conservation International. Collaboration between CO1 and CR4 in the Pantanal is becoming more fluid and hopefully will increase. Collaboration between CR3 and CR4 in Bahia has also improved.

For WP6, exchanges and level of communication between CO1 and CR3 are fluid and leading to a good and confident collaboration. Collaboration with CR8 is variable, depending on the center of Embrapa involved. They are fluid with Embrapa Pantanal and more difficult with Embrapa Gado de Corte.

The later is responsible for WP7 and task WP6.4, and level of collaboration has diminished since they resigned to continue in the project and passed on the whole responsibility of the project to Embrapa Pantanal.

In the case of WP6, it is uncertain at the time of writing this report, if CR8 through scientist José Carlos Chaves will continue working on the development of a computer model. A high level of networking and exchange will be necessary from CR8, with other partners working with CP ecology in the pantanal and also with scientists working with computer modeling at CO1 to succeed in this task.

During 2005, some efforts of communication and exchange need to be strengthened in some workpackages:

CR8 should encourage the exchanges of information concerning the construction of the computer model of WP6. In the case of being continued, this work will need an important cooperation and exchange of information between the different teams of research working in the Pantanal, including CO1 (CIRAD), CR8 (EMBRAPA) and CR4 (DICE).

Equally , CR5 should be more pro-active with the other partners of the consortium in the task of gathering health information from the other partners in Brazil to complete the database on health problems in CP under production.

Finally, the use of a common platforms of exchange and communication between different partners available in the Web page of the project has so far received very little attention from the consortium. This is probably because confidence links between partners and collaborations are build on a particular basis depending on personal and professional affinity rather than on an obligation basis. The only interactive activity in which several partners have participated is the building of bibliographic data base on CP, which hold now 34 references.

2.2 – Meetings

This year several meetings between partners have occurred during the celebration of international congresses or scientific events.

• May 2004, Pantanal

Early May, Marie-Noël de Visscher and Mathieu Bourgarel (CO1) visited EMBRAPA Pantanal, to define Task II work priorities in the Pantanal, assess the work so far conducted, exchange ideas and present a model being developed by CIRAD and Zé Carlos Chavez to model collared peccary populations in the Pantanal.

WP6 team members Mathieu Bourgarel, Ubiratan Piovezan, Zé Carlos Chavez and Elisabete Marques de Jesus Costa met with Arnaud Desbiez (CR4) at the end of May in Campo Grande to discuss the SMA model under development at Embrapa Gado de Corte in Campo Grande (CR8).

• July 2004, Paris

In the beginning of July 2004, CR3, CO1 and CR6 members met in Paris during the 6th International Wildlife Ranching Symposium to present several oral and written communications issued from the project and to discuss about on going collaborations. The congress was co-organized by CO1, among other institutions. A total of 3 oral communications and 4 posters based on results issued from the INCO PECARI project were presented at this event.

• July 2004, Barcelona

At the end of July, CO1 (Ferran Jori), CR2 (Manel Lopez Bejar), CR4 (Richard Bodmer) and CR7 (Robert Mauget) met at the Autonomous University of Barcelona for the PhD thesis presentation of Pedro Mayor (CR2), concerning the reproduction of the CP female in captivity. CR4 and CR7 were part of the PhD Jury and CO1 and CR2 were co-directors. The PhD thesis obtained the highest qualification and the European Doctorate label (the 2nd in the whole university). It was also a good opportunity to discuss about ongoing collaborations between partners.

- **August 2004, Porto Seguro (Brazil)**

Pedro Mayor assisted to the 15th International Congress on Animal reproduction in Porto Seguro, Brazil, where he met with scientists from CR6.

- **September 2004, Iquitos (Peru)**

In September all members of the INCO PECARI except for CR7, met in Iquitos Peru, during the VI Latin American Congress of wildlife management organized by CR4. They were involved in several round tables and workshops concerning captive breeding of wildlife and collared peccary ecology. A total of 10 oral communications and 5 posters presenting results produced from the INCO PECARI project were exposed. It was a good opportunity to meet with other institutions and scientific colleagues working on wildlife production in other parts of Latin America. During this event, it was decided that the VIIth Latin American Congress of wildlife management would be held in Bahia and hosted by CR3 and CR4 as co-organizers.

2.3 - Scientific exchanges

2.3.1 - Personnel exchanges

Long term (more than 3 months)

- Yvonnick Le Pendu formerly invited researcher at the University of Para (CR6), has been contracted as permanent staff to the University of Santa Cruz in Ilhéus (CR3) and will carry on working on research activities of WP4.
- Arnaud Desbiez from DICE (CR4) is performing his PhD in Brazil hosted by EMBRAPA Pantanal (CR8).

Short exchanges

- Pedro Mayor, will spend several months at UESC (CR3) performing the remaining experiments on CP reproduction in Bahia.
- José Carlos Chaves from Embrapa (CR8) moved to CIRAD in Montpellier (CO1) for 4 months in order to get support from CO1 on the construction of the WP6 computer model. This training session was possible through the funding of the European Commission through an Alpha Project to promote scientific exchanges between France and Brazil.

2.4 - Outline for 2005

This is the final year of the project. Besides most of the activities of the project are in its final phases, a certain degree of exchange will still occur between partners in order to achieve the programmed activities. It will be also the time to discuss between partners about results exploitation and future collaborations above the INCO PECARI project.

2.4.1 -Personnel Exchanges

During 2005, the following scientific exchanges have already been programmed.

Pedro Mayor from CR2 will travel to Brazil and Peru to finalize some ongoing work concerning reproduction with CR6 and CR5.

Ferran JORI (CO1) will visit Bahia in March-April 2005 in order to collect data on productivity of large scale semi-intensive CP production systems.

Arnaud Desbiez, from CR4, will carry on working in the Pantanal hosted by CR8.

2.4.2 – Scientific collaboration and meetings

The final meeting is programmed to be held in the Pantanal during August 2005 in typical Pantanal lodge. The fact of celebrating the meeting 4 months before the end of the project, will leave the consortium enough time to attend administrative obligations (Reporting, TIP) before closing date in December 2005.

2.5 - Problems

Funding difficulties: An important delay in the arrival of funds from the European Commission rendered again the continuity of the activities very difficult for some of the partners with less financial autonomy, particularly in Latin American countries. Indeed, the first intermediate payment originally planned in the first trimester of 2004, only occurred at the beginning of 2005. As result, some of the activities in Brazil and Peru experimented some delays.

Internal misunderstanding between Embrapa Centers (CR8).

The performance of CR8 concerning WP7 is worrying because so far, because despite the enormous importance of this task within the project, no detailed program of activities for the development of this task has been submitted to the coordination. Moreover, CR8 has not proposed any person with sufficient expertise in the area of socio-economic studies in order to undertake this task with a reasonable probability of success. A letter will be sent to the direction of Embrapa, asking them to take into consideration this point and to propose a solution.

CONCLUSIONS

The project is ending its last year of activity. In general terms, the project is progressing well and producing a substantial amount of information that can provide the basis for a future development of CP production in Latin America.

Exceptions made, the consortium built within the project is solid and in some cases, it is leading to institutional links that will remain beyond the duration and the scope of the project. Scientific contribution is being considerable if we consider that six publications, 37 communications and a PhD have already been produced and a considerable number of scientific papers are under preparation or in press.

Contributions to help out on the development of CP production have been so far important, particularly concerning intensive production systems: The project has provided considerable information in the field of CP reproduction which allow now the possibility to increase the reproductive productivity of CP herds under captivity. As an example, a non invasive ELISA test to detect hormones in faeces has been validated. The reproductive cycle in the CP female is now well known, and ultrasound techniques have proved to be useful in the detection of pregnancy in CP.

In addition, the project provides evidence that CP herds under production can grow rapidly and that sanitary or behavioural factors do not appear as limitant factors in it. Moreover, the ability of CP to convert fiber into protein, opens up the possibility to feed the animals with low cost efficient diets, out of agricultural by products.

Despite major contributions have dealt with small scale production systems suitable for forested areas such as the Amazon Basin, the project is collecting data on other systems of CP production at a larger scale that appear as promising alternatives for the commercial production of CP meat and hides. Moreover, despite results, concerning the exploitation of free ranging CP herds (Task II), do not allow to expect major developments in the management of that species alone, the INCO PECARI project is producing very new and valuable information on the ecology of that species in the Pantanal and the Atlantic forest of South Bahia State and suggests that some of the methods tested for the management of CP in the Pantanal appear also as technically acceptable for the exploitation and management of sympatric species of wild suiforms such as the feral pig or the white lipped peccary.

In terms of impact, results of the project can benefit scientists working in the fields of tropical animal production, wildlife ecology and management and rural development in Latin America. In that sense, the project can contribute to the development of small scale CP production in the Amazon for production of meat and hides. In Peru, this activity represents an economic alternative for rural dwellers and great opportunity for the CP leather industry to be furnished with a substantial amount of pelts of better quality than those obtained as a by-product of hunting. In this context, a growing interest is being expressed by several development and scientific institutions and private firms, since CP intensive farming appears as an appealing activity with productive and economic potential and this is being confirmed by our project. In addition, experimental farms supported by the project in Peru and Brazil are a public demonstration of CP production potential. In those farms CP population has grown exponentially and animals stocks are being used to create new farms with a perspective of commercial production.

Therefore we can say that the INCO PECARI project is responding well to a public demand and is actually reaching the goal to fill a gap in the production of scientific information about the viability, the advantages and the limits concerning the potential of CP production in Latin America. This tendency should be emphasized during 2005.

ANNEXES

ANNEXES

ANNEXE 1 - WP1 ANNUAL REPORT

WP1 : Studying the reproductive physiology of the CP

Appendixes

ANNEXE 2 - WP2 SCIENTIFIC REPORT

WP2 : Developing efficient diets from locally available food resources

Appendixes

ANNEXE 3 - WP3 ANNUAL REPORT

WP3: Assessing and improving the health status of CP

ANNEXE 4 - WP4 ANNUAL REPORT

WP4 : Reducing aggression and stress in captive CP

Appendixes

ANNEXE 5 - WP5 ANNUAL REPORT

WP5: The ecology of natural populations of collared peccary (*Tayassu tajacu*) under natural conditions in cocoa farms in the Brazilian Northeast and the cattle ranches of the Pantanal

ANNEXE 6 - WP6 ANNUAL REPORT

WP6: Experimenting innovative schemes of CP harvest under quasi-natural conditions

Appendixes

ANNEXE 7 - WP7 REPORT: STUDY ON ECONOMIC VIABILITY OF CP FARMING IN BAHIA

ANNEXE 8 - PROJECT DATA SHEET 2004

ANNEXE 1 - WP1 ANNUAL REPORT

WP1 : Studying the reproductive physiology of the CP

Appendixes to Annex 1 :

Appendix 1: Scientific production within deliverable D 1.2

Appendix 2: Scientific production within deliverable D 1.3

Appendix 3: Deliverable D 1.4: Paper published in "Anatomy- Histology- Embriology"

Appendix 4: Scientific production within deliverable D 1.5

ANNEXE 1 - WP1 ANNUAL REPORT

A- WP1 : Studying the reproductive physiology of the CP

WP leader: CR2

Participants: CR7, CR5, CR3 and CR6

Executive summary

Different activities have been performed to increase knowledge on the reproductive physiology and the establishment of diagnostic methods of reproductive events which occur in the female of the CP. The efficacy of an ELISA test for determination of progesterone in faeces has been confirmed this year in various activities of the WP. General features of the oestrous cycle of the CP have been studied. The analysis at regular intervals of time of vaginal smears, external genital features and oestradiol values in blood suggest that females in captivity show a polyoestrous reproductive pattern with no seasonal effect in the Peruvian and Brazilian Amazon. The efficacy of pregnancy diagnosis by ultrasonography has been confirmed. The earliest definitive pregnancy diagnosis could be performed on Day 18 of pregnancy. Sensitivity of the pregnancy diagnosis on Day 26 was 100%, and specificity on Day 28 was 100%. Consequently, from a practical point of view, we determined that pregnancy diagnosis through ultrasonography could be performed on Day 28 of pregnancy. The existence of a fertile oestrous cycle in the early postpartum period has been confirmed by progesterone levels in faeces, vaginal smears, external genital features, oestradiol levels in serum and finally establishment of a pregnancy. The existence of a fertile oestrus at the postpartum period in lactating females has also been confirmed by productive data from CR5 and CR6 farms. Macroscopic and microscopic features of the genital organs of the CP female have been studied.

a.1 - Technical Overview

The activities performed during the third year of the project in the WP1 have been mainly headed to satisfy one of the two aims of this WP: to provide data on the reproductive physiology of the CP. The experiments directed to satisfy the second aim of this WP (to improve reproductive efficiency of the CP under captive breeding) have been started and will continue during the next year.

The work performed in this period of time has been developed following the proposed "timetable of activities". The activities performed have been developed in the six different proposed experiments:

- WP1.1: ELISA test for determination of sexual hormones in faeces.
- WP1.2: Study of the oestrous cycle of the CP.
- WP1.3: Pregnancy monitoring by ultrasonography.
- WP1.4: Influence of lactation on postpartum oestrus.
- WP1.5: Hormonal control of the oestrous cycle in the collared peccary female.
- WP1.6: Study of the functional anatomy of the female genital organs.

WP 1.1: ELISA test for determination of sexual hormones in faeces.

The ELISA test developed by CR7 for determination of progesterone in faeces has been used to get data in experiments WP1.1, WP1.2, WP1.3, WP1.4, and WP1.5. Progesterone in faeces samples collected by CR2 from females maintained in CR6 experimental farms has been measured. These samples were obtained at regular intervals from: *i*) females isolated from males, *ii*) females maintained with males, *iii*) pregnant females, *iv*) lactating females at the postpartum period, and *v*) females with a prostaglandin injection at the luteal phase of the oestrus cycle.

The previous year, results from RIA and ELISA tests, on serological and faecal samples respectively, showed that progesterone contents in non-pregnant females isolated from males were continuously low. By contrast, progesterone levels of pregnant females were considered to be normal values for this reproductive state. In order to obtain an explanation to this fact, CR2 collected faeces samples in CR6 lab from females isolated from males, and females in continuous contact with males. CR7 analysed those samples and progesterone values in the luteal phase were similar in females from both groups. These results suggest that the continuous low progesterone values obtained from females isolated from males in CR5 farms can be due to technical aspects (probably due to sample conservation because progesterone is a very labile compound). However, physiological causes (females in anoestrus) cannot be completely discarded.

The efficacy of the ELISA test as a method to monitor reproductive activity in the collared peccary will be reported in a paper that is being prepared with results from WP1.2 and WP1.3.

WP1.2: Study of the oestrus cycle of the CP female.

During this year, CR2 have collected blood and faeces samples during the dry and humid seasons from adult females in the CR6 farm. Faeces samples have been shipped to CR7 and blood samples analysed in CR2 lab. Oestradiol and progesterone values in blood and progesterone in faeces confirm that females in captivity show a polyoestrous reproductive pattern with no seasonal effect, at least in the Peruvian and Brazilian Amazon. The study of a total of 47 oestrous cycles of 14 captive collared peccary females allowed determining the utility of vaginal cytology and external genitalia features as diagnostic methods for predicting oestrus and the period of sexual receptivity. Based on serum 17 β -oestradiol measurements, we have observed that vaginal smears have detected the 80.8% of the total estruses and, appearance of external genitalia detected the 88.4% of the total estruses. The oestrus was characterised by presence of vaginal mucus, and reddish and tumefacted appearance of external genitalia. Females in oestrus showed increased density of superficial and intermediate cells in vaginal smears. Mating was located on the last third of the oestrous length. Based on 17 β -oestradiol and progesterone values, the oestrous cycle length of the collared peccary is 23 to 32 days.

These data will conform part of the Deliverable D1.2 and have been presented as communications to the VI International Conference on Wildlife Management in Amazonia and Latin America (Iquitos, Peru; 5-10 Sept. 2004; Deliverable D1.2d) and

15th International Congress on Animal Reproduction (Salvador, Brazil; 8-12 August 2004; D1.2c). Also as a part of this deliverable, a manuscript has been submitted to the journal *Animal Reproduction Science* (D1.2a). Another manuscript is in preparation with data obtained exclusively by the ELISA test developed by CR7 in WP1.1.

WP 1.3. Pregnancy monitoring by ultrasonography

Pregnancy diagnosis by ultrasonography was developed by CR2 in CR5 and CR6 farms. This study presents the first work through real-time ultrasonography in captive collared peccary females. The ultrasonographic study of 10 pregnant females allowed to diagnose pregnancy, based on the detection of the embryo, on Day 22 in average (n=10). Nevertheless, the earliest definitive pregnancy diagnosis could be performed on Day 18. Sensitivity of the pregnancy diagnosis on Day 26 was 100%, and specificity on Day 28 was 100%. Consequently, from a practical point of view, we determined that pregnancy diagnosis through ultrasonography could be performed on Day 28 of pregnancy. Foetal measurements of collared peccary were collected in order to estimate gestational age and predict parturition day. The foetal measurements which presented higher correlations with the gestational age were crown-rump-length (CRL), thoracic length and diameter. CRL was assumed to be the most practical measurement because, contrary to thoracic foetometry, it was available since the first embryo detection.

The study of progesterone and 17beta-oestradiol serum profiles in pregnant females, allowed determining an increase in progesterone levels by Day 4 after conception, reaching levels of 33.4 ± 5.6 ng/ml serum on Day 10 of pregnancy. Serum levels of progesterone between Days 10 and 130 of pregnancy were maintained at values between 20 and 60 ng/ml. Three to six days before parturition a decrease in progesterone levels (<15 ng/ml) was detected. During the two first weeks of pregnancy, serum 17beta-oestradiol concentrations showed no detectable levels. From Day 15 of pregnancy onwards, the females showed an increase of concentration, reaching levels of 70 pg/ml between Days 20 and 115. From Day 120 onwards, 17beta-oestradiol levels regularly increased, reaching levels of 131.4 ± 40.8 pg/ml in the parturition day. This increase of oestradiol levels during pregnancy could be used, in combination to progesterone levels, for pregnancy diagnosis. The examination of vaginal cytology in 4 collared peccary females showed a pattern of change of the cells of vaginal epithelium between Day 25 and 115 of pregnancy. The external genitalia features showed no pattern of change through pregnancy of the CP.

Blood samples from pregnant females have been shipped to Dr. JF Beckers's lab (Laboratory of the *Physiologie de la reproduction animale*, Université de Liège, Belgium) to try to detect pregnancy-associated glycoproteins (PAGs) to be used for early diagnosis of pregnancy.

As parts of the deliverable No D1.3, a paper is in press in the journal *Theriogenology* (Deliverable D1.3a), a communication has been presented to the 15th International Congress on Animal Reproduction (Salvador, Brazil; 8-12 August 2004; D1.3.b), another communication was presented at the 6th International Wildlife Ranching Symposium (Paris, France - July 2004; D1.3c), another one to the VI International

Conference on Wildlife Management in Amazonia and Latin America (Iquitos, Peru; 5-10 Sept. 2004; Deliverable D1.3d), and two manuscripts are in preparation, one of them about hormonal profiles during pregnancy and the second about non-invasive diagnosis of the reproductive state with results from WP1.2.

WP1.4: Influence of lactation on postpartum oestrus

Serum progesterone and 17 β -oestradiol profiles, and several features of vaginal smears and external genitalia were analyzed in 20 animals housed with their piglets during the first postpartum month in CR6 farm. This study allowed confirming the occurrence of an ovulatory and fertile oestrus in the early post-partum period. Sixteen out of the 20 collared peccary females presented a serum 17beta-oestradiol peak (53.4 pg/ml) on Day 7 \pm 1.5 of the post-partum period. Serum progesterone levels increased from Day 10 to 18 post-partum, reaching levels of 30.8 \pm 4.9 μ g/ml. In these cycling females, a pattern of change on the cells of vaginal epithelium it was observed. Nine (45%) females presented sperm cells through vaginal cytology on Day 8.8 \pm 1.3 of the post-partum period, and 6 (30%) became pregnant. Four (20%) females showed no oestrous signs and progesterone and 17beta-oestradiol levels presented basal values.

Productive data of CR6 farm, mainly calving intervals, has been used to confirm the existence of a fertile oestrous cycle few days after calving.

The results from this WP will form part of the Deliverable 1.2. A manuscript has been submitted to the journal *Theriogenology* (D1.2.b), and a communication has been presented at the VI International Conference on Wildlife Management in Amazonia and Latin America (Iquitos, Peru; 5-10 Sept. 2004; Deliverable D1.2e).

WP 1.5. Hormonal control of the oestrous cycle in the collared peccary female

This experiment has started this year with the collection of faeces samples and study of vaginal smears and external genitalia by CR2 in CR6 farms after an injection of an analogue of prostaglandin F2alpha to females in the luteal phase of the oestrous cycle. CR7 have analysed faeces samples to measure progesterone levels before and after the prostaglandin injection. Preliminary results suggest that only two females from seven experimental females were responsive to the prostaglandin injection. Further experiments are required to state if the injected dose is insufficient to provoke corpora lutea luteolysis. These activities will be implemented during the next year.

WP 1.6. Functional anatomy of the CP female genital tract

This experiment is close to be finished with the publication of a manuscript about anatomical and histological features of the genital tract in the journal *Anatomy, Histology and Embryology* (Deliverable No D1.4a), and another paper on ovarian features, characterising ovarian structures by histology and immunohistochemistry, which is under submission in a peer-review international journal.

Observations indicate that the female CP has a mean ovulation rate of 2.3 \pm 0.6 follicles and a mean ovum mortality of 0.4 \pm 0.6 oocytes or embryo per pregnancy. The females presented a follicular wave involving the synchronous growth of a

group of follicles from which several seem to attain dominance over the others. The presence of antral follicles in pregnant females suggests that a follicular turnover could be taking place during pregnancy. Immunohistochemistry showed that luteal cells from active corpora lutea presented intensive 3beta-HSD activity at advanced stages of pregnancy, suggesting the necessity of the corpora lutea for maintaining the pregnancy of the CP, similarly to the domestic pig. One manuscript is being prepared to be submitted to a peer-review journal on morphology (D1.4b).

Overall reproductive parameters

Reproductive parameters of two collared peccary farms located in Iquitos (Peru) and Belém (State of Pará, Brazil) were analysed. Parturitions occurred throughout the year. The mean duration of the gestation was 138 days (n=12). The average litter size was 1.9 newborns per parturition (n=53). Collared peccary females had a newborn sex ratio of 48.2% males and 51.8% females. The mean age at first parturition was 615 days. Nevertheless, the earliest first parturition occurred at 381 days old. Mean age at first conception was 453 days (n=19), and the earliest estimated first conception was 239 days. First post-partum oestrus was observed at 8.6 days (n=18). The estimated parturition-conception interval was 41 days (n=32). The mean farrowing interval was 179 days (n=32). Mean production was 2.35 litters per female and year. Taking into account the prolificacy and number of births per female and year, the reproductive production was 4.4 newborns per female and year (n=32). Production in Iquitos was 2.1 litters per female and year, and 3.3 newborns per female and year (n=8). This study suggests that CP bred in captivity presents interesting reproductive parameters for the zootechnical development of this species. These data are included in a communication presented at the 6th International Wildlife Ranching Symposium (Paris, France - July 2004; D1.5b).

A PhD thesis (D1.5a) has been presented at the *Universitat Autònoma de Barcelona* (Spain) by Dr Pedro Mayor (CR2), under supervision of Dr Lopez-Bejar (CR2) and Dr. Jori (CO1), with data get from the activities of the project. This doctoral thesis has get the European label.

a.2 - Problems

- With the extension of the project for 1 year, activities forming WP1.5 have been postponed to be carried out during the last year of the project.
- LH and FSH in serum were tried to measure by CR2 by RIA with kits developed for the porcine proteins, but the results were not successful. No commercial kits are available for this purpose.
- The laptop acquired by CR2 to be used in CR5 and CR6 labs was robbed this year in Brazil when Dr. Mayor was travelling to Peru. The correspondent notification of the crime was performed in a local police station.

a.3 - Outline for the next year

WP1.1.

The next year, CR7 will receive samples to continue experiments of WP1.5. A manuscript about the efficacy of the test is being prepared with data from Experiment WP1.2.

WP1.2.

This experiment will finish with the preparation and publication of different manuscripts. At this moment, 2 communications to international meetings have been presented. Also, a paper is under submission to a peer-review international journal and another one is close to be finished and submitted to another international journal.

WP 1.3.

The efficacy of pregnancy diagnosis by ultrasonography has been demonstrated. A paper about the efficacy of ultrasonography for pregnancy diagnosis and features of the embryo/foetal development is in press in the journal *Theriogenology*. In addition, three communications to international meetings have been presented.

WP1.4.

This study is finished because reproductive data from CR5, CR6 and CR7 farms confirm experimental data demonstrating that a fertile oestrus exists early in the postpartum period of lactating CP females. A manuscript has been submitted to a peer-review international journal.

WP1.5.

This experiment will continue with the study of the efficacy of prostaglandin F2alpha to provoke luteolysis in the CP. The prostaglandin F2alpha dose will be increased to a value similar to the dose used in pigs. This experiment will be performed in CR6 farms and faeces samples to measure progesterone will be shipped to CR2 to be analysed by CR7. After this study, a new one analysing the efficacy of eCG and hCG will be started.

WP1.6.

A manuscript about the functional anatomy of the ovary is being submitted to a peer-review international journal.

Appendix 1: Scientific production within deliverable D 1.2

- a) Manuscript submitted to "Animal Reproduction Science"
- b) Manuscript submitted to "Theriogenology"
- c) Communication presented at the 15th International Congress on Animal Reproduction, Salvador (Brazil), August 2004
- d) Communication presented at the VIth International Congress on Wildlife Management in the Amazonia and Latin America, Iquitos (Peru), September 2004

Characteristics of estrus in the female collared peccary (*Tayassu tajacu*) from the Eastern Amazon region

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Abstract

This report describes the characteristics of external genitalia and vaginal cytology of the female collared peccary (*Tayassu tajacu*) from the eastern Amazon and relates these to sexual receptivity during estrus. Two consecutive studies were performed. The objective of the first was to characterize the features of external genitalia and vaginal smears of females showing estrous signs. The second study was designed to evaluate the effectiveness of these features for predicting the period of mating acceptance. In Study 1, we monitored 47 estruses in 14 captive females. All females showed a serum estradiol peak approximately every 20 days. This peak was used as an indicator of estrus. Estrus was characterized by a reddish, swollen appearance of the vulva, the presence of vaginal mucus and vaginal opening. These four estrous signs (swollen vulva, reddish color of vulva, vaginal mucus, and vaginal opening) persisted for 4 ± 1.8 (mean value \pm SD), 3.9 ± 1.4 , 2.4 ± 1.3 , and 2.1 ± 0.8 days, respectively and appeared 2.8 ± 1.2 , 2.3 ± 0.9 , 1.1 ± 0.5 , and 1.3 ± 0.7 days before the serum estradiol peak. In vaginal smears, superficial plus intermediate cells became predominant (accounting for 60% of all cells) for a 4.4 ± 2.6 day period, as from 2.3 ± 1.5 days before the estradiol peak. Superficial cells did not attain their maximum density (45% of all cells) until immediately before (0.8 ± 0.5 days) the serum estradiol peak. Following estrus, superficial and intermediate cells were notably reduced and the appearance of the external genitalia was characterized by a pale, non-swollen vulva and vaginal closure. Based on serum estradiol determinations, the overall accuracy of external genitalia and vaginal cytology changes for the detection estrus were 83.9% and 83.7%, respectively. For the second study, every female used in Study 1 was presented to a single male until mating or for a 30-day period. Mating was confirmed in 10 out of the 14 cyclic females and occurred 3.1 ± 0.9 , 1.02 ± 0.25 , 2.76 ± 1.23 , and 1.3 ± 0.7 days after the first four signs of estrus defined in Study 1, respectively, and 0.6 ± 0.5 days after the superficial/intermediate vaginal cell peak. We were therefore able to

identify the time of sexual receptivity as the last third of the period during which estrous signs were shown. In conclusion, examining the external genitalia and taking a vaginal smear constitutes a useful method of detecting estrus and predicting the period of male acceptance of the collared peccary female. Estrus was indicated by a predominance of superficial cells, and a proportion of surface plus intermediate cells higher than 60% in the vaginal smear.

Key Words: collared peccary, *Tayassu tajacu*, estrus characteristics, vaginal cytology, external genitalia, mating

1. Introduction

The collared peccary (*Tayassu tajacu*), a member of a family within the Suiformes, is an important source of meat for local people across the Amazon and is among the most hunted species in this region (Redford, 1993; Robinson and Redford, 1993). Hence, in tropical forests where there is considerable demand for peccaries, effective captive breeding programs could be used as a sustainable system for the production of this animal. Field studies have shown that in the Amazon region this species breeds throughout the year with little or no seasonal periodicity (Gottdenker and Bodmer, 1998). The reproductive features of the collared peccary female established in experimental studies include an estrous cycle of 22 to 28 days (Mauget et al., 1997; Sowls, 1997), a sexual receptive period from 2 (Lochmiller et al., 1984) to 4 (Mauget et al., 1997) days, a mean gestation period of 138 ± 5 days (Mayor et al., 2004b) and a low litter size, in the range of 1.7 to 1.9 fetuses or newborns (Gottdenker and Bodmer, 1998; Lochmiller et al., 1984; Mayor et al., 2004a, 2004b; Sowls, 1997).

Before appropriate management practices can be established to exploit the collared peccary, it is essential we improve our current knowledge of its reproductive physiology. Vaginal cytology and features of the external genitalia have been identified as effective tools for detecting estrous cycle events in the domestic pig (Gordon, 1998). Also, vaginal cytology has

[illegible]

FIRST POSTPARTUM ESTRUS AND PREGNANCY IN THE FEMALE COLLARED
PECCARY (TAYASSU TAJACU) FROM THE AMAZON

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ABSTRACT

Herein, we describe the reproductive pattern of the lactating collared peccary (*Tayassu tajacu*) during the postpartum period. Serum progesterone and 17 β -estradiol profiles, and several features of vaginal smears and external genitalia were analyzed in 20 animals housed with their piglets during the first postpartum month. The appearance of external genitalia showed no variation in any of the females: a shallow, reddish vulva, and vaginal mucus were constant features throughout the study. Based on hormonal and vaginal smear cell patterns, 16 (80%) of the 20 peccaries showed estrous signs and were considered cyclic. The remaining 4 females (20%) showed no estrous signs and low levels of progesterone (0.86 ± 0.44 ng/mL) during the postpartum period. In the cyclic peccaries, a serum 17 β -estradiol peak (53.4 pg/mL ± 8.1 pg/mL) was observed on postpartum Day 7 ± 1 , along with a linear increase in progesterone concentration from 3 (4.3 ± 2.6 ng/mL) to 11 (30.8 ± 4.9 ng/mL) days after this estradiol peak. Proportions of the different cells of the vaginal epithelium also changed in these females: superficial plus intermediate cells amounted to 76% of the cell total from 6 to 9 days postpartum, corresponding to the estradiol peak. Nine (56%) of the 16 cyclic females were mated, indicated by the presence of sperm cells in their vaginal smears, and 6 (67%) became pregnant, reaching term. Non-pregnant cyclic females ($n = 10$) showed a steady decrease in serum progesterone concentration from 11 to 23 days after the estradiol peak, when basal levels were attained and a new estradiol peak registered, indicating the resumption of cyclicity in these females. The time interval between the two estradiol peaks was 23.5 ± 2.1 days in these females. In pregnant females, progesterone concentrations continued to rise to levels of 60 ng/mL ($n=6$) 23 days after mating. These findings indicate that the lactating collared peccary female can become cyclic and fertile during the early postpartum period, and that a predominance of superficial plus intermediate vaginal cells can be taken as the first sign of estrus.

ESTRUS DETECTION BY USING VAGINAL CYTOLOGIC AND EXTERNAL GENITALIA EXAMINATION IN COLLARED PECCARY (*TAYASSU TAJACU*) FEMALES IN NORTHEASTERN AMAZON

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INTRODUCTION

The collared peccary (*Tayassu tajacu*) represents an important source of meat for local people in northeastern Peruvian Amazon. Efficient captive breeding programs could be considered an effective system of exploiting this species. The optimization of breeding management of wild species in captivity can be obtained through the development of reliable methods for monitoring the reproductive cycle. The objective of the present study was to determine, based on serum 17 β -estradiol concentrations, whether exfoliated cells from the vagina and external genitalia features may act as indicators of the estrus phase of the sexual cycle in the collared peccary.

MATERIALS AND METHODS

Fifteen females were maintained in captivity on an experimental farm in Iquitos (Peru) between March 2002 and March 2003. The examination of external genitalia features and vaginal smears were performed four times per week during two 75-days periods, one in the moist and other in the dry season. The examination included observation and description of the vulva area, indicating presence and subsequent description of an external vaginal membrane, and vaginal mucus. Vaginal cells were obtained by passing a cotton-tipped swab into the caudal vagina and stained with Diff-Quick[®] stain. Vaginal epithelial cells were described in order to determinate the phase of the sexual cycle. Blood samples were collected three times per week during the two experimental periods and 17 β -estradiol values measured by RIA with a commercial kit (ICN Pharmaceuticals, CA).

RESULTS AND DISCUSSION

Fourteen out of 15 females showed periods with significant 17 β -estradiol peaks (peak

mean value: 124.6 \pm 21.1 pg/ml) at regular intervals of time, following the characteristic preovulatory increase in estradiol secretion of the late follicular phase of the sexual cycle. A total of 41 periods with peak values of estradiol were monitored. During the estrogenic predominant phase of the sexual cycle, when blood levels of estradiol were high and increasing to reach the peak value, the vulva and vaginal opening were reddish and tumefacted. The reddish appearance of the external genitalia was observed for 3.92 \pm 1.42 days, vulva tumefaction for 3.97 \pm 1.78 days and presence of fluid vaginal mucus for 2.45 \pm 1.30 days. Females in this phase showed increased density of surface and intermediate cells in vaginal smears. The predominance of surface and intermediate cells in the vaginal mucus at a proportion higher than 40% could be used as an estrus indicator. The highest density of surface cells in vaginal cytology was delayed 0.78 \pm 0.45 days from the serum 17 β -estradiol peak. When the estradiol values were low, surface and intermediate cells were notably reduced in proportion and the vagina presented a pale and non-tumefacted vulva and a vaginal closure membrane. Based on serum 17 β -estradiol values, we have observed that the study of vaginal smears allowed predicting 88.4% of the total peak values of estradiol and, the study of changes in morphological features of the external genitalia allowed detecting 90.5% of the total peak values of estradiol. Females in captivity showed spontaneous peaks of estradiol in a continuous pattern. This study confirms vaginal cytology and external genitalia examination as useful tools to diagnose successfully the estrus period of the sexual cycle of the collared peccary.

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Características del estro de la hembra de pécari de (*Tayassu tajacu*) del este amazónico

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Resumen

Este estudio describe las características morfológicas de los genitales externos y los cambios del epitelio vaginal durante la fase de estro de la hembra de pécari de collar (*Tayassu tajacu*). Se analizó un total de 47 ciclos estrales de 14 hembras mantenidas en cautividad. La fase de estro se caracterizó por la apariencia tumefacta y rojiza de los genitales externos, presencia de moco vaginal y presencia de abertura vaginal observados durante un periodo de 4 ± 1.8 ($X \pm SD$), 3.9 ± 1.4 , 2.4 ± 1.3 , y 2.1 ± 0.8 días, respectivamente. Estos signos de estro pudieron ser observados 2.8 ± 1.2 , 2.3 ± 0.9 , 1.05 ± 0.5 , y 1.3 ± 0.7 días antes de la aparición del pico de estradiol sérico. El estudio de la citología vaginal mostró una predominancia de células superficiales e intermedias (con valores superiores al 60%) durante un periodo de 4.4 ± 2.6 días. Esta predominancia de células superficiales e intermedias se inició 2.3 ± 1.5 días antes del pico de estradiol sérico. La máxima densidad de células superficiales (45% respecto al total) se retrasó 0.8 ± 0.5 días respecto al pico de estradiol. Después de la fase de estro, el porcentaje de células superficiales e intermedias se redujo considerablemente, los genitales externos se presentaron pálidos y tumefactos, y la abertura vaginal permaneció cerrada. En base a los valores de estradiol sérico, el valor predictivo positivo de la fase de estro del examen mediante citología vaginal y cambios de los genitales externos fue de 86.4% y 88.9% respectivamente. De esta forma, se demostró que el examen de la citología vaginal y de los genitales externos constituyen una técnica útil para predecir la fase de estro de la hembra de pécari de collar.

Introducción

El pécari de collar (*Tayassu tajacu*) representa una importante fuente de carne para las poblaciones locales de las regiones amazónicas (Robinson and Redford, 1991) y está considerada como una de las especies más frecuentemente cazadas en América Latina (Redford, 1993). Los programas de cría en cautividad pueden ser considerados como sistemas renovables de explotación útiles en regiones de bosques húmedos tropicales donde exista una demanda real de proteína de origen animal de pécari de collar. Los estudios de campo muestran que esta especie presenta partos a lo largo del año, pudiendo ser considerada especie de cría no estacional en la región Amazónica (Gottdenker and Bodmer, 1998). Estudios experimentales demuestran que el pécari de collar presenta una longitud de ciclo estral entre 22 y 28 días (Mauget et al., 1997), un periodo de receptividad sexual de 2 (Lochmiller et al., 1984) a 4 (Mauget et al., 1997) días, una longitud de gestación de 145 días (Sowls, 1997) y un tamaño de camada bajo entre 1.7 y 1.9 fetos o recién nacidos (Lochmiller et al., 1984; Gottdenker and Bodmer, 1998; Mayor et al., 2004).

Es necesario profundizar en el conocimiento de la fisiología reproductiva del pécari de collar con la finalidad de establecer un sistema práctico de manejo más efectivo que repercuta en la producción de este suiforme. La citología vaginal y los hallazgos de los genitales externos han demostrado ser herramientas efectivas a la hora de determinar la fase de estro en el cerdo doméstico (Gordon, 1997). El uso de la citología vaginal en el manejo de animales silvestres

Appendix 2: Scientific production within deliverable D 1.3

- a) Manuscript in press in "Theriogenology"
- b) Poster presented at the 15th International Congress on Animal Reproduction, Salvador (Brazil), August 2004
- c) Poster presented at the 6th International Wildlife Ranching Symposium, Paris, July 2004
- d) Communication presented at the VIth International Congress on Wildlife Management in the Amazon and Latin America



Integrating ultrasonography within the reproductive management of the collared peccary (*Tayassu tajacu*)

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Abstract

Ultrasound imaging has been used to elucidate certain aspects of the reproductive biology of wild or endangered species. However, to our knowledge, this tool has not been used for reproductive monitoring of the collared peccary (*Tayassu tajacu*). In this study, real-time ultrasonography was used in 16 collared peccary females to diagnose early pregnancy status and predict gestational age. Based on the detection of an embryo, the earliest pregnancy diagnosis was made on Day 18 after mating, with the mean time needed for diagnosis being 22 days. Overall accuracies on Days 22, 26 and 28 were 56, 93, and 100%, respectively. On Days 26 and 28, all pregnancy and non-pregnancy diagnoses, respectively, were correct. The fetal measurements that best correlated with gestational age were crown-rump-length (CRL) and the length and diameter of the thorax. CRL was considered the most practical measurement because, contrary to thoracic fetometry, it could be determined when the embryo was first detected. Our findings revealed real-time ultrasound scanning to be a very accurate method for early pregnancy diagnosis and prediction of gestational age in the collared peccary.

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Keywords: Collared peccary; *Tayassu tajacu*; Ultrasonography; Pregnancy diagnosis; Gestational age

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b) Poster presented at the 15th International Congress on Animal Reproduction,
Salvador (Brazil), August 2004

PREGNANCY DIAGNOSIS IN THE COLLARED PECCARY (*TAYASSU TAJACU*) BY REAL-TIME ULTRASONOGRAPHY

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INTRODUCTION

The collared peccary (*Tayassu tajacu*) is a small artiodactyl that belongs to a separate family within the Suiformes, the Dicotylidae. This species is one of the most frequent hunted species in Latin America (1). Limited information about reproductive features of this species exists in the literature. The gestation period of the collared peccary is 144.7 days in average (2). A litter size of 1.65 to 1.93 fetuses or newborn animals/pregnant female in average has been reported (2,3,4). To our knowledge no data have been published on methods for pregnancy diagnosis in collared peccaries. Ultrasound imaging provides a potential tool for the elucidation of certain aspects of reproductive biology in wild or endangered species, such as pregnancy diagnosis (5). The usefulness of real-time transabdominal ultrasonography as a tool for pregnancy diagnosis in collared peccary females in northeastern Amazon was investigated.

MATERIALS AND METHODS

Twenty females were maintained in captivity on an experimental farm at EMBRAPA-UFPA, Belem do Para (Brasil), between June 2003 and January 2004. Examination of external genitalia features and vaginal smears were used to monitor the estrous cycle. Females at the estrus period were introduced to a single male. Coitus was controlled by the observation of sperm cells in vaginal smears. The day of first coitus was assumed to be the first day of pregnancy. After coitus detection, females were isolated from males. Real-time ultrasonographic pregnancy testing was conducted in a serial manner without sedation every 2 days beginning at day 12 after coitus using a scanner (Pie Medical) provided with a 5.0 MHz linear-array transducer. Transabdominal scanning with the females on lateral recumbency was performed at either the

left or right abdominal wall. After day 30 of pregnancy, ultrasound scanning was performed every 10 days. Confirmation of pregnancy was based on recorded farrowings or abortions. A diagnosis of nonpregnant was given only after both sides had been found negative. All the ultrasound exams and pregnancy diagnoses were performed by the same operator.

RESULTS AND DISCUSSION

Coitus was confirmed on 14 out of the 20 experimental females. Uterine changes associated with pregnancy were first detected at 12 days after mating, when anechoic fluid accumulated inside the embryonic membranes (5.4 mm in diameter) within the uterus. The embryo could be identified from day 18 onwards (22.4 ± 2.2 days of pregnancy in average). Between days 35 and 40 of pregnancy, the contour of the embryo was evident and it was possible to identify the general fetal structures: head, neck, abdomen and limbs. The fetal heartbeat was visible at day 45-50 of pregnancy. The sensitivity (correct detection of pregnancy) of the ultrasonographic test was 75% on day 24 but improved to 100% on day 26 of pregnancy (n=9). The test specificity (correct detection of nonpregnancy) was 100% at day 28 of pregnancy (n=5). These results show that real-time ultrasound scanning provides a very accurate method for pregnancy diagnosis in the collared peccary, enabling immediate decisions on its reproductive management.

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- c) Poster presented at the 6th International Wildlife Ranching Symposium, Paris,
July 2004

vegetation cover and wildlife habitat. This almost balanced natural environment lured more wild animals leaving the eastern side. The resulting increases in the wild animal population in the west has seen a marked rise in the CAMPFIRE revenue. Through participatory land use planning exercise by the Biodiversity Conservation project (CIRAD) in the eastern side a game ranch, game corridor and a Conservancy were identified and implemented. Through PRAs done it has been resolved that more game corridors need to be opened to minimise the human – wildlife conflicts (especially for elephants which are still found in the area) and conserve the important botanical sites identified in the area. CIRAD has proposed a Communal Conservancy in the western side that is intended to benefit ward 1, 2, and 11 residents. This proposal stems from the realisation of an almost stable ecosystem in this area as compared to the depleted eastern side. With the recently gazetted Traditional Leader's Act there is need for relevant stakeholders to do an awareness campaign on the roles of the traditional leaders in the conservation of their local natural resources.

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PREDICTION OF GESTATIONAL AGE IN THE COLLARED PECCARY (*Tayassu tajacu*) BY REAL-TIME ULTRASONOGRAPHY

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Abstract:

INTRODUCTION

The collared peccary, *Tayassu tajacu*, is a pig-like artiodactyl that represents an important source of meat for local people in Amazon regions (Robinson and Redford, 1991). The collared peccary female presents a gestation length between 141 and 151 days (Lochmiller et al. 1984; Sowls, 1997) and a low litter size (1.65 to 1.93 fetuses; Nogueira-Filho et al., 1991; Sowls, 1997; Gottdenker and Bodmer, 1998; Mayor et al., 2004). Ultrasonic imaging is a potentially valuable non-invasive tool to study the events of pregnancy and conceptus development in a wide range of wild or endangered species (Griffin and Ginther, 1991; Göritz et al., 1997). The objective of the present study was to characterize embryo and foetal development for estimation of gestational age in most stages of pregnancy of the collared peccary female in eastern Amazon.

MATERIALS AND METHODS

Ten females were maintained in captivity on an experimental farm at EMBRAPA-UFPA, Belem do Para (Brasil), between June 2003 and January 2004. Embryo and foetal development was monitored by real-time ultrasonography in a serial manner without sedation every 2 days beginning at day 10 after coitus using a scanner (Pie Medical, Maastricht, Holand) provided with a 5.0 MHz linear-array transducer. Transabdominal scanning with the females on lateral recumbency was performed at either the left or right abdominal wall. After Day 30 of pregnancy, ultrasound scanning was performed every 10 days. The duration of ultrasonographic exams was of 2 to 5 minutes per female. All measurements were made at the longest cross-sectional diameter or length in mm. Embryo-foetal parameters monitored included crown-rump-length (CRL), thoracic length (TL) and diameter (TD), skull length (SL) and biparietal diameter (BPD). Changes in size of various foetal parts were compared to known gestational age over time. All the ultrasound exams and pregnancy diagnoses were performed by the same operator.

Regression models were derived to estimate gestational age of the foetus from the biometric measures (Radcliffe et al., 2000; Place et al., 2000). The relationships between estimated gestational age (EGA) and each of the ultrasonographic measurements (CRL, TL, TD, SL and BPD) were plotted as linear regressions and expressed as straight-line equations using GraphPad Prism (GraphPad Software, San Diego, CA, USA).

RESULTS AND DISCUSSION

Uterine changes associated with pregnancy were first detected at 12 days after mating, as an anechoic fluid accumulation into the lumen of the uterine horn. The average diameter of the embryo vesicle at this stage was 5.4 mm. The embryo could be identified from day 18 onwards. On Day 20, the crown-rump length (CRL) and trunk diameter of the embryos measured 5.5 mm and 2.2 mm, respectively. On Day 30, the CRL and trunk diameter of the embryos measured 14.3 mm and 2.37 mm, respectively. Between days 42 and 49, the first signal of fetal ossification could be noticed. Foetal heartbeat was visible at Day 45-50 of pregnancy. The foetus in the first two months of

pregnancy presented a constant tendency of growth lower than 1.5 mm per day. Between Days 60 and 90, the greatest foetal growth occurred (2.0-3.0 mm per day).

CRL proved to be the most effective measurement, as it correlated well with gestational age [Estimated Gestational Age = $-4.953 + (0.2583 * CRL) + (0.00028 * CRL^2)$, with a R^2 of 0.9923, $P=0.0001$]. Our data indicate that real-time ultrasound scanning provides a very accurate method to monitor embryo and foetal development in the collared peccary. In wild animals, both introduced in captive breeding programs or in wildlife, the ability to accurately estimate the date of parturition has practical applications. Management decisions can be made on behalf of a pregnant female and her unborn offspring through the ability of prediction of the day of parturition. Crown-rump-length measurement can be used to accurately predict gestational age from about Day 20 of pregnancy to term, providing useful information to managers of both wild and captive collared peccaries.

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GESTION DE LA FAUNE INTEGREE AU DEVELOPPEMENT RURAL AU CAMEROUN LE CAS DU SANCTUAIRE A GORILLES DE MENGAME

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Mots-clés : sanctuaire à gorilles, grands singes (singe anthropoïde), nids terrestres et arboricoles de gorille, faune mamalienne, conservation centrée sur les communautés villageoises

Résumé :

Situé sur la frontière entre le Gabon et le Cameroun, dans un corridor d'un grand intérêt pour la conservation de la biodiversité de l'ensemble du bassin du Congo (Afrique Centrale), le sanctuaire à gorilles de Mengamé joue un rôle crucial dans l'initiative visant à faire émerger un réseau transfrontalier d'aires protégées. Couvrant 115.000 ha, le sanctuaire à gorilles de Mengamé possède un potentiel faunique important qui contraste avec son appellation. En plus des gorilles (*Gorilla gorilla gorilla*) qui y sont fortement représentés, on y rencontre des chimpanzés (*Pan troglodytes troglodytes*) et des éléphants. Trois espèces menacées de disparition et qui font l'objet d'une protection intégrale au Cameroun. Une trentaine de villages borde la périphérie du sanctuaire. Face aux pressions et menaces de leurs habitants sur les populations des grands singes (braconnage, destruction de l'habitat, déforestation, pression démographique, pratiques agricoles...), le sanctuaire bénéficie d'une stratégie de conservation de l'aire protégée en général, des grands singes en particulier qui est centrée sur les communautés villageoises. Initiative développée par le Jane Goodall Institute et qu'il a déjà mis en application à Tacare en Tanzanie. Cette approche se base sur l'établissement d'un lien entre une meilleure gestion des ressources naturelles et l'élévation du niveau de vie des populations). Bien que le développement rural puisse être en soi problématique pour la conservation, l'Institut Jane Goodall pense que la survie des grands singes est probablement liée à la diversité des perspectives économiques offertes aux populations de ces zones et à l'avènement d'une conservation plus centrée sur ces communautés rurales.

- d) Communication presented at the VIth International Congress on Wildlife Management in the Amazonia and Latin America, Iquitos (Peru), September 2004

Metodología diagnóstica de gestación en el pécari de collar: ecografía transabdominal, palpación abdominal y perfiles hormonales de estradiol y progesterona

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Resumen

Veinte hembras de pécari de collar fueron mantenidas en cautividad en la granja experimental EMBRAPA-UFPA, Belem do Para (Brasil), entre Junio de 2003 y Enero de 2004 para comparar la precisión del diagnóstico de gestación mediante ecografía transabdominal, palpación abdominal y perfiles hormonales en el pécari de collar. Después de la confirmación de la cópula, las hembras fueron separadas del macho para realizar el diagnóstico precoz mediante ecografía a tiempo real, palpación abdominal y perfil hormonal. El diagnóstico definitivo, basado en la visualización ecográfica del embrión, se realizó a un promedio de 22.4 ± 2.1 días de gestación. Sin embargo, el diagnóstico de gestación más temprano realizado mediante ecografía fue realizado el día 18. La precisión total de esta prueba diagnóstica fue del 100% a partir del día 28 de gestación. El diagnóstico de gestación por palpación abdominal se realizó a un promedio de 54.4 ± 8.6 días de gestación, siendo el diagnóstico de gestación más temprano a través de la palpación abdominal el día 44. El feto en esta época generalmente es blando y de forma esférica, con una medida de unos 6 mm de diámetro. El día 60 de gestación, la precisión total del diagnóstico de gestación por palpación fue de 80%. En cuanto a las técnicas hormonales, el hecho de que los valores de estrógenos de hembras no gestantes son menores a los que presentan las hembras gestantes, junto con constantes valores elevados de progesterona, sugiere la aplicabilidad de los niveles séricos hormonales como metodología diagnóstica de gestación. No obstante, debido a que las concentraciones de estrógenos no son significativamente elevadas hasta los 30 días de gestación, ésta metodología puede no ser precisa para el diagnóstico precoz de gestación. En este estudio se muestra la efectividad de las técnicas de diagnóstico de gestación de la ecografía transabdominal y la palpación abdominal, y se sugiere la viabilidad de las técnicas hormonales como técnica diagnóstica de gestación.

Introducción

El pécari de collar, *Tayassu tajacu*, representa una importante fuente de alimento para los pobladores locales de la Amazonía (Robinson and Redford, 1991). Debido a la importancia del pécari de collar en estas localizaciones, esta especie podría incluirse en programas de manejo de cría de animales silvestres con la finalidad de abastecer la demanda local que existe en América Latina.

Según estudios llevados a cabo en Texas con animales mantenidos en cautividad, la longitud de la gestación del pécari de collar varía entre 141 y 151 días (Lochmiller et al., 1984; Sowls; 1997). Este artiodáctilo presenta una tasa de ovulación de 2 a 2.1, en base al recuento de cuerpos lúteos (Hellgren et al., 1995; Gottdenker and Bormer, 1998) y un tamaño de camada pequeño entre 1.7 y

Appendix 3: Deliverable D 1.4: Paper published in "Anatomy- Histology- Embriology"

Anatomicohistological Characteristics of the Tubular Genital Organs of the Female Collared Peccary (*Tayassu tajacu*) from North-eastern Amazon

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With 13 figures and 4 tables

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Summary

The present study examines anatomical and histological characteristics of tubular genital organs and its relationships with the reproductive state of 24 wild adult collared peccary (*Tayassu tajacu*) females. The tunica mucosa of the uterine tube presents a pseudostratified, intermittently ciliated columnar epithelium. The epithelial secretory cells of pregnant females and females in the luteal phase of the oestrous cycle became taller than the ciliated cells and showed abundant apical secretory blebs, whereas secretory cells of females in the follicular phase showed abundant mucous secretory activity (periodic acid-Schiff positive cells). The uterus is composed of two narrow and convoluted uterine horns, separated by the velum uteri, a small uterine body and a long and muscular cervix. The endometrial lining of both uterine horns and body is a monostratified, columnar ciliated epithelium. Pregnant females and females in luteal phase showed a more developed hyperplasia of the endometrial simple tubular glands than females in the follicular phase. The cervix presents interdigitated rows of mucosal prominences that project into the lumen, structures similar to pulvini cervicali, occluding the cervical canal. In pregnant females, the endocervical canal was filled by a viscous cervical secretion. Females in follicular phase presented a thicker vaginal epithelium than pregnant females and females in luteal phase. The present study suggests that the collared peccary female showed different histological features of the uterine tubes, uterus and vagina in accordance with the reproductive state of the females.

Introduction

Humans in north-eastern Amazon depend on mammals for protein input to their nutrition, and also for cash income (Lahm, 1993; Redford, 1993). The collared peccary (*Tayassu tajacu*) is one of the most frequent hunted species in Latin America (Robinson and Redford, 1991). Captive breeding of wild species could play an interesting role in reducing the effects of intensive hunting in areas where this activity is no longer sustainable (Jori et al., 1998). Taking into account that gregarious and highly productive species are generally the most appropriate for captive breeding programmes (Newing, 2001), the collared peccary, already intensively hunted in the forest of the north-eastern Amazon, could be a candidate for more rational management. However, an understanding of the reproductive features of the collared peccary is essential for

effective management of the species, and limited information is available in the literature.

The collared peccary is a small artiodactyl that belongs to a separate family within the Suiformes, the Dicotylidae. This family includes two genera and three existent species of peccaries. These are the collared peccary (*T. tajacu*), the white-lipped peccary (*T. pecari*), and the Chacoan peccary (*Catagonus wagneri*). Compared with its counterparts, the collared peccary is extremely widespread in the American continent. The concurrent habitats of this ungulate ranges from Mexico to northern Argentina. The external morphology of the collared peccary (Fig. 1) is similar to that of the common pig but with a lower body weight, 14–30 kg (Nowak and Paradiso, 1983).

Field and experimental studies have shown that female peccaries are capable of producing young all around year in different locations: Texas (Low, 1970; Sowls, 1984), French Guyana (Henry and Dubost, 1990), different areas of Brazil (Nogueira-Filho and Lavoretti, 1997; Da Silva et al., 2002) and north-eastern Peruvian Amazon (Gottdenker and Bodmer, 1998). A peak in birth seems to occur in late spring–early summer in Texas (Low, 1970; Sowls, 1997), but Hellgren et al. (1985) suggested that females under good nutritional conditions could override periods of lactational and seasonal anoestrus. In fact, the peccary females in the wild are considered to be aseasonally polyoestrous in the Peruvian Amazon (Gottdenker and Bodmer, 1998), a location with no pronounced wet and dry seasons (Bodmer, 1989), such as that occurs in captivity in the Brazilian Amazon (Da Silva et al., 2002). Sowls (1997) reported that the gestation period of the collared peccary varied between 141 and 151 days and averaged 144.7 days. This artiodactyl presents an ovulation rate of 2.01–2.13 ovulated follicles/ovulating female, based on counting of corpora lutea (Hellgren et al., 1995; Gottdenker and Bodmer, 1998). The low litter size of the collared peccary, between 1.65 and 1.93 fetuses or newborn animals/pregnant female in average (Nogueira-Filho and Lavoretti, 1997; Sowls, 1997; Gottdenker and Bodmer, 1998), when compared with the domestic pig, indicates that differences in the features of the genital tract, mainly uterine horns, may exist in this species. The reproductive biology of the collared peccary inhabiting the Amazon regions is poorly known (Gottdenker and Bodmer, 1998) and few data exist on the anatomy and histology of the female genital tract. The present report describes macroscopic and microscopic features of the female genital organs of the

Appendix 4: Scientific production within deliverable D 1.5

- a) PhD Thesis from Pedro Mayor defended at the UAB on 27th of July 2004
- b) Oral communication presented at the 6th International Wildlife Ranching Symposium, Paris, July 2004

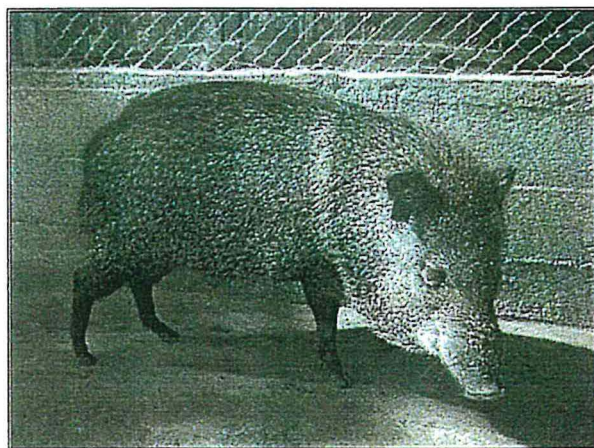


UNIVERSITAT AUTÒNOMA DE BARCELONA
FACULTAT DE VETERINÀRIA
DEPARTAMENT D'ANATOMIA I SANITAT ANIMALS



FACULTAT DE VETERINÀRIA DE BARCELONA

FISIOLOGÍA REPRODUCTIVA Y DESARROLLO DE MÉTODOS
DIAGNÓSTICOS DEL ESTADO REPRODUCTIVO DE LA HEMBRA
DE PÉCARI DE COLLAR (*Tayassu tajacu*, Linnaeus 1758)
DE LA AMAZONÍA



PEDRO G. MAYOR APARICIO

2004

TESIS DOCTORAL

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INFORMAN

Que Pedro Ginés Mayor Aparicio ha realizado bajo nuestra dirección el estudio titulado “Fisiología reproductiva y desarrollo de métodos diagnósticos del estado reproductivo de la hembra pécarí de collar (*Tayassu tajacu*, Linnaeus 1758) de la Amazonía”

Manel López Béjar

Ferran Jori i Massanes

Bellaterra, 21 de mayo de 2004

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Reproductive biology of female collared peccaries (*Tayassu tajacu*) raised in captivity in Amazon region

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Key Words: Reproductive biology, captive breeding, collared peccary, *Tayassu tajacu*, *Suidae*.

Mammals from Amazon region are an important source of animal protein and cash income for rainforest populations (Lahm, 1993; Redford, 1993). Therefore, many species, particularly those with a high commercial value, are becoming locally or even widely extinct through over-hunting (Emmons, 1990; Redford and Robinson, 1991). Captive breeding programs can be considered an effective system to exploit these renewable natural resources in tropical forests, where a substantial demand of wildlife products exists.

The collared peccary (*Tayassu tajacu*) represents an important source of meat for local people in the Amazon region (Redford and Robinson, 1991) and is considered an interesting species for captive breeding programs. Nevertheless, the reproductive biology of the collared peccary inhabiting the Amazon region is poorly known (Gottdenker and Bodmer, 1998). Such knowledge is essential to establish accurate management practices for future commercial exploitation. The objective of the present study was to examine the reproductive biology of captive females of collared peccary in

Amazon region: gestation length, foetal sex ratio, litter size, productivity, first parturition and conception, first post partum oestrus, inter-birth intervals and births per female and year.

Fifty-three reproductive cycles of 21 collared peccary females were studied between September 1999 and December 2003 in an experimental farm of collared peccary in Belém, Pará, Brazil. All reproductive groups were formed by a 1:3 male to female rate ratio, individually raised in paddocks of 3x12m. All animals were maintained under natural lighting conditions. Paddocks temperatures ranged from 22° to 32° C. The caloric and protein supply per animal and per day were 2500 kcal and 14%, respectively. Water was always available.

Parturitions occurred throughout the year. The mean duration of the gestation was 138.3 ± 5.3 days, ranking 127-147 (n=12). The evidence of mating was confirmed through the visualization of spermatozooids by colpocitology, and ultrasonography was used in order to diagnose pregnancy. The average litter size was 1.82 ± 0.42 , ranking 1-3 (n=53). Collared peccary females had a newborn sex ratio of 48.2% males and 51.8% females, which not differ significantly from a 1:1 sex ratio (n=110). The mean weight of newborn male was not significantly greater than that of female (859 g vs. 769 g; $P > 0.1$ Anova - Less square means).

The mean age of first parturition was 595.2 ± 239.9 days (n=10). Nevertheless, earliest first parturition occurred at 381 days of age. Considering a gestation length of 138 days, the mean age of first fertilization was 453.2 ± 239.9 days (n=10) and the earliest estimated first fertilization was 239 days.

Based on the presence of mating, the first post-partum oestrus was observed at 8.6 ± 2.4 days, ranking 5-14 (n=18). The estimated parturition-conception interval for 43

observations was 39.3 ± 55.5 days. When excluding two intervals greater than 80 days, conception took place in 18.74 ± 19.59 days after partum, ranking 5-77 days ($n=41$). The fertilization rate of the post-partum oestrus was 60.5% ($n=41$). The mean inter-birth interval was 179.2 ± 55.6 days ($n=43$). When excluding two intervals greater than 200 days, the mean decreased to 155.2 ± 15.0 days ($n=41$). Mean production was 2.35 ± 0.43 litters per female and year, ranging 1.86-2.57 litters ($n=41$). Taking into account the prolificacy and the number of births per female and year, the production of newborns per female and year was 4.6 ± 1.1 (ranking 3.38 - 5.95).

This study suggests that collared peccary females raised in captivity present good reproductive parameters. Captive breeding programs of collared peccary for exploitation in Amazon region should be considered.

The present study was financed by the European Commission (INCO-DEV/ICA4-CT-2001-10045, PECARI project); the National Council for Scientific and Technological Development (CNPq, TAYATAJA project) and the Pará State Fund for Science and Technology (Funtec-Sectam) and EMBRAPA/CPATU-PA/PPG7.

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ANNEXE 2 – WP2 SCIENTIFIC REPORT

WP2 : Developing efficient diets from locally available food resources

Appendixes to Annex 2 :

Appendix 1: Communication presented at the VIth International Congress on Wildlife Management in the Amazonia and Latin America, Iquitos (Peru), September 2004

Appendix 2: Publication on food preference in captive collared peccaries (submitted)

ANNEXE 2 – WP2 SCIENTIFIC REPORT

<p>Third progress report of PECARI project Scientific report of WP2 (Developing efficient diets from locally available food resources) November 2004</p>

Task I: concentrate on develop efficient diets from locally available feed resources for CP in captivity is subdivided in 4 WP. WP2 analyze an aspect of intensive captive breeding of CP: nutritional management.

WP2 Developing efficient diets from locally available food resources

CP has the ability to handle a large amount of roughage in its diet. Such a characteristic represents an attracting asset since the species could utilize by-products of human food and coarse products of the farm with little current outlet so far. A crucial keystone is the knowledge of the relative values of non-conventional foodstuffs that have not been investigated at all. The traditional way to obtain information on digestibility of feed for animals is through an in-vivo nutrient digestibility experiment. However, this method is costly and laborious. In reason of that, one task of this study was to improve pre-existent regression equations obtained by comparing in vivo and in vitro (using cow rumen inoculum) digestibility results of seven standard feeds for CP. After that, we used these equations to estimate in vivo digestibility of 13 conventional and non-conventional locally available feed resources. With these data, voluntary intake and nutritional requirements for CP we established four experimental diets, two for reproduction animals and two for growing individuals, that are being tested to evaluate zootechnical parameters, as growth and feed consumption rates.

WP 2.1. Chemical analysis of the nutrient composition of non-traditional foodstuffs

D 2.1 Report on the nutritional content of locally available foodstuffs for CP

Description of the work:

CR3 and CR5 identified several products potentially useful for feeding CP. Samples from these food resources were collected for nutrient composition analysis. The samples were air dried at 60°C and ground in a Wiley mill through 1-mm screen. Dry matter, ashes and organic matter, acid detergent fiber, neutral detergent fiber, and crude protein were determined by proximate analysis. Gross energy was determined with a Parr adiabatic bomb calorimeter. The results of these analyses it is showed in Table 1.

Table 1: Proximate composition in dry matter basis of 20 ingredients of traditional and non-traditional foodstuffs.

Foodstuffs	Organic Matter (%)	Crude Protein (%)	Energy (kcal/g)	FDA (%)	FDN (%)	Ash (%)
Cassava	97.4	2.7	4.2	4.6	5.2	2.6
Cassava's leafs hay	87.6	28.2	4.6	53.8	61.3	12.4
Cassava hulls	81.9	8.7	3.8	4.0	9.0	18.1
Cassava by-product meal	98.3	2.7	9.7	-	-	1.7
Passion fruit hulls	91.6	6.5	4.1	-	-	8.4
Cocoa meal	90.0	16.9	3.4	-	-	10.0
Papaya tree	85.1	14.5	4.0	-	-	14.9
Banana	95.0	4.0	4.1	-	-	5.0
Banana tree	91.2	7.6	4.3	-	-	8.7
Pineapple hulls	95.2	6.5	3.4	-	-	4.7
Jenipapo (<i>Genipa americana</i>)	96.2	4.7	4.5	-	-	3.8
Jack fruit	96.2	8.4	4.2	-	-	7.0
Pumpkin	89.3	20.0	4.9	31.1	28.6	10.2
Corn	95.6	10.9	4.8	6.3	23.3	4.4
Elephant grass	90.2	9.1	-	39.0	73.5	9.8
Palm oil meal	96.3	15.6	5.1	42.1	64.6	3.7
Soybean meal	93.0	51.0	4.2	5.4	8.2	4.7
Wheat meal	94.5	16.9	4.4	12.1	41.1	5.5
Fish meal	79.1	66.6	4.2	-	-	20.8
Blood meal	96.7	78.4	5.1	-	-	3.3

WP 2.2. Determination of food preference order and voluntary intake

D 2.2. *Publication on food preference in captive CP* (the manuscript send to be published resulted from this WP it is showed in the Annex WP2B of this report)

Description of the work:

Among the foodstuffs analyzed in the WP2.1, 20 disposable in CR3 were selected and individually supplied together with a standard food (corn grain) through a double choice test in order to establish the voluntary consumption and determine preference order. In this study we used six pen-raised adult collared peccaries and six metabolism chambers. The voluntary consumption of each experimental foodstuff it is showed in Figure 1.

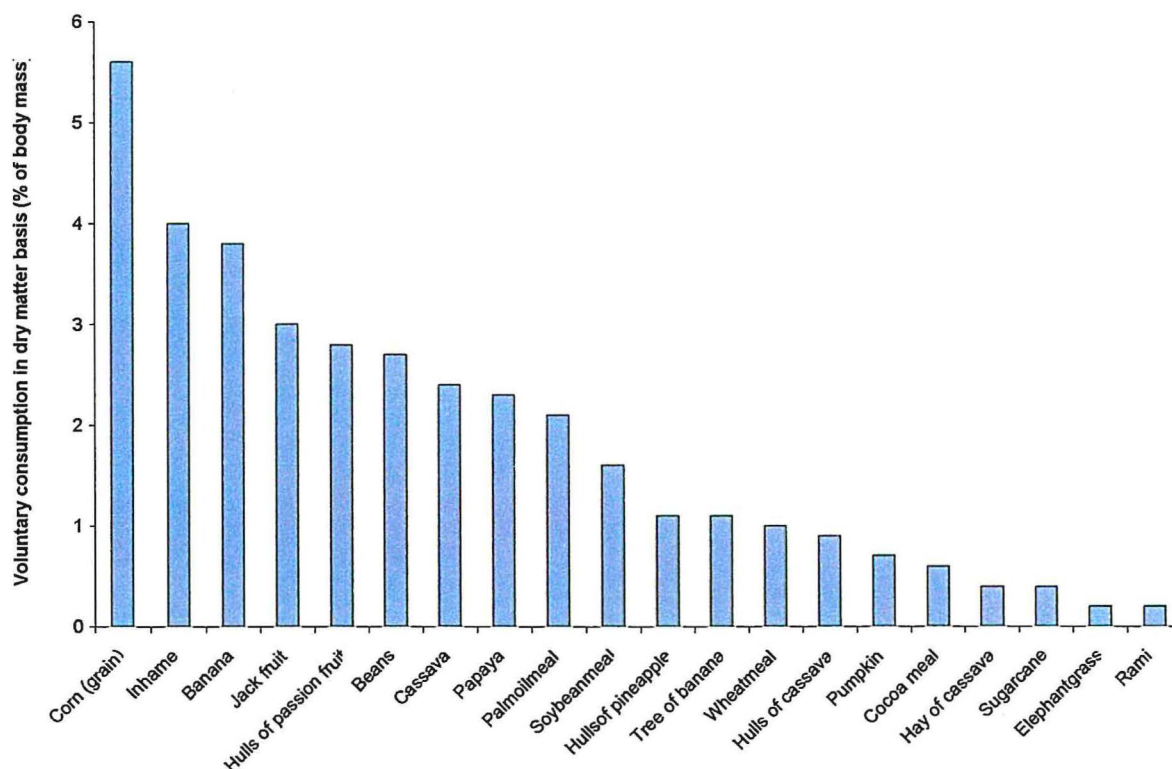


Figure 1: Average voluntary consumes in dry matter basis as % of body mass of 20 foodstuffs by collared peccary in captivity.

WP 2.3. Determination of nutrient digestibility of conventional and non-conventional foodstuffs used by CP

D 2.3. Report on the digestibility of locally available foodstuffs for CP (the manuscript resulted from this WP it is showed in the Annex WP2B of this report).

Description of the work:

Bibliography concerning the digestion of CP is controversial. Several authors have pointed out its ability to digest fiber. This WP determined the *in vivo* nutrient digestibility of six feed standards for CP. For those tests, six pen-raised adult CP and six metabolic chambers were used. Each trial test lasted 15 days: 10 days for adjustment to experimental foodstuff and 5 days for fecal collection. During the adjustment-period the experimental diets were available ad libitum except for three days before and during the collection when feed was provided about 90% of the previous minimum consume. The water was available ad libitum, and the same caregiver feed with fresh food and collected the total amount of faeces twice a day at 0600 h and 1800 h. The faeces were weighed and frozen in plastic bags for later analysis. The average digestibility coefficients of major nutrients are showed in Table 2.

Table 2. Apparent nutrient digestibility coefficients (SE) of collared peccaries fed with conventional and non-conventional foodstuffs.

Foodstuff	Digestibility Coefficients of Crude Protein (%)	Digestibility Coefficients of Crude Energy (%)
Cassava	28.2 (5.06)	88.9 (2.12)
Corn (triturate grain)	79.1 (2.03)	82.6 (4.83)
Palm oil meal	51.2(11.01)	68.0 (6.96)
Wheat meal	68.0 (6.57)	59.3 (7.70)
Pumpkin	42.9 (16.8)	44.3 (17.7)
Cassava hay	62.3 (36.4)	32.4 (33.3)
Elephant grass	26.5 (32.4)	35.8 (29.0)
Corn (entire grain)	75.2 (3.30)	80.4 (3.45)
Experimental Growth Diet 1	80.4 (3.40)	79.7 (2.56)
Experimental Growth Diet 2	78.4 (2.80)	76.7 (3.56)
Experimental reproduction diet 1	81.3 (2.40)	78.6 (3.67)
Experimental reproduction diet 2	80.4 (3.60)	76.7 (2.43)

Pre-existent regression equations to compare in vivo and in vitro digestibility of standard foodstuffs using cow rumen inoculum were improved. The equations obtained with the data obtained in this study were: in vivo digestible protein (y) = 0.97 in vitro digestible protein (x) + 0.98452, R² = 0.9843 and in vivo digestible energy (y) = 1.6434 in vitro digestible energy (x) - 2.6342, R² = 0.9289

The determined values of in-vitro digestibility, using cow rumen inoculum, of dry matter, organic matter, crude protein and crude energy of 13 conventional and non-conventional locally available feed resources are showed in Table 4.

Table 4: In-vitro digestibility coefficients, using cow rumen inoculum crude protein and crude energy of conventional and non-conventional locally available foodstuffs.

Foodstuffs	CP (%)	CE (kcal/g)
Cassava by-product meal	2.71	9.75
Opuntia	5.53	3.78
Banana	3.99	4.13
Passion fruit hulls	6.51	4.13
Andu leafs	18.07	5.32
Cocoa meal	16.37	3.38
Papaya tree	14.49	3.96
Jenipapo (<i>Genipa americana</i>)	4.78	4.52
Cassava hulls	8.72	3.43
Pineapple hulls	6.53	3.43
Banana tree	7.62	4.26
Soybean meal	51.00	4.74
Jack fruit	8.45	4.25

The estimate in vivo digestibility predicted by the regression equations of these conventional and non-conventional locally available foodstuffs are showed in the Table 5.

Table 5: Estimate levels of digestible protein (DP) and digestible energy (DE) predicted by regression equations of 13 foodstuffs.

Foodstuffs	DP (%)	DE (kcal/g)
Cassava by-product meal	1.58	8.08
Opuntia	3.74	2.47
Banana	2.56	2.64
Passion fruit hulls	4.49	2.78
Andu leafs	13.34	0.89
Cocoa meal	12.03	0.99
Papaya tree	10.59	2.08
Jenipapo (<i>Genipa americana</i>)	3.16	3.36
Cassava hulls	6.18	1.58
Pineapple hulls	4.50	3.27
Banana tree	5.34	1.41
Soybean meal	38.52	3.95
Jack fruit	5.98	3.02

Actions during 2004

During this year we replied again the digestibility trials with cassava hay and elephant grass that resulted in lowest standard deviations. Also we determined the in-vivo digestibility coefficients for the four experimental diets (described on the following WP2.4 section). By means of that, it was possible to estimate the peccaries in vivo nutrient digestibility through the regression analysis, and the equations showed R^2 coefficients higher to that ones obtained by Strey and Brown (1989). This was one of the original objectives of this work.

WP 2.4. Evaluation of the animal response to the experimental diets

D 2.4. Recommendations for CP diets made of locally available foodstuffs

Description of the work:

Based on the data obtained in this study (WP 2.1, 2.2, and 2.3) and nutritional requirements for CP we established four experimental diets, two for reproduction animals and two for growing individuals, for CP in captivity (Table 6) with conventional and non-conventional foodstuffs. We formulated different diets in reason of foodstuffs' seasonal disposition. These diets are being evaluated in semi-intensive conditions in CR3, in terms of the animal production obtained throughout two years. Data are being recorded on the number of young weaned per female, food consumed, growth rate, and alimentary conversion rate. This will provide the financial inputs of captive breeding of CP.

Table 6: Percentile composition of the experimental diets.

Ingredient	Experimental Reproduction Diet 1		Experimental Reproduction Diet 2		Experimental Growth Diet 1		Experimental Growth Diet 2	
	%	Rate/kg (Euro)	%	Rate/kg (Euro)	%	Rate/kg (Euro)	%	Rate/kg (Euro)
Cottonseed meal	16	0.08						
Wheat meal	5	0.06						
Bicalcium phosphate	0.3	0.17	4.5	0.17	4.5	0.17	4.6	0.17
Cassava root	33	0.02	25.0	0.02	30.0	0.02		
Cassava's leaf hay					8.7	0.01	15	0.01
Corn	14.2	0.10						
Cassava hulls	7	0.02						
Soybean meal	10	0.08	27.2	0.27	32.6	0.27	26.4	0.27
Pineapple hulls			35.0	0.005				
Cocoa meal					5.0	0.02		
Jack fruit							21.6	0.01
Pumpkin					18.5	0.03	26.6	0.03
Calcium carbonate			0.6	0.06	0.4	0.06	0.4	0.06
Palm oil meal	10	0.05	7.3	0.05				
Mineral and Vitamin supplement	0.1	0.25	0.1	0.25	0.1	0.6	0.1	0.6
Salt	0.5	0.03	0.3	0.03	0.3	0.03	0.3	0.3
Vegetable oil	2	0.05						
Total	100	0.06	100	0.09	100	0.11	100	0.09

Problems

During this year after we resolved some of the behavioral problems detected in the last year we obtained a total of only 16 young that were weaned from the three experimental paddocks. In the higher density paddock we obtained only 4 young while in the intermediary and lowest density we obtained 6 young in each one.

There was no statistical difference on average daily consume of the reproduction diets in all experimental paddocks that was 630 g (\pm 87g). This data resulted in foodstuffs expenses of 28.75 EUROS per young weaned in intermediary and lowest density paddocks and 57.50 EUROS per young weaned in highest density paddock. This expenses were very high in reason of the low reproduction rates (0.65 weaned young/ female and year) that were below the expected (at least 1.65 weaned young/ female and year). We are verifying the reasons of this lower reproduction rates in order to obtain more reliable data on animal production costs.

Now we are testing the Experimental Growth Diets in order to determine the growth rate and food intake/growth rate.

Plans for next year:

We intend to continue the activities on evaluation of the animal response to the experimental diets formulate and on food consume, number of young weaned per female, growth rate, and alimentary conversion rate.

References

- Nogueira-Filho, S.L.G. 1992. Estudo da digestibilidade de nutrientes em caitetus (*Tayassu tajacu*) adultos submetidos a dietas com níveis crescentes de alimentos volumosos. MSc Dissertation. Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo, Brazil. 120 pp.
- Strey, O.F.I. & Brown, R.D. 1989. In vivo and in vitro digestibilities for collared peccaries. J. of Wildlife Management, 53:607-612.

Cooperation and Meeting between partners proceeded during 2004

Meeting of INCO project – Iquitos, Peru September 2004

Communication and paper concerning WP2

Presentation of the work: “Ensaaios de digestibilidade *in vivo* e *in vitro* para caititus (*Tayassu tajacu*)” during the VI Congreso Internacional de Manejo de Fauna en la Amazonia y Latinoamerica at Iquitos, Peru. (Annex WP2A).

The work “Developing efficient diets to collared peccary (*Tayassu tajacu*) from locally available food resources” (Annex WP2B) was sent to the scientific editorial board of this congress in order to evaluate it to publish as a book chapter of this congress proceedings.

Presentation of the work: “The commercial production of collared peccary (*Tayassu tajacu*): an example of wildlife ranching from Bahia, Brazil” during the 6th International Congress of Wildlife Ranching, Paris, France.

This work was send to the scientific editorial board of this congress in order to evaluate it to publish as a paper on Game Wildlife Science Journal.

Appendix 1: Communication presented at the VIth International Congress on Wildlife Management in the Amazonia and Latin America, Iquitos (Peru), September 2004

Annex WP2A

ENSAIOS DE DIGESTIBILIDADE *IN VIVO* E *IN VITRO* PARA CAITITUS (*Tayassu tajacu*)^{*}

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Os caítilus (*Tayassu tajacu*) têm potencial para digerir a fibra alimentar semelhante a de bovinos. Esta característica possibilita a utilização de subprodutos agrícolas disponíveis na região onde sua criação é desenvolvida. Um ponto crucial, no entanto, é o conhecimento do valor nutricional destes alimentos não convencionais. A forma tradicional de obter estes dados é através da realização de ensaios de digestibilidade *in vivo*, que é um método caro e demorado. Por este motivo, os objetivos deste trabalho foram quantificar os nutrientes disponíveis aos caítilus presentes em alimentos convencionais e não convencionais através de equações de regressão obtidas a partir da comparação dos resultados da digestibilidade *in vivo* e *in vitro* (usando inóculo ruminal obtido de vaca fistulada) de cinco alimentos. Neste estudo, foram utilizados seis caítilus adultos e determinados os coeficientes de digestibilidade *in vivo* da matéria seca, matéria orgânica, proteína bruta e energia bruta do milho, farelo de trigo, torta de dendê, mandioca e abóbora. Também foram estabelecidos os coeficientes de digestibilidade *in vitro* destes mesmos alimentos. A partir destes dados foram estabelecidas equações de regressões entre estas duas variáveis e através delas estimados os coeficientes de digestibilidade *in vivo* dos nutrientes para caítilus presentes em 13 alimentos disponíveis no sul da Bahia. Com os resultados obtidos e com dados sobre as exigências nutricionais de caítilus foram estabelecidas rações nutricionalmente balanceadas para crescimento e reprodução.

^{*} Este estudo foi realizado com auxílio financeiro obtido junto à Comunidade Européia (Projeto INCO-Pecari).

Appendix 2: Publication on food preference in captive collared peccaries
(submitted)

Annex WP2B

DEVELOPING EFFICIENT DIETS TO COLLARED PECCARY (*Tayassu tajacu*) FROM LOCALLY AVAILABLE FOOD RESOURCES

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This manuscript on food preference in captive CP and in-vivo/ in-vitro digestibility coefficients for CP was presented during the 6th Congreso de Manejo de Fauna in Amazonia y Latinoamerica, Iquitos, Peru, and accepted to be published in the Congress Proceedings as a book chapter.

ABSTRACT

The collared peccary has the ability to handle a large amount of roughage in its diet. Such a characteristic represents an attracting asset since the species could utilize by-products of human food and coarse products of the farm with little current outlet so far. In order to obtain economic viability of collared peccary farming, this study concentrated in the reduction of farming costs by the establishment of productive diets based on locally available foodstuff resources. We identified 20 foodstuffs potentially useful for feeding collared peccary and its specific nutritional content and digestibility coefficients were determined by chemical and in vivo digestibility analysis, respectively. As well we determined the voluntary consumption of some of them, through a double choice test in order to establish the voluntary consumption and determine preference order. In this study we used six pen-raised adult collared peccaries and six metabolism chambers. With these data, voluntary intake and nutritional requirements and digestibility for collared peccary we established four experimental diets, two for reproduction animals and two for growing individuals.

1. Introduction

The collared peccary (*Tayassu tajacu*), a pig-like mammal, ranges throughout the whole American continent from New Mexico in the USA to northern Argentina, in habitats as diverse as semi-arid deserts and tropical rainforests (Sowls 1997). In Neotropical areas, the harvest of peccaries for meat and hides is widespread and overexploitation may become a threat to their natural populations (Bodmer *et al.* 1994). Therefore, it is necessary to experiment new methods to exploit these species sustainable to preventing depletion of the resources. The captive breeding is an option that has not been explored sufficiently, despite being repeatedly quoted in the literature (Sowls 1997). The experiences developed in Brazil are mainly conducted in large outside enclosures and some of them are yielding good results (Nogueira-Filho and Nogueira *in press*).

In the Amazon region, the collared peccary is largely a frugivore, feeding mainly on the fruits of palms (Kiltie 1981, Bodmer 1989, Barreto *et al.* 1997, Fragoso 1999). Throughout its range a wide variety of roots, tubers, bulbs, and rhizomes contribute also to its normal diet (Sowls 1997). In captivity this animal adapts easily to different kinds of food such as cassava, cassava hulls, pumpkin, maize, sorghum silage, maize silage, sugar cane, and compound pig diets (Nogueira-Filho & Nogueira *in press*).

Anatomically, this species has a fore-stomach with active fermentation (Langer 1979, Carl & Brown 1983, Cavalcante-Filho *et al.* 1998), that has given rise to considerable speculation regarding its ability to utilize roughage by transforming the dietary fibre to usable short chain fatty acids (Sowls 1997).

According to Sowls (1984) the pH of the fore-stomach of the collared peccary that range from 5.7 to 6.1, it is suitable environment for the microbial bacteria capable of breaking down

cellulose. Carl & Brown (1983) found live protozoa in the fore-stomach of collared peccaries. No studies have yet been done to reveal the importance of microbial protein synthesis to collared peccary. Carl & Brown (1985), however, studying the protein requirements of this species, suggested that the high digestibility for crude protein and the low protein requirements supports the evidence that the collared peccary has a digestive physiology more similar to that of ruminants than to that of

ANNEXE 3 – WP3 ANNUAL REPORT

WP3: Assessing and improving the health status of CP

ANNEXE 3 – WP3 ANNUAL REPORT

MID-TERM REPORT

Contract N° : ICA4-2000-10393

Project N° : ICFP500A4PR02

Acronym : PECARI

Title: Development of different production systems for the sustainable exploitation of the collared peccary (*Tayassu tajacu*) in Latin America.

WP3: Assessing and improving the health status of CP

Project CO-ORDINATOR : CIRAD

Partners :

IVITA- PERU

Reporting period: from Diciembre, 2003 a Noviembre 2004

Project Start date: Diciembre, 2001 duration : 3 años

Date of issue of this report: Diciembre 2004

Contenido:

Sumario Ejecutivo

Objetivos y aspectos estratégicos

Asistencia Técnica y Científica

Lista de Productos/Deliverables

Planes de Uso y Difusión

Aspectos del Manejo de la Coordinación

Conclusiones

Sumario Ejecutivo

El WP3, que viene realizándose en Iquitos/PERU, considera el siguiente objetivo: Proporcionar esquemas sanitarios apropiados para la asistencia Veterinaria en el manejo productivo del pecarí de collar bajo crianza en cautividad en el Trópico.

Para lo cual se diseñaron procedimientos para el reconocimiento sanitario del pecarí de collar, se establecieron parámetros referenciales bajo las condiciones de manejo en la especie, a nivel de Bioquímica hepática y renal; colectándose muestras de sangre periférica (2.5 ml) y suero, de la vena safena, obteniéndose los siguientes resultados: Proteína total: 8.56 ± 0.01 g/dl, Albumina 4.43 ± 0.01 g/dl, Colesterol 94.42 ± 0.25 mg/dl, Bilirrubina directa 0.16 ± 0.0 mg/dl y 0.64 ± 0.0 mg/dl total, Urea 81.13 ± 0.24 mg/dl, Creatinina 2.31 ± 0.01 mg/dl, y Fosfatasa Alcalina 30.66 ± 0.34 UI/L.

La susceptibilidad a procesos parasitarios a nivel hematológico sobre el total de ejemplares muestreados resulto negativa a las distintas técnicas de identificación de la presencia de hemoparásitos.

Se determino una prevalencia del 65% para Leptospirosis, reconociéndose los serovares *autumnales*, *bataviae*, *borinacana*, *icterohemorragica*, *tarasovi*, *bratislava*, *ballum S102*, y una nueva cepa denominada *Varillal 010*. *Varillal 010* resulto en 87.5% de las muestras positivas, las prevalencias de las asociaciones de las otras cepas registro 12.5%. En referencia a los registros de la patología básica del pecarí de collar bajo cautividad, se indica que la mortalidad en este periodo correspondió solo a un ejemplar juvenil, agredido por sus congéneres a los pocos días de nacido.

Objetivos y Aspectos estratégicos

Los Objetivos del WP3 están enmarcados dentro de la evaluación sanitaria del pecarí de collar, bajo manejo en cautiverio, con la finalidad de establecer recomendaciones sanitarias relevantes en la cría intensiva de la especie.

Los aspectos estratégicos pasan por reconocimientos frecuentes del estado de la salud individual y de la población, así como de la evaluación de la casuística de mortalidad del pecarí de collar.

En lo concerniente a las actividades realizadas por el WP3, en el periodo se logro la participación de otros Zoocriaderos instalados en la región Amazónica del Perú, en los estudios realizados lo que enriqueció la información generada.

Zoocriadero	Región	Ubicación	Tipo de Zoocriadero	Población total
Biodiversidad Amazónica (BIOAM)	Loreto	Carretera Iquitos – Nauta, Km. 23. Zona Reservada Allpahuayo - Mishana	Comercial	50
Comunidad San Francisco	Loreto	Río Marañón, margen izquierda.	Familiar	2
San Juan. Fundación Backus	Ucayali	Carretera Federico Basadre, Km. 13	Comercial	62
Parque Natural de Pucallpa	Ucayali	Carretera Federico Basadre, Km. 3	Recreativo	12
Club Divina Montaña Resort	Ucayali	Carretera Federico Basadre, Km. 11,5	Recreativo	11
Zoocriadero de la Comunidad Nativa San Rafael	Junín	Comunidad Nativa de San Rafael	Familiar	9
Zoocriadero de la Comunidad Nativa Huascayacu	Junín	Comunidad Nativa Huascayacu	Familiar	8

Se continuo asistiendo al Zoocriadero BIOAM en el mantenimiento optimo de sus ejemplares a fin de garantizar el área de estudio, lográndose la participación activa del criador particular, toda vez que se evidencia mejoras en los niveles de producción y condiciones sanitarias de su plantel. Los mismos que vienen siendo puestos a disposición de los estudios que se tiene programado.

Resultados Científicos y Técnicos

Objetivos considerados para el presente periodo:

Monitoreos de la Salud

- Evaluación de Ivermectina al 1% y Doramectina al 1% en el control antiparasitario
- Evaluación y seguimiento clínico de ejemplares enfermos y establecer una casuística de mortalidad.
- Prevalencias de anticuerpos contra *Leptospira* en Pecarí de Collar
- Perfil Bioquímica hepático y renal
- Capacitación de un profesional en Brasil y recopilación de información
- Tercer Meeting INCO-PECARI

Durante el presente periodo se implementaron los siguientes estudios:

Perfil Bioquímica hepático y renal del Pecarí de collar en la Amazonia Peruana

Con la finalidad de conocer el estado sanitario de la cría en cautiverio del sajino o pecarí de collar (*Tayassu tajacu*), se realizaron monitoreos serológicos bioquímicos para conocer parámetros la función hepática y renal en el sajino (*Tayassu tajacu*), importantes para evaluar la salud animal en esta especie.

Se colecto muestras de sangre periférica (2.5 ml) y suero, de la vena safena, en 30 ejemplares del Zoocriadero BIOAM(Loreto). Los valores séricos fueron: Proteína total: 8.56 ± 0.01 g/dl, Albúmina 4.43 ± 0.01 g/dl, Colesterol 94.42 ± 0.25 mg/dl, Bilirrubina directa 0.16 ± 0.0 mg/dl y 0.64 ± 0.0 mg/dl total, Urea 81.13 ± 0.24 mg/dl, Creatinina 2.31 ± 0.01 mg/dl, y Fosfatasa Alcalina 30.66 ± 0.34 UI/L. No se reconocieron diferencias estadísticas significativas entre machos y hembras en cuanto a sus valores de bioquímica sanguínea. Los resultados obtenidos, guardan relación con reportes de la misma especie realizados por otros autores, siendo en algunas variables distintos:

Proteínas Totales: Los valores hallados fueron mayores a lo reportado por el International Species Information System (ISIS) (1999) 7.3 g/dl de promedio, con valores mínimos y máximos de 5.8 y 8.9 g/dl respectivamente; y ligeramente superiores a lo obtenido por Wallach *et al.* (1971) que indica un promedio de 8.0 g/dl para esta especie. Merck y Co (2000) reportan valores similares al cerdo domestico (8.3 g/dl).

Albúmina: Los valores obtenidos resultaron mayores a lo reportado por el ISIS(1999) 3.9 g/dl de promedio, con valores mínimos y máximos de 3.1 y 4.7 g/dl respectivamente; y superiores a lo obtenido por Wallach *et al.* (1971) que indica un promedio de 3.4 g/dl para esta especie. Merck y Co (2000) reporta valores ligeramente inferiores (4.0 g/dl) en el cerdo doméstico.

Bilirrubina: Los valores de bilirrubina directa hallados fueron superiores a lo reportado por ISIS, (1999) 0.0 mg/dl; asimismo, valores de bilirrubina total coinciden con lo

obtenidos por Wallach *et al.*, (1971): 0.0 – 0.9 mg/dl; siendo mayor a lo reportado por ISIS (1999) 0.2 mg/dl de promedio, con valores mínimos y máximos de 0.0 y 0.5 mg/dl respectivamente para la especie. Por otra parte, los valores encontrados para bilirrubina total, son ligeramente superiores a lo reportado por Merck y Co, (2000) 0.5 mg/dl en el cerdo doméstico.

Colesterol: Los valores hallados coinciden a lo reportado por ISIS (1999) 100.6 mg/dl de promedio, con valores mínimos y máximos de 52.8 y 165.3 mg/dl respectivamente; asimismo, son ligeramente menores a lo reportado por Wallach *et al.* (1971) 120 mg/dl para la especie. Por otro lado, los valores encontrados fueron similares a lo reportado por Merck y Co (2000) 81.4 – 134.1 mg/dl en el cerdo doméstico.

Alanino Amino Transferasa (ALT): Los valores hallados coinciden con los reportados por ISIS(1999) 32 UI/L de promedio, con valores mínimos y máximos de 5 y 68 UI/L respectivamente.

Aspartato Amino Transferasa (AST): Los valores hallados son menores a los reportados por ISIS(1999) 38 UI/L de promedio, con valores mínimos y máximos de 18 y 82 UI/L respectivamente.

Fosfatasa Alcalina (PA): Los valores hallados fueron menores a lo reportado por ISIS(1999) 61 UI/L de promedio, con valores mínimos y máximos de 11 y 339 UI/L respectivamente; asimismo, coinciden a lo obtenido por Wallach *et al.* (1971) 30 – 54 UI/L para la especie. Por otro lado, los valores encontrados fueron menores a lo reportado por Merck y Co (2000) 41 – 176 UI/L en el cerdo doméstico.

Urea: Los valores hallados fueron mayores a los reportados por ISIS (1999) 30.1 mg/dl, con valores mínimos y máximos de 10.8 y 43.0 mg/dl respectivamente; asimismo, fueron superiores a lo obtenido por Wallach *et al.* (1971) 23.0 – 37.0 mg/dl para la especie.

Creatinina: Los valores hallados fueron ligeramente superiores a los reportados por ISIS (1999) 1.6 mg/dl de promedio, con valores mínimos y máximos de 1.2 y 2.0 mg/dl respectivamente para la especie. Por otra parte, los valores encontrados fueron similares a lo reportado por Merck y Co (2000) 0.8 – 2.3 mg/dl en el cerdo doméstico.

Las diferencias existentes en algunos de los parámetros bioquímicos obtenidos en el presente estudio y los reportados por otros autores, se pueden deber a factores ambientales en cada estudio (altitud, clima, etc.), edad de los ejemplares, tipo de crianza (extensiva e intensiva) y tipo de alimentación. Por lo que pueden ser considerados como patrones referenciales de la especie en condiciones de manejo de crianza intensiva en la Amazonía Peruana.

Prevalencia de anticuerpos contra *Leptospira* en Pecari de Collar.

Se identificó la presencia de anticuerpos contra *Leptospira spp* en ejemplares aparentemente sanos y sin sintomatología clínica (98), provenientes de diferentes zocriaderos ubicados en la Amazonía Peruana.

Zoocriadero	Región	Población analizada
Biodiversidad Amazónica (BIOAM)	Loreto	27
Comunidad San Francisco	Loreto	2
San Juan. Fundación Backus	Ucayali	52
Parque Natural de Pucallpa	Ucayali	6
Club Divina Montaña Resort	Ucayali	11

Se utilizó una batería compuesta por 24 cepas correspondientes a 22 serovares de *Leptospira spp.* Las pruebas de elección fueron la de Aglutinación Microscópica (MAT), y la prueba *gold standard* de referencia internacional para la confirmación serológica de una infección reciente y pasada de Leptospirosis. Los análisis serológicos fueron realizados en el Laboratorio de Enfermedades de Transmisión Sexual y Leptospiras del Instituto Nacional de Salud (INS) en la ciudad de Lima.

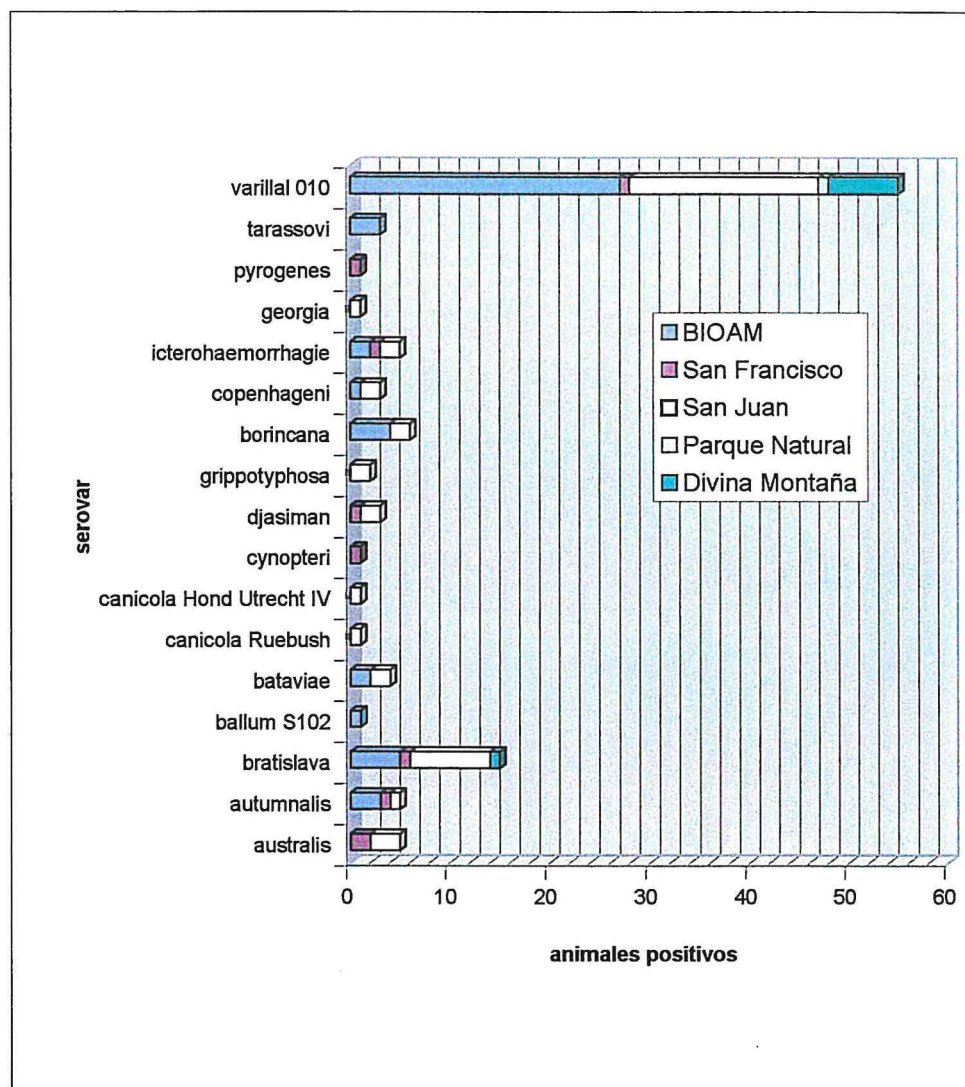
Especie	Serovar
<i>L. interrogans</i>	<i>Australis</i>
<i>L. interrogans</i>	<i>Bratislava</i>
<i>L. interrogans</i>	<i>Autumnales</i>
<i>L. interrogans</i>	<i>Bataviae</i>
<i>L. interrogans</i>	<i>Canicola</i>
<i>L. interrogans</i>	<i>Canicola(cepa Ruebush)</i>
<i>L. interrogans</i>	<i>Djasiman</i>
<i>L. interrogans</i>	<i>Grippotyphosa</i>
<i>L. interrogans</i>	<i>Copenhageni</i>
<i>L. interrogans</i>	<i>Icterohaemorrhagiae</i>
<i>L. interrogans</i>	<i>Pomona</i>
<i>L. interrogans</i>	<i>Pyrogenes</i>
<i>L. interrogans</i>	<i>Hardjo</i>
<i>L. interrogans</i>	<i>Wolffi</i>
<i>L. borgepetersenii</i>	<i>Javanica</i>
<i>L. borgepetersenii</i>	<i>Tarassovi</i>
<i>L. borgepetersenii</i>	<i>Ballum</i>
<i>L. borgepetersenii</i>	<i>Ballum(cepa S102)</i>
<i>L. weilli</i>	<i>Celledoni</i>
<i>L. kirschneri</i>	<i>Cynopteri</i>
<i>L. santarosai</i>	<i>Borincana</i>
<i>L. santarosai</i>	<i>Georgia</i>
<i>L. santarosai</i>	<i>Alexi</i>

Se colectaron muestras de sangre periférica (2.5 ml) y suero, de la vena safena, de animales no anestesiados.

El 65% de ejemplares resultó positivo a Leptospirosis, reconociéndose prevalencia de los serovares *Autumnales* (1.6%), *Borincana* (1.6%), *Ballum S102* (1.6%), y una nueva cepa denominada *Varillal 010* (50%). Las asociaciones entre cepas significó el 45.2%, donde las asociaciones de *Varillal 010* con una o más cepas (*Bratislava*, *Autumnalis*,

Icterohaemorrhagiae, *Borincana*, *Copenhageni*, *Tarassovi*, *Ballum S102*, *Bataviae*, *Cynopteri*, *Djasiman*, *Georgia*, *Canicola* e *Canicola cepa Ruebush*, *Australis*, *Grippotyphosa*) represento el 37.5%, mientras que asociaciones de *Australis* y *Pyrogenes* (1.5%); *Bratislava* y otras (*Australis*, *Djasiman*, *Grippotyphosa*, *Autumnales*, *Icterohaemorrhagiae*, *Copenhageni*) represento el 6.2%.

Frecuencia de presentación de serovares por zoocriadero



No se encontró asociación significativa entre la presentación de anticuerpos y las variables edad y sexo.

Los resultados de la investigación serológica indican que existe una alta presencia de anticuerpos contra *Leptospira sp.* en sajinos criados en cautiverio en la región Amazónica. De 98 animales muestreados, 64 (65%) presentaron anticuerpos a títulos positivos contra 15 serovariedades pertenecientes a 5 especies patógenas de *Leptospira*: *L. interrogans*, *L.*

weilli, *L. borgepetersenii*, *L. kischneri* y *L. santarosai*, y una serovariedad de clasificación indeterminada.

Los zoocriaderos ubicados en la región Loreto, alcanzaron una prevalencia del 100%. Se estableció entonces que el pecarí de collar, es un reservorio potencial de *Leptospirosis* en la Amazonía Peruana, sugiriéndose por los altos niveles de anticuerpos detectados en sajinos sin evidencia de enfermedad que esta especie actúa como hospedero de mantenimiento a más de un serovar de *Leptospira spp*.

La elevada prevalencia de anticuerpos (65%), así como la presencia de serovariedades patógenas de *Leptospira* en sajinos sin signos clínicos de *Leptospirosis* indicaría infección leptospiral enzoótica, causada por serovares adaptados. A fin de definir el papel de esta especie como reservorio de enfermedad, debe comprobarse la excreción de espiroquetas en la orina. Las fuentes de infección, signos clínicos asociados y la duración de la inmunidad en animales infectados deben ser determinadas.

Presencia y Caracterización de Hemoparásitos en Pecarí de Collar bajo manejo en cautividad en la Amazonía Peruana.

Con la finalidad de identificar y caracterizar la presencia de hemoparásitos en experiencias de cría del pecarí de collar en cautiverio, así como el cuantificar el grado de parasitemia, se realizaron monitoreos hematológicos en ejemplares de distintas poblaciones de Zoocriaderos y crianzas familiares en la amazonía peruana, donde se colectaron entre 2-3 ml de sangre periférica de la vena safena, en ejemplares sin anestesia.

Zoocriadero	Región	Población analizada
Biodiversidad Amazónica (BIOAM)	Loreto	27
San Juan. Fundación Backus	Ucayali	8
zoocriadero de la Comunidad Nativa San Rafael	Junin	7
zoocriadero de la Comunidad Nativa Huascayacu	Junin	8

Las técnicas para la identificación de hemoparasitos utilizadas fueron:

- **Frotis sanguíneo delgado:** que permite identificar la presencia de hemoparásitos intracelulares. Los frotis fueron fijados en metanol por 3 minutos, y coloreados con Giemsa por 30 minutos. Se realizó observación al microscopio (a 100x).
- **Frotis sanguíneo grueso o Gota gruesa:** permite reconocer hemoparásitos extracelulares, específicamente *Plasmodium* sp. Gotas de sangre son coloreadas con Giemsa por 30 minutos, se observó al microscopio (a 100x).
- **Método de Woo o del Hematocrito:** técnica del microcapilar, se utilizó para la detección de protozoarios flagelados y microfilarias de nematodos. Se recurre al tubo microcapilar heparinizado con sangre y centrifugado durante un minuto. El plasma en portaobjeto fue observado al microscopio (a 40x), en la interfase del plasma y el coágulo se buscó las microfilarias y hemoflagelados.

El total de ejemplares muestreados resultaron negativos a las distintas técnicas de identificación de la presencia de hemoparasitos.

Monitoreo de la Mortalidad

Entre Diciembre del 2003 y Octubre del 2004, cada animal del Zoocriadero BIOAM(Loreto), encontrado muerto fue recuperado para su posterior necropsia, registrándose en una plantilla previamente elaborada, su edad, sexo, peso, fecha de muerte y la historia clínica. Solo fue registrada una muerte dentro del grupo de las crías. La causa de muerte fue agresión por sus congéneres, que lograron burlar el cerco del corral días después del nacimiento.

La Valoración Científica y Técnica

Los datos ofrecidos en el presente informe, constituyen la realidad observada en un sistema de cría intensiva en Perú, en instalaciones consideradas rusticas, que aprovecha la cobertura de bosque secundario para recrear ambientes o corrales ofrecidos a los animales, con fuentes de agua que provienen de cursos naturales orientados a través de los distintos corrales, recurriéndose a una alimentación a base de frutos regionales, complementados con insumos dedicados a la producción animal local.

Los procedimientos y metodologías

El WP3, considera de importancia relevante la participación de otros grupos de trabajo con Pecarí en cautividad (CR3, CR6, CR4), para enriquecer la información acerca de la determinación de la incidencia (ecto, hemo y endo) parasitaria de la especie en el trópico.

Del mismo modo y en función a un reconocimiento clínico regular de la población se ha establecido perfiles hemáticos, bioquímicos y serológicos (anticuerpos virales y bacteriales) de importancia económica y social, para la especie bajo estas condiciones, proyectándose ampliar el registro de perfiles virales de zoonosis y otros.

La casuística de mortalidad registrada a la fecha por el WP3 estaría asociada mayormente al manejo ofrecido, siendo las lesiones causadas por peleas y fugas las de mayor presencia. Las mortalidades asociadas a prácticas inadecuadas de alimentación que permitió la presentación de cuerpos extraños (fitobezoares), no se han repetido, en gran medida por las restricciones al acceso de elementos no digeribles en sus instalaciones.

Lista de Productos/Deliverables

- Identificación de las principales infecciones parasitarias y establecer su control

Este producto está programado para ser concluido dentro de los primeros 24 meses de iniciado el Proyecto, a la fecha se ha reconocido la presencia de parásitos de mayor frecuencia en pecarí cautivo bajo condiciones ofrecidas en sistemas de crianza en el trópico peruano. En el enriquecimiento de este producto se tiene previsto la identificación de productos alternativos comerciales (antiparásitarios) (Mebendazole, Praziquantel, Fenbendazol) y posiblemente recursos naturales con propiedades antiparasitarias (*Ficus insipida*), que logren controlar las cargas parasitarias.

- Establecer las principales causas de mortalidad del pecarí en cautiverio

Este producto está programado para ser desarrollado a lo largo de todo el proyecto y entregado al término del estudio. Los registros a la fecha corresponden a la reducida mortalidad en sistemas de cría intensiva en el Trópico peruano, se tiene previsto la recuperación de información vía Base de Datos interactiva a ser utilizada por los distintos participantes del Proyecto.

Planes de Uso y Difusión

El reconocimiento temprano de condiciones sanitarias de riesgo inherentes a una especie y la minimización de los mismos, contribuye a una cría eficiente y sostenible.

La identificación de parámetros fisiológicos clínicos (sangre, heces, bioquímica) contribuye en la identificación del estado clínico de los individuos de una población, lo que permitirá el reconocimiento temprano de procesos patológicos infecciosos, minimizando morbilidad y mortalidad.

Entre las potenciales aplicaciones directas generadas por el WP3, al final del proyecto, consideramos la oferta de esquemas sanitarios recomendables para una asistencia veterinaria que contribuya al manejo productivo de pecaríes bajo cría intensiva en el trópico y la identificación de principales procesos asociados a mortalidad de esta especie. Esto tendrá repercusiones a nivel de grupos orientados a la crianza y comercialización de productos y subproductos del pecarí de collar, a nivel local y regional; contribuyendo a alcanzar mejores niveles productivos.

Los mercados potenciales de los productos del WP3 se encuentran en los países con poblaciones disponibles del pecarí de collar, así como empresas interesadas en implementar la cría intensiva con la intención de asegurar una provisión continua de productos y subproductos que ofrece el pecarí, como también profesionales en veterinaria y ramas afines que dispondrán de información sobre los parámetros fisiológicos, tratamientos, controles y causas de mortalidad. Los mercados reales son los actuales zoocriaderos dedicados a una crianza intensiva de la especie.

En referencia a la difusión de resultados, durante el periodo se participó con una exposición en el VI Congreso Internacional de Manejo de Fauna Silvestre en Latinoamérica. (Anexo)

Aspectos del Manejo de la Coordinación

Las actividades programadas por el WP3, para el periodo en evaluación, dependieron en gran medida de la transferencia de recursos económicos programados inicialmente. Estos recursos correspondientes al segundo periodo, originaron la reprogramación del presupuesto y el retraso en la ejecución de los estudios y actividades de mantenimiento programadas desde Diciembre 2003, pero ejecutadas con limitaciones desde Marzo 2004.

Los estudios realizados sobre el perfil bioquímico hepático y renal del pecarí de collar en la amazonía peruana y la prevalencia de anticuerpos contra *Leptospira* fueron desarrollados con el apoyo de tesis; así mismo los estudios sobre presencia y caracterización de hemoparásitos y el monitoreo de la mortalidad son realizados por los miembros del WP3.

La reformulación del presupuesto inicial, en torno a las prioridades determinó el traslado del requerimiento de personal técnico financiado por el WP3 para el cumplimiento del próximo año.

Conclusiones

Como se había proyectado en las conclusiones del informe medio, las dificultades económicas han sido el mayor limitante en la generación de una mayor información del WP3, a pesar de ello y con serias limitantes se viene cumpliendo las etapas previstas dentro del cronograma presentado inicialmente.

Los avances realizados permiten programar las actividades del próximo periodo que abarcan: La validación de productos farmacológicos comerciales y naturales en el control de infecciones parasitarias en *Tayassu tajacu* (Pecarí de collar) bajo cría intensiva, así como continuar el seguimiento del estado de salud del pecarí de collar en cautividad y finalmente reconocer las causas más frecuentes en su mortalidad.

ANEXOS

Cuadro # 1 Cuadro comparativo de los resultados obtenidos entre machos y hembras de sajino (*Tayassu tajacu*) para evaluar función hepática

	N	Machos X ± IC	n	Hembras X ± IC
Proteínas Totales (g/dl)	14	8.4 ± 0.6	14	8.6 ± 0.6
Albúmina (g/dl)	14	4.4 ± 0.2	14	4.4 ± 0.3
Bilirrubina Directa (mg/dl)	14	0.2 ± 0.05	14	0.2 ± 0.05
Bilirrubina Total (mg/dl)	14	0.6 ± 0.1	14	0.7 ± 0.2
Colesterol (mg/dl)	14	89.0 ± 10.8	14	97.4 ± 10.4
ALT (UI/l)	14	26.8 ± 5.6	14	26.3 ± 3.7
AST (UI/l)	14	16.9 ± 5.1	14	14.9 ± 3.5
Fosfatasa Alcalina (UI/l)	14	26.3 ± 9.4	14	26.4 ± 7.8

n: Número de muestra

X ± IC: Promedio ± Intervalo de Confianza

Cuadro # 2 Cuadro comparativo de los resultados obtenidos entre machos y hembras de sajino (*Tayassu tajacu*) para evaluar función renal

	N	Machos X ± IC	n	Hembras X ± IC
Urea (mg/dl)	14	59.7 ± 6.2	14	56.4 ± 5.7
Creatinina (mg/dl)	14	2.3 ± 0.2	14	2.2 ± 0.3

n: Número de muestra

X ± IC: Promedio ± Intervalo de Confianza

Cuadro 3. Presencia de Anticuerpos de *Leptospira* a la prueba de Microaglutinación, según asociación de serovares

Serovar Infectante	Numero (+)	Titulo Máximo
<i>Varillal 010</i>	32	1/800
<i>Varillal 010- Batrislava</i>	7	1/400 1/100 1/600
<i>Varillal 010- Batrislava-Autumnalis-Icterohaemorrhagie</i>	1	1/800 1/100
<i>Varillal 010- Batrislava-Borincana-Icterohaemorrhagie-Copenhageni</i>	1	1/800 1/100 1/100
<i>Varillal 010- Batrislava-Australis-Autumnalis-Icterohaemorrhagie- Copenhageni-Cynopteri-Djasiman</i>	1	1/800 1/800 1/100 1/1600 1/100
<i>Varillal 010 -Borincana</i>	3	1/400 1/100
<i>Varillal 010- Borincana-Autumnalis</i>	1	1/100
<i>Varillal 010- Borincana -Tarassovi-Ballum S102</i>	1	1/400 1/800 1/100
<i>Varillal 010- Bataviae -Tarassovi</i>	2	1/400 1/200 1/6400
<i>Varillal 010- Autumnalis</i>	1	1/800 1/100
<i>Varillal 010- Ballum S102</i>	1	
<i>Varillal 010- Batrislava-Icterohaemorrhagie-Copenhageni</i>	1	1/100
<i>Varillal 010- Bataviae</i>	1	1/100 1/200
<i>Varillal 010- Georgia</i>	1	1/100
<i>Varillal 010- Canicola Hound Utrech IV- Canicola Ruebush</i>	1	1/100
<i>Batrislava-Australis</i>	1	1/800 1/100
<i>Batrislava-Djasiman</i>	1	1/100
<i>Batrislava-Grippotyphosa</i>	1	1/100
<i>Batrislava-Australis-Autumnalis- Icterohaemorrhagie-Copenhageni</i>	1	1/800 1/100 1/3200
<i>Australis-Pyrogenes</i>	1	1/100
<i>Djasiman- Grippotyphosa</i>	1	1/800
<i>Borincana</i>	1	1/100
<i>Bataviae</i>	1	1/400
<i>Australis</i>	1	1/100
	64	

Artículo presentado en el VI Congreso Internacional sobre Manejo de Fauna Silvestre en la Amazonia y Latinoamérica-Iquitos-PERU

SANIDAD EN EL MANEJO PRODUCTIVO DEL SAJINO (*Tayassu tajacu*) EN EL TROPICO

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Resumen

Con la finalidad de conocer el estado sanitario de la cría en cautiverio del sajino o pecarí de collar (*Tayassu tajacu*), se realizaron monitoreos hematológicos, bioquímico, reconocimiento de anticuerpos contra Leptospiras y parasitologicos de ejemplares adultos, clínicamente normales provenientes de zoocriaderos de la Amazonia Peruana. Se establecieron parámetros referenciales hematológicos y Bioquímicos; colectándose muestras(27) de sangre periférica (2.5 ml) y suero, de la vena safena, con los resultados siguientes: Eritrocitos $8.46 \times 10^6/\mu\text{l}$; Hb 16.3 g/100ml; Ht 44.4 %; 53.01 fl V.G.M., 19.4pg H.G.M. y 36.56 g/dl C.H.G.M.; Leucocitos $11.39 \times 10^3/\mu\text{l}$. Los valores sericos fueron(n=30): Proteína total: 8.56 ± 0.01 g/dl, Albumina 4.43 ± 0.01 g/dl, Colesterol 94.42 ± 0.25 mg/dl, Bilirrubina directa 0.16 ± 0.0 mg/dl y 0.64 ± 0.0 mg/dl total, Urea 81.13 ± 0.24 mg/dl, Creatinina 2.31 ± 0.01 mg/dl, y Fosfatasa Alcalina 30.66 ± 0.34 UI/L.

El 65% de ejemplares(n=98) resulto positivo a la presencia de anticuerpos para Leptospirosis, reconociéndose los serovares reconociéndose prevalencia de los serovares *Autumnales* (1.6%), *Borinacana*(1.6%), *Ballum S102*(1.6%), y una nueva cepa denominada *Varillal 010*(50%). Las asociaciones entre cepas significo el 45.2%, donde las asociaciones de *Varillal 010* con una o mas cepas (*Bratislava*, *Autumnalis*, *Icterohaemorrhagiae*, *Borincana*, *Copenhageni*, *Tarassovi*, *Ballum S102*, *Bataviae*, *Cynopteri*, *Djasiman*, *Georgia*, *Canicola* e *Canicola cepa Ruebush*, *Australis*, *Grippytyphosa*) represento el 37.5%, mientras que asociaciones de *Australis* y *Pyrogenes* (1.5%); *Bratislava* y otras (*Australis*, *Djasiman*, *Grippytyphosa*, *Autumnales*, *Icterohaemorrhagiae*, *Copenhageni*) represento el 6.2%.

Mediante monitoreos parasitarios semanales(n=30), se identificó la presencia de *Strongyloides sp*, *Ascaris sp.*, *Strongylus sp.* y *Balantidium coli*. Se ensayaron tratamientos con Ivermectina (T1, T2, T3) y Doramectina (T4, T5, T6) al 1% en dosis de 1ml, 0.75ml y 0.5 ml/por animal, respectivamente. Los resultados muestran una reducción de la presencia en 25-50-25%(T1, T2, T3) y 100-100-25%(T4, T5, T6) a 24-72 horas post aplicación respectivamente; variando su efectividad a 100-100-100%(T1, T2, T3) y 100-100-50%(T4, T5, T6) a 15 días post aplicación y manteniéndose entre 100-100-100%(T1, T2, T3) y 100-100-75%(T4, T5, T6) hasta los 60 días post aplicación respectivamente. Durante el estudio se registró una mortalidad de 6 ejemplares, entre las causas de mortalidad, se registraron, procesos obstructivos por fitobezoares(3) de etiología desconocida; procesos neumónicos(2) y procesos de origen traumático(1).

Palabras clave: Pecarí, sanidad, cautiverio.

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ANNEXE 4 – WP4 ANNUAL REPORT

WP4 : Reducing aggression and stress in captive CP

Appendixes to Annex 4 :

Appendix 1: Poster presented at the XXIIth Annual meeting of Etology, Campo Grande (Brazil), November 2004

Appendix 2: Manuscript in preparation

Appendix 3: Communications presented at the 6th International Wildlife Ranching Symposium, Paris, July 2004

Appendix 4: Communications presented at the VI International Congress on Wildlife Management in the Amazonia and Latin America, Iquitos (Pru), September 2004

ANNEXE 4 – WP4 ANNUAL REPORT

<p>PECARI project Third Annual Progress Report Scientific report of Work Package 4 (Reducing aggression and stress in captive CP) November 2004</p>

1. Executive publishable WP summary

Task I of the PECARI project attempts to reduce the factors limiting the productivity of captive peccaries (CP) under intensive small scale farming conditions in Neotropical forest areas. The Work Package 4 (WP4) takes part of Task I by analyzing welfare management of CP in intensive breeding systems in order to reduce aggression and stress. According to Terlouw and al. (1997) stress can be defined as biological perturbations that the organism produces when it is challenged beyond its behavioural and physiological capacity to adapt to its environment. WP4 attempts to determine physiological and behavioural indices of stress of CP raised in various captive conditions. The Veterinary Faculty of Barcelona, Spain (CR2), the State University of Santa Cruz, Brazil (CR3) and the Federal University of Pará, Brazil (CR6) are in charge of WP4.

Until now, CR2 tested an ELISA technique for determining cortisone levels in faecal samples of both domestic pigs and CP. The technique detected cortisone but was unable to determine a known amount of cortisone added to the samples, apparently because of the presence of some compounds in the faeces that interfere with cortisol detection. Since then, CR2 works along two different lines in order to solve the problem, (1) modifying the technique of analysis and (2) looking for a different indicator of stress in CP: Acute Phase Proteins (APPs).

(1) Modified ELISA technique is used to determine cortisol in saliva and slightly different metabolites in faecal sample. CR2 is currently working on a trial based on an ACTH-challenge technique to validate the method.

(2) Using plasma APP as stress marker may offer advantages over plasma cortisol in pigs – and probably in CP, but only for specific stressful situations: the first results suggest that APPs increase only when the stress is associated to tissue damage.

CR3 observed CP behaviour raised in various densities and with one to three feeders per pen. CR3 also described the social structure of a group raised in semi natural conditions. CR3 will test the behavioural effect of a variable number of shelters per pen in 2005.

CR6 analyzed the data collected in 2003 in order to detect behavioural differences between captive CP submitted to a supposedly stressful situation (the manipulation of a congener) and CP filmed in a “normal situation”. As expected in the previous report, the animals did not manifest many behavioural indices of stress, probably because they are frequently submitted to such situation. Consequently, we filmed CP submitted to a supposedly more stressful situation i.e. after a transport and their introduction in a new environment. This

occurred during the donation of 50 animals to initiate the first private breeding farms of CP in northern Brazil. CP from CR3 should be submitted to a similar stress and observed using the same methods during their transport to the future scientific farm of UESC. Both sets of data will be analyzed in 2005.

In 2004, CR6 also recorded ethological data in order to relate social behaviour of CP to reproductive status of the females. Data collection is still in progress.

2. Objectives and strategic aspects of your WP

The definition of an adequate environment is crucial when one desires to produce a wild species in an intensive breeding system. The main advantages of raising CP in small enclosures are reduced costs of construction and maintenance of the pens as well as an easier management of the herd. Animals are more docile when raised in a small space; facilitating their capture and sanitary surveillance. Management conditions must be carefully defined to ensure animal welfare, which is not only a growing concern of the consumer but also of the producer. Many studies have demonstrated that a stressed animal can be more difficult to manage, subject to accident, weak, less prolific and vulnerable to pathogens. The commercial success of an intensive breeding system implies optimal growth, a good reproduction rate and minimized health problems. The improvement of these parameters implies adequate breeding conditions minimizing stress.

The objective of WP4 is to study welfare of CP raised in various intensive breeding systems and to define indicators of stress with physiological and behavioural measures.

If the results of WP4 demonstrate that it is possible to raise non-stressed CP in small pens, it will incite South American producers to consider breeding CP in intensive small scale farming. This perspective seems especially attractive in Amazon region where it became more than ever necessary to propose sustainable alternatives to agricultural activities that are source of deforestation, like extensive bovine raising and soy production.

3. Scientific and technical performance

3.1. Summary of the specific project objectives for the relevant period.

WP 4.3. Definition of CP ethogram, with special attention to behavioural indices of stress.

Publication on stress and aggression in captive CP. Delivery date: M24

3.2. Overview of the technical progress

WP 4.1. Testing an ELISA technique for determining cortisol levels in faeces.

ELISA kit for cortisone determination in CP faeces is set-up. Delivery date: M12

W.P 4.1. is conducted by CR2 with samples collected locally and by CR3 and CR6.

As explained in our previous report, analysis of cortisol or cortisol metabolites in faecal samples of both domestic pigs and CP presents some difficulties that are apparently caused

by the presence of some compounds in the faeces that interfere with cortisol detection. As a result of this, we have been working along two different lines:

1. To look for a different indicator of stress in CP
2. To modify the technique of analysis.

Looking for a different indicator of stress in CP

As previously explained, we are working on the use of the so-called “acute phase proteins” (APP). APP are proteins produced in the liver that increase or decrease in serum concentration by at least 25% in the first 7 days after tissue damage (Kushner, 1982). Those that increase are commonly called “positive APP”, whereas those that decrease are called “negative APP”. Positive APP have been recently used as indicators of stress in farm animals (Eurell et al., 1992; Murata and Miyamoto, 1993). In pigs, two of the most commonly used APP are haptoglobin and Pig-Major Acute Phase Protein (Pig-MAP) (Lampreave et al., 1994).

Our preliminary results seem to indicate that plasma APP may be useful as stress markers in pigs –and probably in CP as well-, offering advantages over plasma cortisol (Saco et al., 2003). However, this work was conducted using an acute stress situation, such as transport. As we are particularly interested in long-term stress situations, such as those caused by poor housing, we conducted an experiment using the domestic pig as a model to ascertain whether APP plasma levels show differences between animals raised in different housing systems. In this experiment, sixty pregnant sows Lw x Ld (153-288 kg) from first to eighth parity, were housed between day 29-30 of gestation and 1 week before parturition in three different systems: twenty sows were kept in individual feeding stalls (group 1), 20 sows were housed in two pens (10 per pen) with slow feeding system (Biofix®, group 2), and 20 sows were housed in one pen with electronic feeding system (Fitmix®, group 3). Blood samples were obtained the ninth and the fourteenth week of pregnancy from 6 to 9 sows per housing system. For statistical test, repeated measures ANOVA, paired t-test and Spearman correlation test were applied. Pig-MAP and haptoglobin plasma levels were analyzed by immunodiffusion. Samples were processed at the Veterinary Schools of Barcelona and Zaragoza (Spain). Repeated measures ANOVA showed no differences in Pig-MAP. Haptoglobin plasma levels were lower in group 3 than in groups 1 and 2 ($p=0.050$). When comparing samples for each group separately, pig-MAP and haptoglobin were reduced in group 1 ($p=0.014$ and 0.030 respectively) but not in groups 2 and 3. Pig-MAP and haptoglobin correlations among samples were significant (0.679 and 0.686 respectively). Taken together, these results suggest that APPs are able to discriminate between animals housed in different systems and can, therefore, be reliable indicators to measure long-term stress (Chapinal *et al.*, 2003).

Despite these encouraging results, the problem remains that APPs may either be general indicators of stress or indicators of tissue damage (Kushner, 1982). To investigate this issue, we are currently conducting an experiment subjecting pigs to a situation that is psychologically stressful but does not cause any tissue damage. We are using individually housed pigs that are divided into two experimental groups (control and treatment) of ten animals each. Animals in the control group have free access to food, whereas animals in the treatment group eat the same amount of food as controls but food is available only during a limited period of time that is randomly changed every day. Blood samples are taken at

regular intervals from each animals and analyzed for Pig-MAP and haptoglobin. Our results suggest that APPs increase only when the stress is associated to tissue damage. If this finding is confirmed, it would indicate that APPs can not be used as general stress markers. However, as stress related to social conflict and aggression is usually associated to tissue damage caused either by fighting or by an increase in physical activity, APPs have still some value.

Modifying the technique of analysis of cortisol or cortisol metabolites in faecal samples

We continue to work with a slightly modified ELISA technique that is used to determine cortisol in saliva in a variety of species. Also, together with the School of Veterinary Science in Zaragoza (Spain) we are trying to determine slightly different metabolites in faecal sample to see whether this results in a more reliable technique. Our first results are encouraging and we are currently working on a trial based on an ACTH-challenge technique to validate the method. As soon as we have processed the results, we will be able to make a judgment on the suitability of the technique.

WP 4.2. Determine the best density and the adequate number of feeders and shelters per animal to optimize animal welfare and the design of collared peccary facilities.

Recommendations on optimal stocking rates and management guidelines to improve animal welfare in CP farming systems. Delivery date: M36

The experiment attempting to define the best environmental conditions for CP welfare is in its final phase. We finished the data collection of the “feeder phase” and described the social structure of a group raised in semi natural conditions. We analyzed individual social status in three different densities.

In order to determine the best density to avoid conflicts of animals and enhance group cohesion, CR3 analyzed the social interactions of CP raised in three densities (9 animals in enclosures of 450, 900 and 1800 m²). Interactions and inter-individual distances were recorded when animals were fed. The results suggest that the higher density (0.02 ind/m²) is inadequate to breed CP: Some animals lost a lot of weight because they were prevented from approaching the feeder when others animals are feeding themselves in the same time, suggesting a subordinate status in the group. The animals of this group presented also a lot of aggression displays. Death of animals and infanticide also occurred. This study was presented in November of 2004 in Campo Grande during the XXII Annual Meeting of Ethology (Annex A). In January 2005, a master degree student will present this study to Zoology Program of State University of Santa Cruz (Brazil). He will defend a thesis entitled “Structure hierarchy of Collared Peccary (*Tayassu tajacu*) in semi-natural conditions under feeders influence in three different densities”.

CR3 has also submitted a manuscript to INCO scientific committee, that try to explain the hierarchy structure between animals maintained in one group in semi-natural conditions. This manuscript discusses the social consequences of the removal of one or more animals from a group. (Annex B).

CR3 results about the feeder study revealed that the better number of feeders is 1/4.5 animals. This study was presented in Campo Grande during the XXII Annual Meeting of Ethology in November 2004.

WP 4.3. Definition of CP ethogram, with special attention to behavioural indices of stress.

Publication on stress and aggression in captive CP. Delivery date: M24

Report on the ethogram of captive CP. Delivery date: M18

CR6 conducted new analyses on data previously reported and presented them during two scientific international meetings in Paris, France (Annex C) and Iquitos, Perú (Annex D). These presentations dealt with the global activity pattern of captive CP, the comparison of CP behaviour in normal and stressful situations, social relations in captive CP, the biometric study of growing CP and the comparison of several commercial foods. The results of the study on the global activity pattern of captive CP results were also compiled in a publication accepted by the "Revista de Etologia" (Ethological Review) which is actually in press.

As expected in the previous report, CP from CR6 did not demonstrate many behavioural differences when submitted to a supposedly stressful situation: the main behavioural modifications were a reduced locomotion, an enhanced lain down position and increased level of agonistic interactions. However, the amplitude of these variations was limited and mainly due to the spatial confinement of the animals imposed by the experimental situation. Non-aggressive interactions still represented more than 70 % of all recorded interactions in the supposedly stressful situation. Such behaviour is not necessarily representative of the general behaviour of captive CP: the animals of CR6 are frequently manipulated and group composition is also frequently altered. These management procedures have probably accelerated the domestication process, which is a result in itself.

In attempt to facilitate the detection of behavioural indices of stress, we observed CP submitted to a supposedly more stressful situation i.e. before after a two hour transport and their introduction in a new environment, a shelter in a commercial farm. CP from CR3 should be submitted to a similar stress and observed using the same methods during their transport to the future scientific farm of UESC. Both sets of data will be analyzed in 2005 in order the detect eventual behavioural differences between animals from CR3 and CR6 experimental sites.

In 2004, CR6 also initiated to collect data in order to relate social behaviour of captive CP to the reproductive cycle of females from several groups. Colpocytological examination is used to define the phase of the cycle of each adult female and social interactions are recorded using a camcorder. Data collection is still in progress.

New analyses were conducted in order to compare the growing curve of captive CP from Belém to animals from other experimental farms in Kourou, French Guiana (published in Dubost et al, 2003) and in Piracicaba, Brazil (provided by Sergio Nogueira from CR3). Weight data from each local were analyzed using the Von Bertalanffy growth model. Adult CP from Belém do not show a clear sexual dimorphism in body weight, as encountered in

Kourou and Piracicaba. Males grow more slowly in Belém but reach an adult mean weight intermediate between those encountered in Kourou and Piracicaba. Female adult mean weight is similar in Belém and Piracicaba and heavier than in Kourou.

3.3. Encountered Problems

As already explained in previous reports, the main difficulty encountered by CR2 has been the fact that cortisol appears to be very difficult to be reliably analyzed in CP faeces. Further, APPs are of interest but apparently only with stress associated to tissue damage. Therefore, we are currently working to modify the ELISA technique and validate it.

The main problem met by CR3 was the delay in the construction of shelters because of internal problems and due to the bureaucracy of the UESC, having delayed the assignment of a civil servant to the realization of this task. The problem is now solved and studies can normally continue.

CR6 still faced overpopulation during the first semester of 2004 which limited the management of the animals. The problem was solved in June when 50 animals were given to the first private farm of CP in northern Brazil. As explained in the last management report, WP4 leader moved from CR6 to CR3 region. On one hand, this new situation makes more difficult the supervision of data collection realized for WP4 in Belém. On the other hand, this new situation may facilitate the redaction of scientific publications by WP4 participants from CR3 and CR6.

3.4. Planned activities for the next period

WP 4.1. Testing an ELISA technique for determining cortisol levels in faeces.

ELISA kit for cortisone determination in CP faeces is set-up. Delivery date: M12
CR2 work plan for next year is to finish the ACTH-challenge experiment and the analytical trials to decide whether the modified ELISA technique to measure cortisol in faeces is suitable.

WP 4.2. Determine the best density and the adequate number of feeders and shelters per animal to optimize animal welfare and the design of collared peccary facilities.

Recommendations on optimal stocking rates and management guidelines to improve animal welfare in CP farming systems. Delivery date: M36
CR3 plans to finalize data collection of the shelter phase in April of 2005. CR3 is preparing two manuscripts dealing with the optimal stocking rates of CP and the ethogram of CP.

WP 4.3. Definition of CP ethogram, with special attention to behavioural indices of stress.

Publication on stress and aggression in captive CP. Delivery date: M24
Report on the ethogram of captive CP. Delivery date: M18
CR6 will collect behavioural data during the transfer of CP from CR3 to the new experimental farm and analyze both data sets from Ilhéus and Belém. Behavioural data on

social relations and reproduction will be analyzed. A synthetic publication on the behaviour of captive CP will be submitted.

4. Exploitation and dissemination of results

4.1. Significant aspects of the current market and how it is expected to evolve (real market and potential market)

The trade of CP products bred in captivity is still weak in Southern Brazil and was inexistent in the North until recently. In 2003, nineteen legal commercial farm of CP were registered in southern region but none in the northern region (IBAMA 2003). Nonetheless, the market is susceptible to develop because of an increasing interest of consumers for game meat. This is especially true in urban areas where the numerous potential places for commercialization, mainly "churrascarias" (steak houses) and supermarkets, exist. The increasing interest for this market is corroborated by the fact that several producers of Pará state engaged the administrative procedures and the construction of commercial breeding structures for CP in 2003. In 2004, CR6 donated the 50 individuals to the two first commercial farms of Pará state.

4.2. Technical and economic potential for exploitation

The partial results of WP4 provide many indices that tend to demonstrate a real potential of domestication of CP in intensive breeding systems: a high reproductive rate; a weak mortality; an increasing easiness to manipulate the animals presenting rare and low manifestations of stress. Contrary to what is commonly believed, our experience indicates that it is possible to modify group composition without generating aggressiveness systematically. Furthermore, relative high densities of individuals do not necessarily generate agonistic or aberrant behaviors. Nonetheless, the economic viability of a commercial exploitation depends on many other factors like the dependence of the breeder in relation with the cost variations of industrial porcine ration, cost of taxes, delays in the delivery of authorizations, commercialization strategy, etc.

4.3. Demonstrations given

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4.4. Publications and conference presentations resulting from the project (2003-2004)

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2004

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Appendix 1: Poster presented at the XXIIth Annual meeting of Etology, Campo Grande (Brazil), November 2004

Análise da estrutura hierárquica de caititus (*Tayassu tajacu*) em cativeiro sob a influência de diferentes números de comedouros e diferentes densidades

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Introdução

Os caititus são animais sociais, criados em cativeiro para exploração de sua carne, que é considerada uma iguaria e também para comercialização do seu couro, muito apreciado nacionalmente e internacionalmente. Por isso, estudos comportamentais voltados para o estabelecimento de técnicas de manejo são necessários.

Fase I

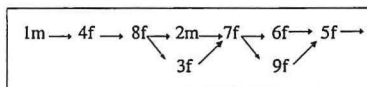


Figura 1: Árvores orientadas da D1 para o grupo todo

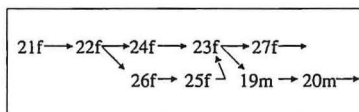


Figura 2: Árvore orientada da D2 para o grupo todo

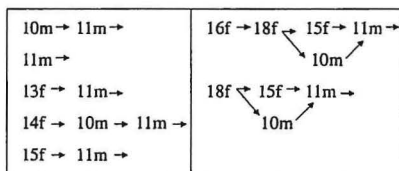


Figura 3: Árvores orientadas da D3 para o grupo todo



Fase I

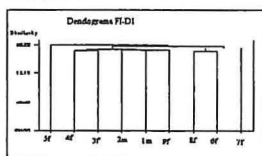


Figura 7: Dendograma da D1

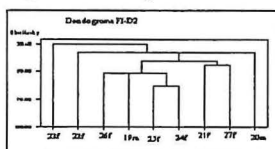


Figura 8: Dendograma da D2

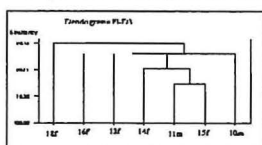


Figura 9: Dendograma da D3

Objetivo

O presente estudo teve como objetivo analisar se há alguma alteração na estrutura hierárquica de três grupos de caititus sob diferentes ofertas de comedouros e sob três densidades populacionais.

Metodologia

Vinte e sete caititus foram divididos em três grupos com nove animais. Cada grupo foi mantido em uma densidade diferente: D1 166,67m²/animal; D2 83,34m²/animal e D3 41,67m²/animal. O estudo foi dividido em duas fases, onde na primeira foram ofertados dois comedouros e na segunda três comedouros. Esses grupos foram observados sob o método de todas as ocorrências dos comportamentos agonísticos e amigáveis, além de uma amostragem de varredura para análise da distância entre os animais.

Resultados

Os resultados revelaram que o índice de Kendall encontrado nas duas fases indicam ausência de hierarquia linear entre os animais (Fase 1: D1 $k=0,28$; D2 $k=0,57$ e D3 $k=0,54$) e (Fase 2: D1 $k=0,32$; D2 $k=0,14$; D3 $k=0,44$). Através das árvores orientadas foi possível notar que houve alteração na estrutura hierárquica dos três grupos quando houve oferta de diferentes números de comedouros (Figuras 1 a 6). Também observamos que os dendogramas obtidos através da amostragem de varredura revelaram a formação de subgrupos em ambas as fases do experimento.

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Fase II

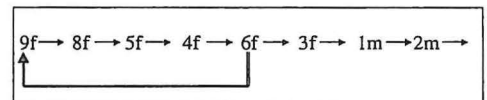


Figura 4: Árvores orientadas da D1 para o grupo todo

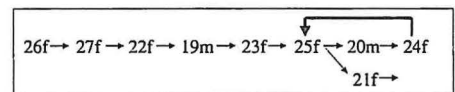


Figura 5: Árvores orientadas da D2 para o grupo todo

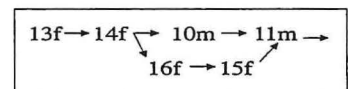


Figura 6: Árvores orientadas da D3 para o grupo todo



Fase II

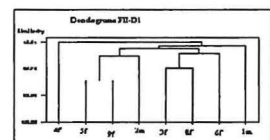


Figura 10: Dendograma da D1

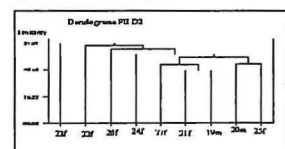


Figura 11: Dendograma da D2

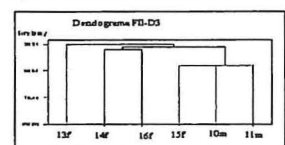


Figura 12: Dendograma da D3

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6 **THE SOCIAL STRUCTURE OF A COLLARED PECCARIES'**
7 **(*Tayassu tajacu*) HERD**

8
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1

2 *Abstract*

3 The collared peccaries are social animals that occur in typically cohesive herds, in reason of
4 that it is expected to observe some kind of social relationship in order to regulate the
5 conflicts. There is, however, doubts regarding the establishment of a dominance hierarchy
6 among the individuals of peccaries' herds in reason of different ways adopted to asses the
7 social structure of this species. Therefore, this study intends to analyze the social structure
8 of collared peccaries' herd in semi-captivity conditions. This herd was submitted to
9 changes in its composition that allowed registering the dynamic on the social structure.
10 Twelve adult collared peccaries were observed regarding agonistic and friendly interactions
11 through the focal animal sampling method. Dyads and subgroups coalitions appeared and
12 disappeared continually, and its depends on herd changes, such as removal of individuals.
13 Despotic hierarchy was observed among the males in some times but they did not show any
14 kind of hierarchy structure in the subsequent periods of observation. While the females did
15 not showed a dominance hierarchy of any kind during the observed periods – before or
16 after individual removals. These results suggested a relatively high flexibility on the social
17 structure of peccaries' herds and their shape will depend on the specific moment that the
18 observer obtains the data to analyze. This fact probably explained the controversy that
19 exists in the literature regarding the social hierarchy among the individuals of collared
20 peccaries' herds.

21

22 Keywords: social hierarchy, *Tayassu tajacu*, peccaries, social dominance, social behavior.

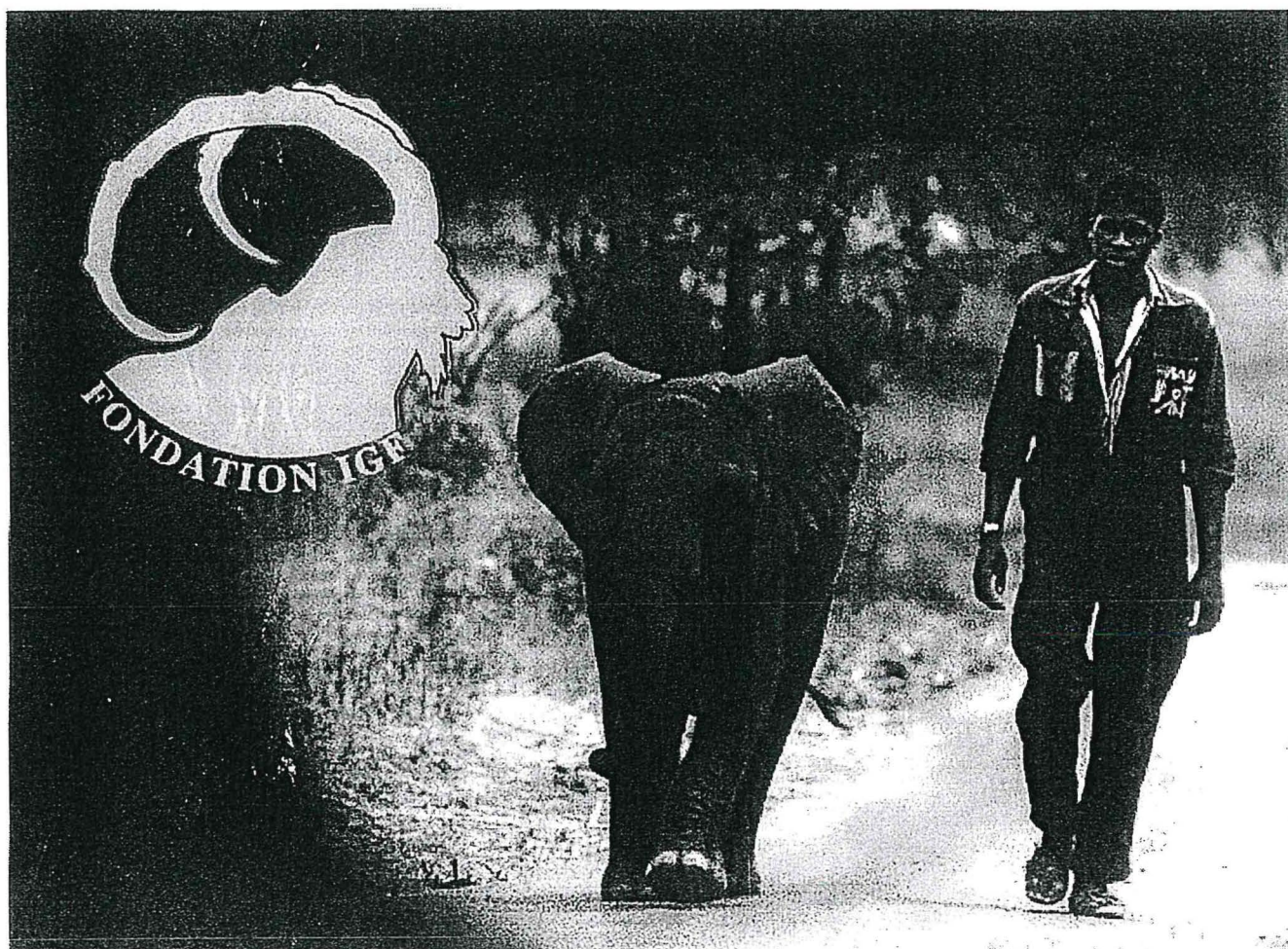
23

Appendix 3: Communications presented at the 6th International Wildlife Ranching Symposium, Paris, July 2004

LA FAUNE SAUVAGE : UNE RESSOURCE NATURELLE

6ème Symposium International sur l'Utilisation Durable de la Faune Sauvage
6th International Wildlife Ranching Symposium

Paris, France
6 – 9 Juillet 2004



RESUMES & POSTERS



6th International Wildlife Ranching Symposium

rural development. It will be a major challenge to bring this message in a convincing way to the public. If that succeeds, hunting has a good future in Europe.



LE PROGRAMME DE RECHERCHE A LA RESERVE DE LA HAUTE TOUCHE, FRANCE

LEGENBRE Xavier

Espace Animalier de la Haute Touche – Muséum national d'Histoire naturelle, Paris - France

Mots-clés : Banque, semence, fécondation in vitro, conservation

Résumé :

Il s'agit essentiellement d'un programme de recherches appliquées avec toutefois une valence fondamentale, notamment dans l'étude des facteurs environnementaux de l'oviducte au cours des différentes étapes de la fécondation.

Chez le mâle

L'objectif est de créer (et de poursuivre) la mise en œuvre d'une banque de semence des différents mâles hébergés à la Haute Touche.

But : disposer d'une « mémoire » génétique, pallier une disparition accidentelle, favoriser les échanges inter-zoos, disposer de semence pour les opérations de FIV (fécondation *in vitro*), éventuellement disposer d'une technique d'apport génétique par prélèvement sur animaux *in situ*.

Recherches : élaboration des meilleures techniques de contention-capture permettant d'optimiser les rendements d'électro-éjaculation, recherche des dilueurs et courbes de congélation appropriés, mise en œuvre d'une « étude génétique » des sujets prélevés (à partir de prélèvements associés de sang, phanères, tissu conjonctif), évaluation de la qualité de la semence avec un programme de FIV hétérologue par exemple...

Chez la femelle

Pourquoi augmenter la productivité (dans le cadre des espèces menacées) ?

Description des différentes techniques, et pourquoi le choix de la FIV ?

Présentation des résultats

Poursuite et développement de la FIV à d'autres espèces. Ceci suppose la maîtrise de la synchronisation des cycles (donc la maîtrise de la contention-capture avec le minimum de stress), l'étude des différentes possibilités de congélation des embryons, les possibilités de transfert inter-spécifique.

Compte tenu de la particularité des ovocytes de cervidés à se développer dans un milieu spécifique, une étude des différents facteurs physico-chimiques entre en cours (essentiellement isolement des différentes protéines concernées).

Des études complémentaires sont à envisager : études de comportement, dosage des stéroïdes fécaux pour une meilleure approche de la connaissance de la cyclicité femelle.

Partenaires

INRA, station de Nouzilly, Facultés d'Orléans et de Tours



CARACTERISTIQUES BIOLOGIQUES DU PECARI A COLLIER (*Tayassu tajacu*) ELEVE EN CAPTIVITE EN AMAZONIE BRESILIENNE

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Mots-clés : *Tayassu tajacu* ; élevage semi-intensif ; Amazonie brésilienne ; croissance ; reproduction ; alimentation

Résumé :

La biodiversité amazonienne est menacée par la déforestation croissante générée par la production extensive de bovins et l'exploitation forestière. De 1978 à 2001, 65 millions d'hectares de forêt ont été détruit en Amazonie brésilienne selon l'INPE (2003). Il est devenu nécessaire de développer des activités économiques moins destructives pour le milieu naturel. L'élevage de faune sauvage peut constituer une alternative répondant à ces préoccupations écologiques tout en procurant des revenus substantiels aux producteurs locaux (Cordeiro Rocha, 2001).

L'élevage commercial du pécarí à collier (*Tayassu tajacu*) présente plusieurs atouts: sa viande est appréciée par la population (Bonaudo et al., soumis), son cuir a une forte valeur commerciale, sa robustesse et la diversité de son régime alimentaire permettent de l'élever en zone rurale à des coûts raisonnables (Nogueira filho, 1999; Nogueira Filho e Nogueira, 2000). Il n'existe pas encore d'élevages commerciaux de pécarí à collier dans le Nord du Brésil (IBAMA, 2003).

Les connaissances sur la biologie de cette espèce en captivité en Amazonie sont encore succinctes (Dubost, 1997, 2001; Dutertre et al., 2001, Dubost et al. 2003). C'est pourquoi des chercheurs de l'Université Fédérale du Pará et de l'Embrapa-Amazônia orientale ont développé depuis 1998 un élevage expérimental de pécarí à collier à Belém, Pará, Brésil. Des données concernant la biométrie, la nutrition, la reproduction et le comportement ont été collectées afin d'identifier d'éventuelles spécificités biologiques régionales et de disposer des informations pratiques nécessaires aux futurs producteurs commerciaux de la région. Quelques résultats concernant la croissance, la valeur nutritive d'espèces végétales régionales, les caractéristiques générales de la reproduction et le comportement seront exposés oralement et présentés plus en détail sur des posters relatifs à chacun de ces thèmes.

Les individus acquièrent leur poids d'abattage entre 10 et 12 mois. Un polynôme du second degré donne une bonne approximation de la croissance durant les 500 premiers jours (males: $y = -0,00008 x^2 + 0,081 x + 0,8855$; $R^2=0,99$; femelles: $y = -0,00009 x^2 + 0,0832 x + 0,6207$; $R^2 = 0,9703$). A 300 jours, un male pèse en moyenne 18 kilos, une femelle 17,5 kilos. A un an, males et femelles pèsent en moyenne 19,8 et 19 kilos, respectivement.

Nous avons analysé l'effet de 4 rations commerciales sur le poids d'animaux adultes. Les animaux se sont rapidement adaptés à la nouvelle ration et n'ont pas présenté de variation de poids notable. Nous avons testé la valeur nutritive de 42 espèces rencontrées dans le milieu naturel et susceptibles d'être utilisées par les producteurs. Dix-huit espèces étaient riches en protéines brutes et 9 espèces présentaient des taux de lipides supérieurs à 10%.

Concernant la reproduction, la durée de gestation est de $138,3 \pm 5,3$ days ($n=12$); La portée est généralement de 2 petits, rarement un, exceptionnellement trois (moyenne: $1,98 \pm 0,41$, $n=53$). L'âge moyen de la première mise-bas est de $595,2 \pm 239,9$ jours ($n=10$). L'oestrus post-partum a lieu $8,6 \pm 2,4$ jours après la naissance. Le nombre moyen de mises-bas par femelle et par an est de $2,35 \pm 0,43$ ($n=41$).

Les animaux sont diurnes. Ils présentent peu de comportement agressifs et de manifestations de stress, notamment lorsqu'ils sont manipulés régulièrement. L'intégration d'un individu dans un nouveau groupe ne pose généralement pas de problème, ce qui facilite la gestion du cheptel.

Les résultats obtenus seront comparés à ceux obtenus dans d'autres biotopes et commentés d'un point de vue productif.

Ces études ont été financées par la Commission Européenne (INCO-DEV/ICA4-CT-2001-10045, projet PECARI); le Conseil National pour le développement scientifique et technologique du Brésil (CNPq, projet TAYATAJA) et le Fond de l'Etat du Pará pour la Science et la Technologie (Funtec-Sectam) et l'EMBRAPA/CPATU-PA/PPG7.

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précédant les premiers prélèvements, on peut penser que cette charge en faune avoisine la capacité de charge écologique du site. Dans ces conditions, la production durable maximum (PDM) annuelle, calculée par la loi de Caughley et Krebs (1983) est estimée à 56 tonnes (1200 têtes, toutes espèces confondues), soit 28 tonnes de venaison, compte tenu des rendements moyens en carcasses obtenus à Nazinga.

Un prélèvement de 680 têtes a été réalisé en 1988-89. Ce volume n'a plus été atteint par le RGN par la suite pour de nombreuses raisons, dont une étatisation rapide de la structure, et les contraintes techniques et logistiques liées au système d'abattage, de conservation et commercialisation. La vocation du site a progressivement évolué vers des prestations de tourisme cynégétique. Ainsi en 2000, les ¾ des 190 animaux abattus officiellement ont été prélevés par des chasseurs de trophées.

Situation récente

Depuis 1989, un seul recensement annuel est effectué, et les taux de rencontre observés sont insuffisants pour estimer des effectifs avec précision. La méthode de recensement n'a pas été adaptée à l'estimation de la disponibilité en grands trophées. Les quotas de tir attribués aux guides de chasse annuellement, de l'ordre de 350 têtes, sont excessifs au regard des effectifs en présence. Les faibles taux de réalisation des quotas en 1999 et 2000 (respectivement 37 puis 27%) le montrent d'ailleurs clairement.

Les prélèvements issus du braconnage sont impossibles à chiffrer. Une représentation spatiale par la méthode de Kernel (WORTON, B.J., 1989) de la distribution des populations animales et des indices de braconnages relevés lors des recensements de la période étudiée révèle cependant une importante réduction de l'aire de distribution du gibier dans le RGN, spatialement corrélée à une augmentation centripète de l'emprise du braconnage villageois local.

Recommandations

Deux recensements annuels successifs sont un minimum pour obtenir des coefficients de variation inférieurs à 25% sur l'estimation d'effectif. De plus, le suivi d'indicateurs complémentaires (taux de réalisation des quotas, évolution de la qualité des trophées prélevés, etc) est indispensable pour l'élaboration de quotas de tir réalistes.

Vu sous un angle strict du technicien, il paraît clair que la viabilité de la vocation actuelle du RGN requiert d'une part une révision à la baisse des prélèvements, et des mesures efficaces pour enrayer le braconnage.

■

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NUTRITION AND SANITARY CHARACTERISTICS OF COLLARED PECCARY (*Tayassu tajacu*) FOR SMALL PRODUCERS IN THE AMAZON REGION

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Keywords: *Tayassu tajacu*, nutrition, sanity, production system, captivity

Abstract:

Although forbidden, hunting is widely practiced in rural areas of the Amazon region of Brazil, mainly by poor populations that do not have an easy access to other animal protein sources. Rodents (capybara *Hydrochaeris hydrochaeris*, paca *Agouti paca*, agouti *Dasyprocta* sp.) and ungulates (collared peccary *Tayassu tajacu*, White-lipped peccary *Tayassu pecari*, deer *Mazama* sp.) are the main game species. Controlling hunting activity is technically impossible in such large region, although the main reason for the impoverishment of fauna and flora is the deforestation. An alternative is to incite the production of these animals in captivity to diminish the uncontrolled hunt and consequently participate to the conservation of the species.

The general purpose of our work is to study the captive production system of collared peccary to obtain a viable production for subsistence or commercialization.

Little is known about the chemical composition and nutritive value of fruits, flowers and seeds from native Amazonian plant species. The chemical composition and nutritive value of native flowers, fruits and seeds consumed by wild peccaries were analyzed to elaborate

balanced diets for captive peccaries for small producers of the Amazon region. The work was carried out at the food technology laboratory at Embrapa, in Belém, Pará, Brazil. We collect the samples in a primary forest area where collared peccaries are naturally common, in Uruará, along the transamazonian highway (BR 230), Pará, Brazil. Data were collected every two months during two years. The material was identified, frozen and transported to the laboratory, where the analyses were conducted: samples were dried at 105°C in order to extract crude protein, ether extract, calcium, magnesium and phosphorus contents. Ash was obtained at 580°C. Forty-eight samples from a total of 42 different species were tested, for the ether extract. 21.42 % of the species tested (n=9) were high in fat, with values comprised between 12,13 and 37.04%, i.e. resulting in a significant source of energy to compose the diets. Results by species were: andiroba seed – *Carapa guianensis* 37.04%; frutão – *Pouteria* sp. 23,29%; abacatinho – *Ocotea* sp. 20,22%; cajuzinho – *Anacardium giganteum* 21,50%; abiu pequeno – *Pouteria* sp. 18,11%; tauari folha – *Couratari* sp. 17,55%; abiu grande – *Pouteria* sp. 15,55%; carvão vermelho – *Pouteria* sp. 13,69%; and pitomba peluda – *Sloanea guianensis* 12,13%. Nearly 40% of the species (n=18) had 9.23 to 20.62% of crude protein, a good indicator for diet elaboration. The calcium, magnesium and phosphorus contents were, respectively 0.07 to 0.99, 0.02 to 0.38 and 0.05 to 0.43. The information obtained in this work will be of great utility for the elaboration of an alternative diet for peccaries and other wild or domestic species of economic interest, or even for human consumption.

In relation with sanitary characteristics, frequent pathological factors in Brazil are the parasites and some zoonoses. We collected samples of faeces to study the parasites and we conducted serological diagnosis of zoonoses. The following parasites were met: *Strongylus* sp., *Ascaris* Suim, *Balantidium coli*, *Schistosoma rançoni* and *Eimeria*. All the samples were negative for tuberculosis and leptospirosis. Two animals were serum positives for Brucellosis.

The results confirm that collared peccary is a viable species for captive production system. They will be useful for other works and people formation.

The present study was financed by the European Commission (INCO-DEV/ICA4-CT-2001-10045, PECARI project) and EMBRAPA/CPATU-PA/PPG7.

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FACTS FROM FAECES OF WILD RUSA DEER IN NEW CALEDONIA: A REVIEW OF CURRENT INFORMATION ON POPULATION MONITORING DIET ANALYSIS AND PARASITES

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Keywords: *Cervus timorensis*, ungulates, faecal pellets, monitoring, Pacific

Résumé :

La gestion des ressources naturelles en général et celle des aires protégées en particulier ont longtemps été réalisées de façon unilatérale par les institutions étatiques chargées de la protection de ces patrimoines. Cette situation a entraîné une quasi exclusion des populations. Au nombre des raisons qui ont engendré la faible protection des ressources naturelles, on peut citer cette relative marginalisation des populations riveraines ou non.

Pour y remédier, depuis les années 1990, le Bénin, comme bien d'autres pays, expérimente des stratégies d'implication des premiers bénéficiaires de la conservation des ressources naturelles. A ce titre, plusieurs méthodes testées et éprouvées ont été appliquées afin d'assurer une participation effective des populations riveraines.

A partir d'enquêtes semi-structurées réalisées au nord-est du Bénin dans les départements du Borgou et de l'Alibori, un diagnostic a été fait dans 30 villages riverains des autres domaines classés et dans 75 villages riverains au parc National du W du fleuve Niger. Dans ce cadre, différents acteurs ont été interviewés : il s'agit des cadres, des animateurs ruraux, des riverains de toutes les catégories socioprofessionnelles, des personnes ressources et ONG.

L'objectif principal de cette investigation est de caractériser les formes d'organisations paysannes mises en place par les différents projets ruraux ou forestiers. Au delà de cette caractérisation, l'étude s'est focalisée sur le cas des Associations Villageoises de Chasse (AVC), de nos jours dénommées Associations Villageoises de Gestion des Réserves de Faune (AVIGREF).

Les résultats de cette étude indiquent en substance que de multiples organisations paysannes (chacune inféodée à un projet), d'appellations diverses, sont installées dans les villages riverains aux domaines classés et sont animées pour la plupart par les mêmes individus du village. Hormis les coûts excessifs de la mise en place de ces structures villageoises, la responsabilisation d'un même individu dans plusieurs structures est souvent source d'un fonctionnement peu efficient des organisations paysannes en place.

Ce constat est perceptible à travers le fort chevauchement des calendriers et des programmes d'un projet à l'autre. De même, les objectifs et les concepts des différents projets sont parfois divergents, conduisant malheureusement au développement de thèmes d'animation et d'activités contradictoires sur le terrain, et au mieux des cas à la duplication des activités au même lieu.

C'est afin de contribuer à harmoniser les interventions des divers projets et programmes que la présente étude a été initiée. La conclusion préliminaire de l'étude préconise la création de fora des partenaires opérant dans un même secteur ou dans un même département. Dans ce cadre, la pleine participation des Maires des Communes riveraines et des autorités (traditionnelles et administratives) au plus haut niveau est requise afin d'assurer une bonne coordination des calendriers, des programmes et des activités sur le terrain. Il s'agit d'une situation intérimaire qui conduira à terme, au montage de projets intégrés.

L'étude a conduit à la formulation de recommandations relatives à la mise en place d'une structuration unique des populations qui serait le répondant des intervenants « développeurs » qui, à leur tour, et au-delà des fora, doivent pouvoir ainsi concevoir des programmes intégrés durables et agir dorénavant de façon concertée dans des cadres incluant la chefferie traditionnelle et l'administration locale.



BEHAVIOURAL CHARACTERISTICS OF CAPTIVE COLLARED PECCARY (*Tayassu tajacu*) IN THE BRAZILIAN AMAZON REGION

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Keywords: *Tayassu tajacu*; semi-intensive breeding system; behaviour; stress; animal production; domestication

Abstract:

Commercial raising of collared peccary (*Tayassu tajacu*) in captivity is still an unexploited activity in the Brazilian Amazon region. Yet such breeding may provide an economic alternative to the main activities responsible for the deforestation in the region i.e. extensive bovine raising, lumbering and planting. The increased interest in the production of peccaries resulted in various experimental raising farms whose objective was to gain research knowledge regarding the technical, biological and economic aspects necessary to develop the activity.

The ethological knowledge of species behaviour in captivity is important in order to determine its receptivity to domestication and to define the appropriate way to manage it. Behavioural analysis is helpful in defining the most suitable group composition, as well as to evaluate the well-being of the animals and to determine the most suitable periods to manage them.

Detailed behavioural studies of wild collared peccaries have been achieved in the South of the United-States (Byers and Bekoff, 1981; Bissonette, 1982) but there are few ethological studies of captive collared peccaries in the Amazon region and these are recent (Dubost, 1997, 2001; Dutertre *et al.*, 2001; Nogueiro Filho, S. *et al.*, 1999; Venturieri and Le Pendu, 2002).

We have conducted behavioural studies of captive collared peccaries since 2000 in the experimental farm of the EMBRAPA-Amazonia Oriental, located in Belém, Pará. The study was begun with 8 individuals captured in the wild, and presently there are more than a hundred animals individually ear-tagged for sex and age. Observed animals were placed in 3X12m, 3X7m and 18X25m enclosures, each comprising 4 to 11 individuals. The animals were observed in two situations: a "normal situation" and a "stressful situation". The potentially "stressful situation" was induced by the manipulation of a congener within the enclosure.

We conducted direct observations to determine the animals daily pattern of activity in the "normal situation". Focal and scan sampling (Martin and Bateson, 1993) respectively, were used during the diurnal and nocturnal periods. Using behaviour sampling, we also filmed the animals in order to record social interactions (Martin and Bateson, 1993). In addition, filmed records were obtained during the "stressful situation" in an attempt to discover behavioural indices of stress.

The animals are clearly diurnal, being especially active in two periods: from 6:30 to 10:30 a.m. and from 2:30 to 4:30 p.m.

The individuals generally interact with all their congeners, independently of their sex and age. In the "normal situation", 60% of the interactions involved olfactory investigation, whereas only 13% of the interactions were agonistic.

In the "stressful" situation, olfactory investigation was still the most frequent type of interaction (54%) but agonistic interactions increased to 29% of the total interactions. Nevertheless, aggressive behaviour occurred only 0,8% of the time in the stressful situation.

The analysis of the interactional network within three different groups doesn't show a clear dominance hierarchy between individuals. This result is supported by the acceptance of new individuals that were added to the group on numerous occasions.

In sum, the behavioural characteristics of captive collared peccaries in the Amazon region seem favorable to its successful commercial breeding: its diurnal habits and low level of aggression, even in stressful situations indicates a strong propensity to domestication.

The present study was financed by the European Commission (INCO-DEV/ICA4-CT-2001-10045, PECARI project); the National Council for Scientific and Technological Development (CNPq, TAYATAJA project) and the Pará State Fund for Science and Technology (Funtec-Sectam) and EMBRAPA/CPATU-PA/PPG7.

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USING TRADITIONAL CONSERVATION NORMS TO COMPLIMENT MODERN CONSERVATION EFFORTS

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Keywords: Bushmeat hunting, wildlife, extinction, traditional conservation norms, totems

Abstract:

Bushmeat hunting in recent years has become a major threat to wildlife conservation in West and Central Africa. Many wild animal populations have declined rapidly as a result of the ever increasing demand for bushmeat in the urban areas. Unfortunately modern

Appendix 4: Communications presented at the VI International Congress on
Wildlife Management in the Amazonia and Latin America, Iquitos (Peru),
September 2004

LIBRO DE RESÚMENES



**VI CONGRESO
INTERNACIONAL
SOBRE MANEJO
DE FAUNA SILVESTRE
EN LA AMAZONÍA
Y LATINOAMÉRICA**

**LECCIONES
APRENDIDAS**

**5 - 10
SETIEMBRE
2004
IQUITOS-PERÚ**



EFFECTO DE LOS GRANDES MAMÍFEROS EN EL BOSQUE ALTO ANDINO

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Los bosques andinos son ecosistemas de alta diversidad que proporciona valiosos servicios ambientales, pero la alta tasa de deforestación de sus bosques amenaza su supervivencia, así como la de especies animales únicas como el oso andino, la danta de montaña y varias especies de camélidos y cervidos. Los mamíferos son un grupo importante dentro de las relaciones ecológicas de los ecosistemas andinos como herbívoros, dispersores y depredadores de semillas que influyen en la estructura y composición florística del bosque montano y el páramo. Este estudio presenta los resultados de 25 experimentos de exclusión en los que se aislaron parcelas de bosque para determinar el efecto de los grandes mamíferos (oso, danta y venados), cuantificado en función de biomasa y diversidad. Luego de un año y medio de instalados 25 exclusiones y 25 controles, se encontraron diferencias estadísticamente significativas en términos de biomasa. Sugiriendo que en el corto plazo la probable extinción de los grandes mamíferos, como consecuencia de la cacería y fragmentación del hábitat, puede llevar a alteraciones de los procesos ecológicos de los bosques alto andinos y los servicios ambientales que estos ecosistemas prestan.

A CONSERVATION STUDY OF THE FAUNA FROM THE ENVIRONMENTAL PARK OF BELÉM AND THE INTERACTIONS WITH THE NEARBY COMMUNITY

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This study was conducted at the Environmental Park of Belém (EPB), a Conservation Unit (CU) located in the Northern of Brazil. The purpose of the present study was: to ascertain the existence of conservation activities of the fauna; to list all the animal species introduced into the EPB between May, 1994 and May, 2003; and to analyze the level of knowledge of the EPB nearby human population. Interviews were conducted at Moça Bonita community where 20% of the homes were visited. This methodology agreed with the census of Brazilian Institute of Geography and Statistics (2000). The documents of Environmental Police, Bulletin of Capture and Release, were analyzed. The analyses showed that: 1) There is no fauna conservation activity at the EPB; 2) A number of 2472 animals have been introduced into the park including birds (65,4%), reptiles (27,7%) and mammals (6,9%); 3) 39 species released in the park including 27 birds, 7 reptiles and 5 mammals had not been recorded in a previous study in the area. This may lead to changes in the local ecosystem equilibrium, and jeopardize the conservation of the biodiversity; 4) The surrounding population knows little about EPB, even though most of them have visited the place, mainly for nature sight walks; 5) The community believes that conserving EPB as a leisure area, and a place for conservation of the fauna is important; 6) The lack of environmental education programs is one of the reasons why EPB does not fully play its role as a CU.

CRIAÇÃO INTENSIVA DE CAITITUS *Tayassu tajacu*: EXPERIÊNCIA NA AMAZÔNIA BRASILEIRA

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Um criatório científico de *Tayassu tajacu* foi implantado na EMBRAPA Amazônia Oriental (Belém-PA) para a conservação e produção da espécie. No ano de 1997 foram construídas cinco baias de 3x12 m, com um bebedouro e um comedouro. Os primeiros 12 animais (adultos, jovens e filhotes) chegaram em maio de 1998 oriundos do município de Uruará (Pará-Brasil). Eles foram distribuídos em cinco grupos: 3 casais, e 2 grupos de 2 machos e 1 fêmea. Em julho de 2000 chegaram mais 5 machos e 15 fêmeas, provenientes do criatório da Escola Superior de Agricultura de Mossoró (Nordeste do Brasil). Eles foram mantidos em um piquete de 18x25 m, com 1 bebedouro e 1 comedouro. Foi ofertada ração comercial com 14% de proteína bruta, além de forrageiras e frutos *ad libitum*. Em setembro de 1999 nasceram os primeiros filhotes em cativeiro. Após o nascimento era feita a sexagem e a biometria. Todos os animais nascidos permaneceram no grupo, não sendo adotado o desmame de filhotes. O sistema de identificação foi o de marcação com brincos de plástico, numerados e usado em duas cores conforme o sexo para facilitar no manejo. Para a captura dos animais utilizou-se puçás de tamanhos diferentes para adultos e filhotes. Para controle sanitário foi aplicado Ivermectina (1%) a cada 6 meses, além de limpeza diárias nas baias. O número de nascimento em cativeiro para o período de

setembro de 1999 a maio de 2004 foi de 156 animais, destes filhotes 44 morreram. Durante o período, foram realizadas 167 mudanças de indivíduos entre grupos diferentes não sendo observado problemas na adaptação. Do total de 134 animais presente na criação em maio de 2004, 55 foram doados para os dois primeiros criatórios comerciais próximos a Belém. É possível manter grupos de caititus em um sistema de criação intensiva visto que os animais se adaptam bem ao manejo em cativeiro, pois se reproduzem, alimentam e não apresentam problemas de sanidade em um meio controlado.

Financiamento: PPG7; Comissão Européia (PECARI-INCO-DEV/ICA4-CT-200110045); CNPq; FUNTEC/SECTAM

SISTEMA DE PRODUÇÃO DE CAITITUS (*TAYASSU TAJACU*) EM CATIVEIRO PARA A PEQUENA AGRICULTURA NA AMAZÔNIA

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O objetivo do presente trabalho foi estudar a biologia de *Tayassu tajacu* em cativeiro na Amazônia afim de avaliar sua produção para sustentabilidade ou comercialização na região. Analisamos os valores energéticos e protéicos de espécies vegetais consumidas pelo caititu na região, a sanidade, a reprodução e o comportamento. As espécies vegetais com maiores valores energéticos foram: *Carapa guianensis* (40,4%), *Pouteria sp.* (23,29%) *Anacardium giganteum* (21,50%) e *Ocotea sp.* (20,22%). De 33,9% das amostras obteve-se de 9 a 20,62% de proteína bruta. Os parasitas encontrados foram: *Strongylus sp.*, *Ascaris suum*, *Balantidium coli*, *S. rançoni* e *Eimeria sp.* Os diagnósticos sorológicos das zoonoses realizados foram todos negativos, exceto dois animais soropositivos para brucelose. A reprodução apresentou-se poliestral contínua, com média de gestação de $138,3 \pm 5,3$ dias, média do cio pós-parto de $8,6 \pm 2,4$ dias e intervalo médio entre partos foi de $155,2 \pm 15,0$ dias. A média da primeira gestação ocorreu aos $595,2 \pm 239,9$ dias. O número médio de filhotes foi $1,82 \pm 0,42$, com 48,2% de machos e 51,8% de fêmeas. Os animais apresentaram um padrão de atividades diurno. Eles dedicaram mais de 50% do tempo à observação, 20% ao deslocamento, 7% à investigação olfatória do ambiente e 5% ao descanso. A investigação olfatória de um congênere representou metade das interações. A classificação botânica e análise química dos frutos, flores e sementes permitiu conhecer bons indicadores para a elaboração de dietas. Os principais agentes etiológicos encontrados foram as endoparasitoses. Recomenda-se a vermifugação semestral do plantel. As fêmeas apresentaram gestações gemelares de períodos curtos quando comparadas a outros mamíferos, com breve intervalo entre partos, indicando cio pós-parto fértil, com até dois partos ao ano. Foi possível conhecer os padrões de atividades da espécie e assim determinar horários para o manejo e adequação ao tamanho do recinto. Essas características representam aspectos positivos para a produção da espécie em cativeiro.

Financiamento: PPG7; Comissão Européia (PECARI-INCO-DEV/ICA4-CT-200110045); CNPq; FUNTEC/SECTAM

ALIMENTAÇÃO DO CAITITU (*Tayassu tajacu*) EM CATIVEIRO COM RAÇÕES COMERCIAIS PARA SUÍNOS.

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A criação comercial de *Tayassu tajacu* em cativeiro pode representar uma alternativa à produção extensiva de gado na Amazônia, principal causa do desmatamento na região. A sustentabilidade da criação de caititu necessita buscar os menores custos de produção, dentro dos quais a alimentação dos animais. No presente trabalho, foram testadas quatro rações comerciais de crescimento para suínos de custo variando entre 0,55 e 1,38 Reais o quilo: Guabi-Porcria 14%(GP), Nutramaz-Crescimento (NC), Ocrim-Suinocrim SF22 (OS) e Makaru-Crescimento (MC). O objetivo era determinar a aceitabilidade das rações, o consumo diário e medir o ganho de peso dos adultos. O estudo foi conduzido entre abril e agosto de 2003 em 12 baias da criação experimental da EMPRAPA Amazônia Oriental em Belém (Pará-Brasil). Durante a primeira fase F1, testamos as 4 rações em 8 baias enquanto que na segunda fase F2, testamos as duas rações mais baratas (OS e MC) durante F1. Um macho e uma fêmea adulta, de cada baia, foram pesados no primeiro e no último dia de cada fase. Antes do experimento, os animais eram alimentados diariamente com 500 gramas de GP sendo complementada ocasionalmente com bananas e a forrageira maria-mole (*Senecio brasiliensis*). Os animais aceitaram as novas rações desde o primeiro dia, mesmo sendo ofertadas na forma farelada ou peletizada. O consumo médio diário por

ANNEXE 5 – WP5 ANNUAL REPORT

WP5: The ecology of natural populations of collared peccary (*Tayassu tajacu*) under natural conditions in cocoa farms in the Brazilian Northeast and the cattle ranches of the Pantanal

ANNEXE 5 – WP5 ANNUAL REPORT

Third Annual Report of the INCO PECARI

NOVEMBER 2004

Work Package Number 5: The ecology of natural populations of collared peccary (*Tayassu tajacu*) under natural conditions in cocoa farms in the Brazilian Northeast and in cattle ranches of the Pantanal.



Collared peccaries foraging in the Brazilian Pantanal

Work Package leader: Dr Richard Bodmer DICE, UK

Participant Number: **CR3 - Bahia Study Site**
Dr Sergio Nogueira, UESC, Brazil
Gastón Gine, UESC, Brazil

CR4 - Pantanal Study Site
Dr Richard Bodmer, DICE, UK

Executive Summary

The possibility of ranching collared peccary in Brazil depends on ecological and socio-economic conditions. Our goal is to examine the possibilities of collared peccary ranching by conducting studies in two representative landscapes in Brazil, the Pantanal of Mato Grosso do Sul State and the Atlantic Forests of Bahia State. Ecological studies examine how keystone and limiting resources influence the population dynamics, habitat use, and feeding ecology of collared peccary. The methods used include line transect counts, feeding stations, micro-histological analysis of faeces, and fruiting phenology. WP5 will define what combination of keystone and limiting resources are most suitable for collared peccary populations. The ecological information will then be combined with socio-economic analyses to make recommendations for the feasibility of ranching peccary populations in the Pantanal of Mato Grosso do Sul and the Atlantic Forests of Bahia. The aims and objectives for WP5 are being successfully attained in both sites.

In the Pantanal CR4 has established 19 trails totalling 78 km, and 2,155 km of trails has been walked. Over 100 collared peccary groups have been sighted from the trails. Phenology studies have been pursued for two years and data from 500 baited tracking stations has been collected. Fifty-six collared peccary faecal samples have been collected. Macroanalysis of the feces has shown that collared peccary show seasonal variations in their diet, fruits being the main item in periods of high fruit availability and vegetation being the main item consumed in periods of fruit scarcity. An interactive key using DELTA *software* is being constructed to conduct a detailed analysis at the species level of plants and fruits consumed. A total of 100 plants are being described as well as 25 fruit seed. The socio-economic study is currently being conducted. Data from hunting registers in seven *fazendas* has been gathered for over a year, and interviews in over 25 fazendas have been conducted. As for CR3 the objective for 2004 was to conduct full field data collection. In this region, 24 collared peccary feces have been collected for the studies on feeding ecology and keystone and limiting resources, phenology of over 16 fruiting trees is being recorded, and 22 fruit baited tracking stations using various species fruits have been checked. In addition, 430 km of transect have been walked for the population analysis in the Cocoa farms study site. Collared peccaries have been sighted 21 times during the transects. Densities in this region will be estimated for both quasi-original forest habitats and cocoa *cabruca* agro-forestry system.

1. Objectives and strategic aspects

Once the proper permits have been obtained, the possibility of ranching collared peccaries in Brazil will depend on the technical feasibility in terms of ecology and population productivity as well as the socio-economic feasibility in terms of cultural and economic realities in each region. Collared peccary population production is being determined through population level studies that examine the group size, age structure, density, sex ratio and fecundity of groups occupying different habitat types. These data, and data on habitat use have been collected during direct observations of collared peccary groups on line transect counts. Keystone and limiting resources have been studied using standard phenology techniques. Data on feeding ecology are collected through feeding stations and faecal analysis. They will be combined with population analysis, phenology of keystone and limiting resources to determine the ecological feasibility of collared peccary ranching. Analysis of the economics and cultural use of current peccary harvests is being done through an exploratory hunting survey, interviews, and collection of skulls from hunted animals. The economics and cultural use of current peccary harvests will then be integrated with the ecological analysis for the final recommendations on the feasibility of collared peccary ranching.

2. Scientific and Technical assessment

2.1. Overview of the technical state of the research

2.1.1. Overview of Activities realized by CR4

Most of the research took place at the EMBRAPA Pantanal ranch, Fazenda Nhumirim and its neighbouring ranches. This study area presents a complex mosaic of habitats, which include permanent and temporary ponds called *baías*, forest patches called *capao* or *cordilheira*, scrub forests of cerrado vegetation, grasslands and seasonally flooded grasslands. However in 2004 field research was extended to a second study area, fazenda Manduvi, which is dominated by vast areas of flood planes. In this area the line transect study as well as feces collection took place. These two study areas have enabled the research to cover the principal landscapes that occur in Nhecolândia.

Research began in July 2002 and on November 2004 the following has been accomplished:

- 19 transects totalling 78 km have been opened and walked
- 2,155 km of transects have been walked (17,055 km in Nhumirim area and 400 km Manduvi area)
- Over a 100 collared peccary groups, over 50 white lipped peccary groups and over 100 feral pig groups have been registered from the trails in both study areas
- Phenology study of 20 tree species have been carried out since October 2003 in the Nhumirim study area
- Data has been gathered from 500 fruit baited tracking stations using palm fruits (*Scheelea phalerata*) in the Nhumirim study area.
- 109 feral pig, 113 white lipped peccary, and 56 collared peccary faecal samples have been collected in the Nhumirim study area. 23 feral pig feces have been collected in the Manduvi study area.
- Macro analysis of feces for the collared peccary, white lipped peccary and feral pig from the Nhumirim study area has been conducted
- An interactive key using DELTA *software*, to conduct the micro histological analysis of feces is being constructed

- Over 100 feral pig, 7 collared peccary and 8 white-lipped peccary skulls have been collected
- Hunting registers have been distributed in 7 ranches for over a year
- An exploratory survey on hunting practices has been conducted during one and a half years
- Interviews have been conducted in 25 different fazendas

Specifically 2004 activities have included:

1. 2 months were spent at the University of Kent in Canterbury to analyse data, review and plan future work with Richard Bodmer
2. 400 km of transect in the Manduvi area were walked
3. Habitat characterization of the Nhumirim study area has been conducted
4. Density estimates for *Scheelea phalerata* has been conducted in the Nhumirim study area
5. Washed and sieved 278 feces (Collared Peccary (56); White lipped peccary (113); Feral pig (109))
6. Macro analysis of 278 feces using 10-point sampling frame was conducted
7. Creation of interactive key for micro histological analysis
8. The character list for gramineae has been established
9. Epidermal cell characteristics of 46 gramineae have been identified.
10. The character list for dicotyledonous plants has been established
11. A list of 60 dicotyledonous plants has been identified
12. Over 35 interviews in 25 different fazendas of Nhecolandia have been conducted
13. The collection of skulls was finished and they were brought to Corumba for analysis
14. Attending the Latin American Congress of fauna management in Iquitos, Peru

2.1.2. Overview of main results obtained by CR4

A. Ecological study

A.1 Feeding Ecology of Collared Peccary

Sustainable harvesting will ultimately depend on the limiting and keystone resources during periods of low food production. Limiting food resources are those food types that are abundant during most of the year but not available during periods of scarcity. Keystone resources are food types that are abundant during most of the year but not available during periods of scarcity and allow the animals to overcome these harsh periods. Methods to determine limiting and keystone resources include macro and micro histological analysis of feces samples, fruit baited tracking stations, tree phenology studies, fruit trails.

a. Analysis of feces

The diet of the collared peccary is being investigated through macroscopic and micro-histological analysis of fecal samples. Generally feces collection was done opportunistically at any time in the field. Between August 2002 and November 2003, 56 collared peccary feces were collected and stored in 70% alcohol. Samples are being analysed in the EMBRAPA Pantanal laboratory in Corumba.

Feces are washed with water over a 1 mm sieve and a 0.57 mm sieve. Materials from both sieves are then stored in 70% for later analysis.

Macroscopic analysis

Macroscopic analysis of feces was conducted using a 10-point sampling frame. This method involved spreading the contents of the 1 mm sieve on an aluminium sheet. The 10-point sampling frame is then placed parallel over the sheet. Each pin is lowered toward a feces particle which is then identified (seed, seed husk, fruit, fiber, stem, leaf, root, and others). Frequency of occurrence of each item is recorded for each frame (10 points). This process was repeated 10 to 15 times until cumulative means (based on sets of 10 points) of the most common food items stabilized within 1% between frames. Therefore 100 to 150 points were collected for each feces analysed. Seeds, and fruit parts were separated to be later identified at the species level.



Collared Peccary feces being analysed by 10 point sampling frame

For the purpose of this analysis items were grouped in to vegetation, fruit, WHT (hard base of root), and others. This method was selected for comparative purposes as McCoy (1990) in Costa Rica and Keuroghlian (2002) in the Atlantic Forest (Brazil) have used it to analyse collared peccary diet through fecal analysis.

Results from the macro analysis of collared peccary feces showed seasonal variation in resource use and are presented in figure 1. During periods of highest fruit availability (October-March) fruits were the most frequently encountered item in the diet of collared peccaries, while during periods of low fruit availability (April to September) vegetable material was most frequently encountered. Fruits are not the main item in the October-December 2003 period because most of the samples from this period were collected in October and 1 in November, no feces were collected in December which is the peak of the fruiting season.

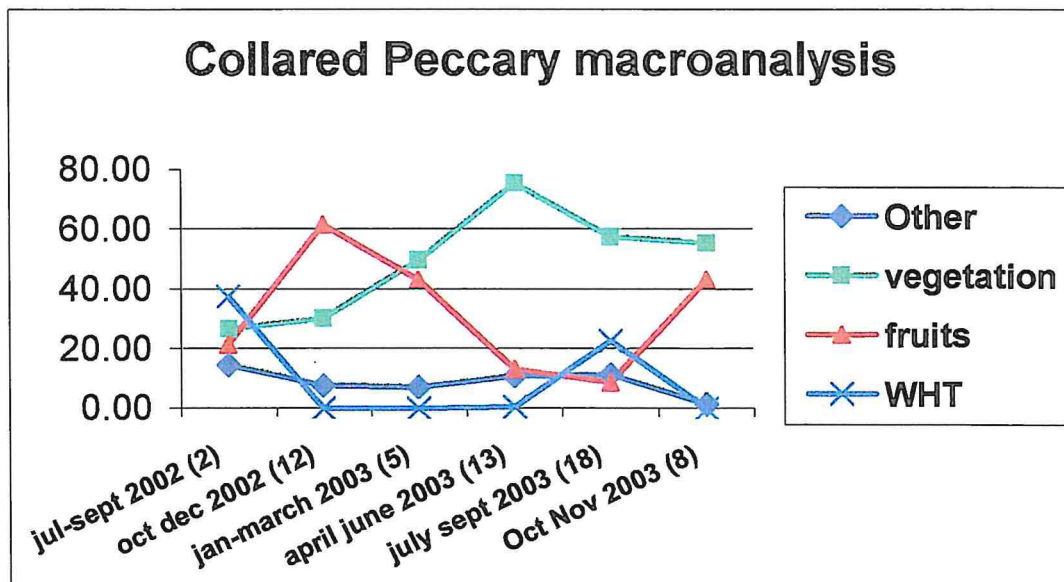


Figure 1. Frequency of occurrence of items encountered in collared peccary feces divided into 3 month periods. Numbers in brackets are the number of samples analysed for each of the periods

Most of the seeds encountered in the collared peccary feces were broken characterising collared peccaries as seed predators. However collared peccary do disperse seeds of some fruits, particularly those that have larger hard seeds such as *Acrocomia aculeate*, *Scheelea phalerata* for which the animals masticate the pulp and spit out the seed.

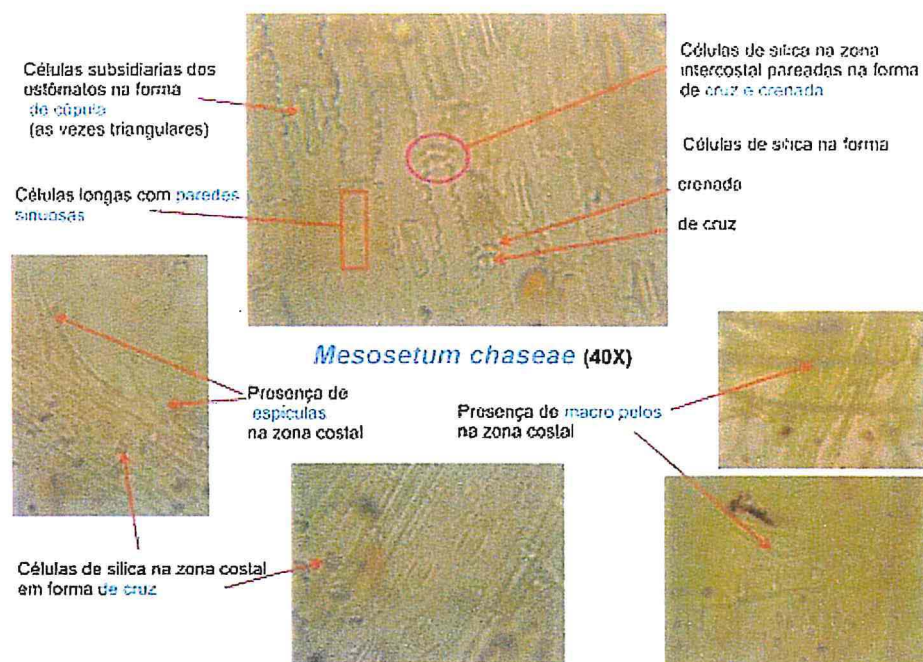
One item, classified as WHT, encountered in the feces was of particular interest. We believe that WHT is from the root of a graminea, but this needs to be confirmed by the micro histological analysis. In any case this item was extremely important in the collared peccary diet during the height of the dry season when resources are most scarce.

Most of the vegetation encountered was not from aquatic plants. *Bromelia balansae* was very common. Identification of the plants consumed by the collared peccary will be conducted through microhistological analysis of feces. This will provide further clues on habitat use of the animals.

Microhistological analysis

In order to conduct the micro-analysis of fecal samples we are building an interactive key using the DELTA software. To create the key, plants collected throughout study areas must be identified and referenced. Plants that we observed the animals to eat are of course used, however as direct observations of animals feeding are difficult a wide array of plants must be used. Plants are then used to prepare slides, which will enable us, using a microscope (X10;X40), to identify, describe and characterize the anatomical characteristics of the epidermal cells of these plants. Each characteristic is then photographed, categorized and entered into the DELTA software thus contributing to the creation of the interactive key. Therefore, when looking at a micro-histological slide of a fecal sample, the observer can compare the anatomical characteristics of epidermal cells of each plant part found in the feces to the series of illustrated characteristics displayed by the key. The observer selects characteristics from the key that he can visualize in the microscope. The interactive key then automatically identifies plant species, therefore enabling the observer to rapidly and accurately identify plants consumed by the animal whose feces have been collected.

Example of the characteristics of a grass species used for the interactive key:



The interactive key is in the process of being created. We have identified and photographed characteristics of 46 gramineae. The character list for both gramineae and dicotyledons plants has been created.

A.2. Phenology and fruit abundance study, fruit baiting tracking stations

No new results (see Second Annual report INCO PECARI 2003)

A.3 Population analysis

Nhumirim study area

In the Nhumirim study area 1755 km have been walked. Twenty-three species have been recorded on the transects. Collared peccary groups were sighted through out the year (6,55 groups observed per 100 km of trails walked). Figure 2 illustrates the seasonal variation of collared peccary encounter rates in the Nhumirim area. Although it appears that the encounter rate of collared peccaries fluctuated during the year (Higher encounter rate between April and September/Lower encounter rate between October and March) collared peccaries were seen regularly throughout the year. The same groups were observed in the same areas throughout the year contrarily to white lipped peccaries and feral pigs.

Difference in encounter rates are most likely due to the fact that between April and September collared peccaries forage mostly on vegetation in open areas and are therefore much more visible from the transect whereas between October and March they feed more on fruits which are found within more forested areas where visibility is lower (see Figure 1 Collared peccary diet macro analysis).

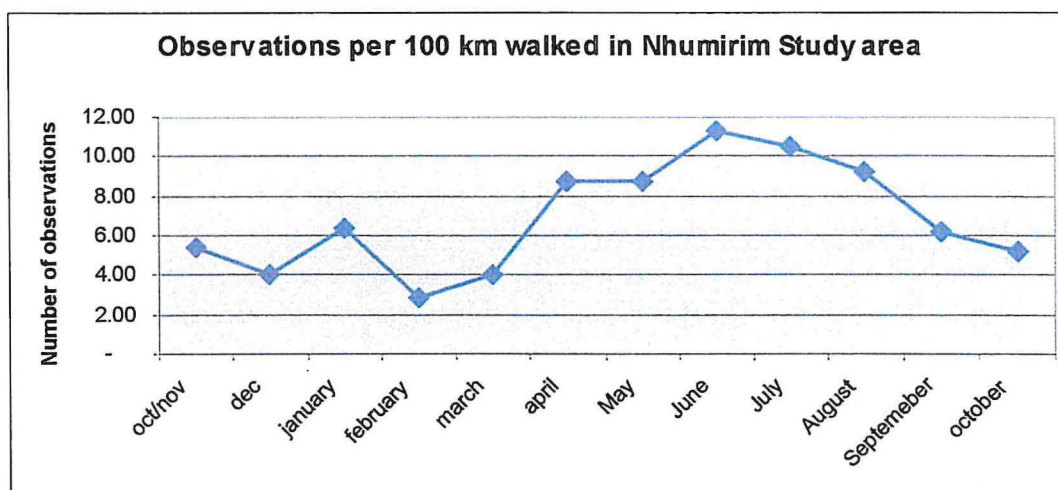


Figure 2 Seasonal variation of Collared Peccaries in the Nhumirim Study Area

Densities were estimated using the "DISTANCE sampling" method and computer software developed by Buckland *et al* (1993) and Laake *et al.* (1994). Since study area presents a complex mosaic of habitats, which include permanent and temporary ponds called *baias*, forest patches called *capao* or *cordilheira*, scrub forests of *cerrado* vegetation, grasslands and seasonally flooded grasslands the visibility along the trail varied greatly. In forested areas the maximum visibility was of 25 meters while in the more open areas the maximum visibility was 250m. Therefore we conducted a preliminary analysis of the transect data by estimating density of animals in "closed" environments, which included the forested areas and the scrub forests, and "open" environments, which included open grasslands. We were able to conduct this analysis due to the large sample size. In total 898 km were walked in closed environments and 856 km were walked in open environments. Therefore we conducting a separate analysis for these two environments we found that in closed habitat collared peccaries density of 11.6 ind/km² (CV: 20.74 model: Uniform simple polynomial adjustment) and that in open habitat collared peccaries have a density of 1.3 ind/km² (CV: 31.79 model: Half normal Hermite adjustment). Therefore considering that 40% of the study area includes closed areas and 60% open areas we estimated a density of approximately 5.5 ind/km². Therefore biomass of collared peccary in the Nhumirm area is of 99 kg/km².

We are currently investigating new manners to analyse data from these particular field conditions of such heterogeneous habitat.

Manduvi study area

In the Manduvi study area a total of 400km were walked during two field expeditions in April-May 2004 and November 2004. These seasons were selected as May is a period of relative fruit scarcity and conditions in the area were dry, while in November the study area was flooded. Collared peccary groups were only sighted 3 times (encounter rate 0,75 groups observed per 100 km of trails walked). Table 1 presents the frequency of sightings in both study areas, and illustrate the differences in the fauna communities from these two areas.

Table 1. Names of species sighted and frequency of sightings in both study areas the Nhumirim (represented by an X) and Manduvi (represented by an O)

Common Name	Scientific Name	Very Often	Often	Not Often	Rarely	Not sighted
Collared Peccary	<i>Tayassu tajacu</i>	X			O	
White lipped Peccary	<i>Tayassu pecari</i>		X			O
Feral Pig	<i>Sus scrofa</i>	O	X			
Grey brocket deer	<i>Mazama gouazoubira</i>	X			O	
Red brocket deer	<i>Mazama americana</i>				X	O
Pampas deer	<i>Ozotoceros bezoarticus</i>	O		X		
Marsh deer	<i>Blastocerus dichotomus</i>				X	O
Tapir	<i>Tapirus terrestris</i>				X	O
Capybara	<i>Hydrochaeris hydrochaeris</i>	–			–	
Azara's agouti	<i>Dasyprocta azarae</i>	X		O		
South American Coati	<i>Nasua nasua</i>	X	O			
Crab eating fox	<i>Cerdocyon thous</i>			X		O
Tayra	<i>Eira Barbara</i>				X	O
Ocelot	<i>Leopardus pardalis</i>				X	O
Bush Dog	<i>Speothos venaticus</i>				X	O
Puma	<i>Puma concolor</i>				X	O
Giant anteater	<i>Myrmecophaga tridactyla</i>				XO	
Southern Tamandua	<i>Tamandua teradactyla</i>				X	O
Yellow armadillo	<i>Euphractus sexcinctus</i>		O	X		
Black howler monkey	<i>Alouatta caraya</i>	X	O			
Greater rhea	<i>Rhea americana</i>	O	X			
Bare faced Curassow	<i>Crax fasciolata</i>	X		O		
Tortoise	<i>Geochelone sp.</i>				X	O

Very often: 0-20 km Often: 20-40 km Not often: 40-80 km Rarely: more than 80 km

Very often means, the species or group is sighted very often at least every 0-20 km of transect walked. Not sighted means the species was never sighted during the study.

The landscape and flora of the two study areas are quite different, further details are given in the habitat use section of this report. Generally the Manduvi study area was characterised by fauna typical

of open areas such as the pampas deer (*Ozotoceros bezoarticus*), rhea (*Rhea Americana*) and feral pigs (*Sus scrofa*), while the Nhumirim study area was characterised by fauna characteristic of more forested areas such agoutis (*Dasyprocta azarae*), coatis (*Nasua nasua*), grey brocket deer (*Mazama gouazoubira*), howler monkeys (*Alouatta caraya*) and peccaries (*Tayassu tajacu* and *Tayassu pecari*). Furthermore in the Nhumirim study area fauna communities varied between areas of forest and scrub cerrado forest.

Due to the low number of sightings of collared peccaries in the Manduvi study areas we were unable to estimate densities. Eventhough encounter rates of collared peccaries was very low, they were present which does show that this species is quite adaptable.

Conclusions

Results from the population density study show that although collared peccaries were present in both areas their densities do vary greatly within the region. This has been confirmed by results from the fazenda Rio Negro were densities of collared peccaries found by Alexine Keuroghilian and her team are lower than in the Nhumirim area. However contrarily to other species such as the white lipped peccaries or feral pigs collared peccaries remain through out the year in their territory.

A.4 Habitat use

Areas with different vegetation characteristics were separated. In the Nhumirim study three different areas were defined. One area, called the forested area, had a high proportion of forest, while the Cerrado area had a high proportion of scrub forest, finally one area was called transitional area and corresponds to the area in between the forested area and the cerrado area. The Manduvi area was considered as one single area of flood plains. Figure 3 describes the proportion of different habitats in each area.

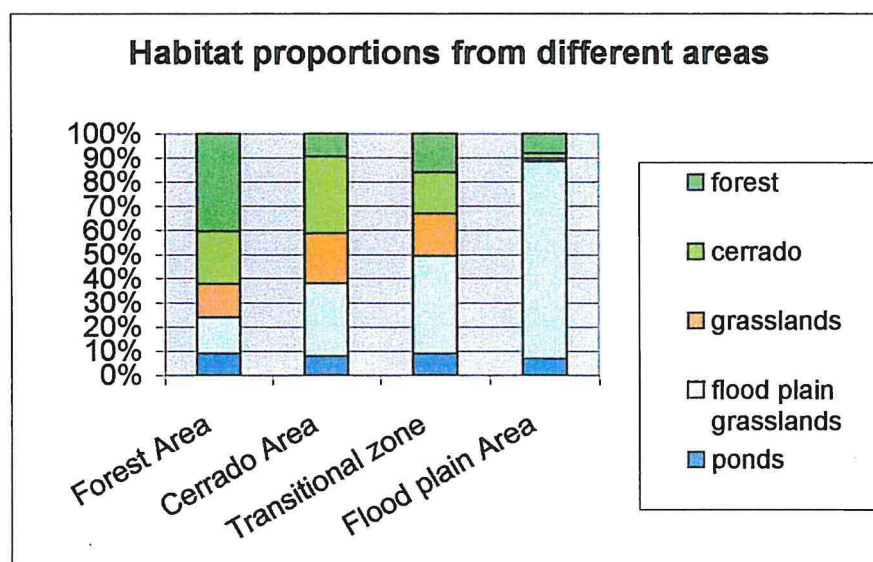


Figure 3 Proportions of habitat from the different areas research was conducted.

Habitat use of the collared peccary was determined from observations made from the trail. Once again we were confronted to the problems due to visibility on the trail. Since visibility is lower in forested areas it is possible that less observations will be made therefore skewing the results. For this reason for the habitat analysis we only considered observations made within 10 meters from each side

of the trail to ensure homogeneity between different sections of the trail (containing different habitat) and the different trails from different landscapes.

Collared peccary encounter rates (10 m from each side of the trail) were then compared between the different areas, results are presented in Figure 4. (For this analysis data from the November 2004 Manduvi field expedition have not yet been included, this should not change the results as encounter rates were extremely low)

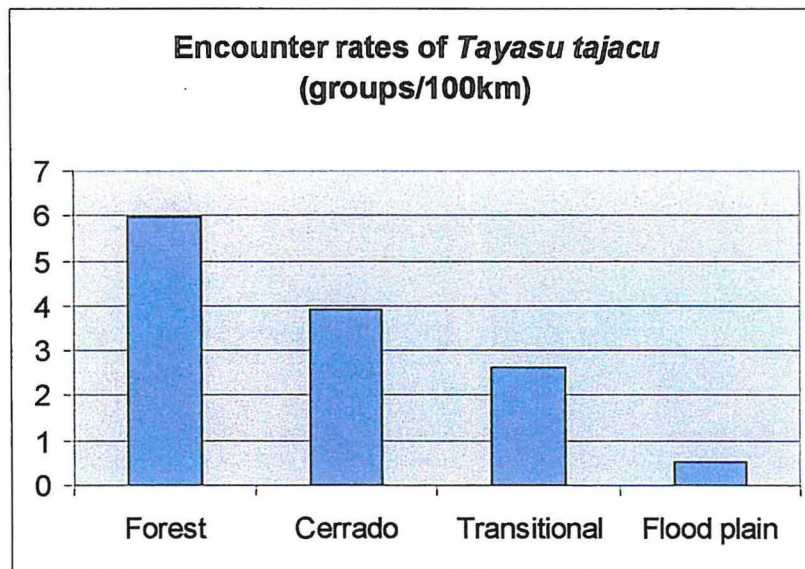


Figure 4. Encounter rates of collared peccaries in the different areas.

Differences in encounter rates between the different areas demonstrate that collared peccaries have higher encounter rates in some areas than others. Comparing results from the encounter rates and habitat proportions, it appears that the determining factor was tree cover (this means forest habitat + cerrado habitat). A liner regression of encounter rate and proportion of tree cover proved to be significant ($R^2=0,993$ and $p=0,03$) as presented in figure 5

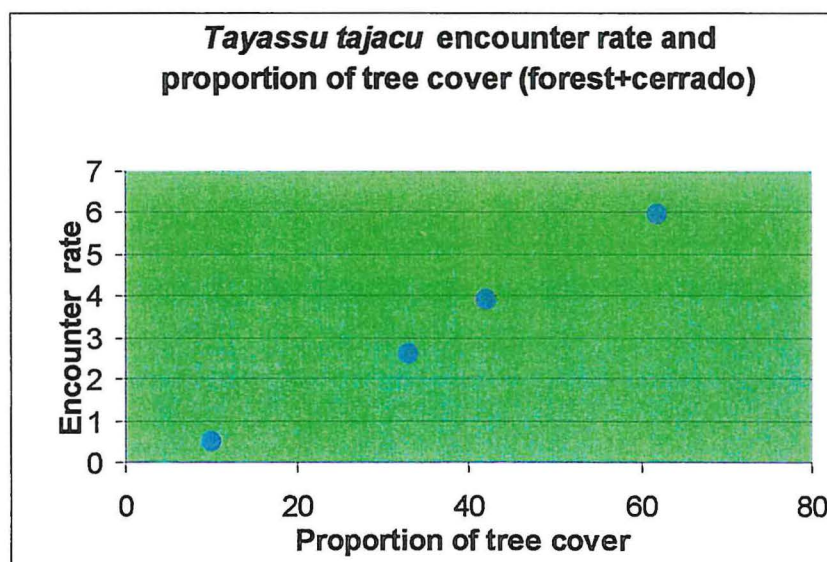


Figure 5. Linear regression of collared peccary encounter rates and proportion of tree cover

Therefore habitat use of collared peccary in the areas where the research took place was closely linked to tree cover. This was particularly obvious in the flood plain area where the only few observations of collared peccary were made in the small forest patches.

A.5 Group size, Age structure, Sex ratio and Fecundity of groups

Generally we have found that groups of collared peccaries varied between 7-12 individuals. However when foraging, particularly in the forest, individuals from the same group spread out in to groups of 1 to 4 individuals. Therefore exact counts of groups have generally taken place when the group moved between forest patches in an open grassland, or to a pond to drink. In these instances of higher exposure groups usually remained more unite. These moments were used to make the group counts.



Exact group counts usually occur when collared peccaries are foraging in open areas

Interestingly as shown by table 2 group size does not seem to vary in between the different areas of the Nhumirim study site (we have only three sightings for the Manduvi area which was not considered significant). Using the number and size of groups seen 10 m from the trail (for visibility reasons as explained above in the habitat section) we found that groups of collared peccaries averaged 4 individuals. This low number is due to the fact that the animals break up into smaller groups when foraging. White lipped peccaries and feral pigs for example showed average group size variation in between areas of the study site.

Table 2 Collared peccary group size variation between areas of the Nhumirim study area.

Area	N. Groups	N. Individuals	Group size
Forest	32	124	3.875
Transitional Zone	15	64	4.27
Cerrado	25	98	3.92

Sexing collared peccaries is difficult. This can usually be done with binoculars and with luck when the animals are at close proximity. It appeared that there were as many males as females within groups, however this should be confirmed through captures.

Usually a group of collared peccaries was composed of various adults 1 or two large juveniles and 1 or 2 small piglets. The CR4 field researcher never observed more than two small piglets within a group even though the group contained several adult females. Breeding appeared to be seasonal and births usually occurred between October and June. This is based on the observation of the small piglets and the two birthing events witnessed by the field researcher.

B. Socio-Economic Study

Analysis of the economics and cultural use of current peccary harvests was achieved through an exploratory hunting survey, interviews, hunting registers and collection of skulls from hunted animals.

The exploratory survey was conducted during the first two years of the project. During this time the CR4 field researcher, was living in the fazenda Nhumirim and was therefore able to accompany hunters, visit many different fazendas, and had constant first hand contact with the people living in the Pantanal. Every occasion was used to discuss use of the local fauna and in particular, past and present hunting practices. Results from the exploratory survey were used to create the outline for semi-structured interviews. Interviews began in July 2004 in the Nhecolandia region. Using a car from EMBRAPA Pantanal the field researcher along with a key informant who knew the region and people from different fazendas drove to different fazendas to conduct the interviews. The semi structured interview with the most experienced person on the fazenda, generally the capatas (person responsible for cattle management) then took place as well as informal discussions with other people. To conduct the interviews over 400 km were driven through out the region. Over 35 interviews from 25 different fazendas from the Nhecolandia region have been conducted.

Since June 2004 interviews are also being conducted in the Rio Negro region by Alexine Keuroghilian (Earthwatch) using the same interview sheet as CR4.

To assess quantitatively hunting practices hunting registers were distributed in 7 neighbouring fazendas. These registers were filled in voluntarily by one person in each fazenda where hunting occurred. Data from these registers was collected for at least a year in each fazenda

Another method for assessing hunting practices was the collection of skulls found through out the study area. After hunting an animal, hunters chop off their head and clean the animals, therefore skulls found in the field with no other bones near them have a high probability of having been killed by a hunter. Skulls were collected for 2 years between November 2002 and November 2004. Collection was made at any time in the field, people in neighbouring fazendas also volunteered their time and collected and donated skulls to the project. So far over well over 100 feral pig skulls and around 10 white lipped and collared peccary skulls have been collected. Almost all the feral pig skulls were found on their own, while remains of the animal generally bones and fur were found near peccary skulls.

All the different methods used: the exploratory survey, the hunting registers, skull collection and the interviews lead to the same conclusion. Collared peccaries are rarely hunted in Nhecolandia. This is because the feral pig (*Sus scrofa*) is the favourite target of the hunters.

We have documented hunting practices, traditions, use and perceptions on feral pigs during the interviews, and this introduced species is without doubt an extremely important animal within the local Pantaneira culture. The collared peccary on the other hand is not. A summary of the reasons why feral pigs are preferred over collared peccaries is provided in table 3.

Results from the socio-economic study and the implications this will have on the potential for ranching collared peccaries in the Pantanal is being analysed and discussed in deliverable 4: Preliminary results on potential for harvesting CP in two different ecosystems.

Table 3: Reasons why local people prefer to hunt feral pigs and not collared peccaries.

Reasons for hunting	Feral Pig (FP)	Collared Peccary (CP)
Cost/Benefit	A castrated FP weighs >50kg and provides a lot of meat	An adult CP in the Pantanal weighs on average only 18 kg (Keuroghilian pers. Com.)
Fat	FP provides fat which is used as cooking oil, and to store food	CP do not provide any fat
Entertainment	Hunting and castration of FP is an important traditional entertainment	NOT.
Legal	Hunting FP is legal	Hunting CP is ilegal
Soil and pasture management	FP cause damage when they forage and uproot pastures	Collared peccaries do not cause large scale damage to pastures

2.1.3. Overview of Activities realized by CR3

The objective for this year (December 2003/ December 2004) was to select new research areas and begin full field data collection on aspects of collared peccary ecology in the Brazilian Northeast. The population analysis studies are based on line transects. The studies on feeding ecology, keystone and limiting resources include: macro analysis of feces samples, fruit baited tracking stations, tree phenology studies. Habitat use and activity are analyzed through observations from the transects, direct observations of animals off transects and fruit baited tracking stations.

Field data collection that was planned for the year 2004, included the following

- Search new study sites
- Increasing number of transects
- Collecting data by the walking transects
- Collecting collared peccary feces
- Conducting fruit phenology studies and fruit abundance
- Conducting fruit baited tracking stations.

All of the planned field data collection activities have been accomplished by CR3.

- The study area now has 28 transects totaling 32 km in four cacao farms
- 430 km of transects have been walked and 21 sightings of collared peccary have been made from the trails
- 24 collared peccary feces have been collected
- Phenology study of tree species and fruit abundance studies have been carried out since October 2002.
- Data has been gathered from 158 fruit baited tracking stations checks

2.1.4. Overview of main results obtained by CR3

A. Analysis of feces

The diet of the collared peccary is being investigated through macroscopic analysis of feces samples. We have collected feces opportunistically at any time in the field. However until now we obtained only 24 samples between October 2002 and November 2004. The very low number of samples collected was principally due to the constant rain which occurred during the first year of the study. However, we continue to collect a few feces samples during 2003. Normally, the Collared Peccary feces were collected in some restrict places (the *latrines*) around where they rest. These places are very difficult to locate and have difficult access probably because the CP is hunted to provide meat to local people. In this region this species it is also persecuted in the Southeast of Bahia in order to avoid agriculture damage control. In spite of that it was possible to conduct the macroscopic analysis of feces samples. This was done at the UESC Botanic laboratory. The analysis consisted of washing the feces through a sieve and weighing the respective items (leaves, roots, fruits...) The partial results obtained confirmed that CP are mainly frugivore (more than 65% of total residuals found in the feces samples).

B. Phenology and fruit abundance study

Since fruits are the mainly nutritional resource for CP the resource availability studies are very important to determine management practices. For this reason a phenological study of fruit trees is being conducted to help determine keystone and limiting resources.

The phenology studies include over 16 species of trees, which are distributed within the cacao cabruca and Atlantic forest, habitats used by collared peccary in the Southeast of Bahia. They include: *Lecythis psonis* Cambes (sapucaia); *Quararibea floribunda* K. Schum (virote); *Cnidoscolus macgravii* Pohl (penao); *Pouteria procera* (mucuri), *Ficus clusifolia* (mata-pau), *Inga affinis* (ingazeira); *Polyanrococos caudensis* (buri); *Cecrópia hololeuca* (embauba); *Anacardium occidentale* (caja); *Artocarpus integrifolia* Lam (jaca); *Sarcaulus brasiliensis* (cambuca), *Ficus insipita* (gameleira branca), *Ficus gomelleira* (gameleira preta), *Solanea obtusifolia* (gindiba) *Genipa americana* (genipapo); and *Jambosa bulgaris* (jambo). These trees were selected because produce fruits that are consumed by wild animals. Around of some of the cajá and jaca trees we observed CP tracks and in some fruits with tooth marks of *Agouti paca*. The phenology data collection will continue in 2005.

C. Fruit baited tracking stations

Fruit baited tracking stations was conducted in all the four data collection areas during the last year. Conducting studies using fruit baited tracking stations has been done with no difficulty in the Southeast Bahia site since we adopted the same technique developed by CR4 in the Pantanal.

We placed 2 to 10 fruits, according fruit availability and size, in a station and checked each station twice a day at sun rise and at sun down. The same station was generally checked for only 5 consecutive days to prevent rodents from habituating themselves to the station. Stations have been placed throughout the study area in proximity of fruiting trees found.

In total 22 stations in 4 different areas have been checked 158 times (79 morning checks and 79 afternoon checks). Table 4 gives a brief description of the number of stations placed. The following mammals were recorded to visited the stations: collared peccaries, Agoutis, small rodents, coatis, armadillos, and *Mazama* spp. deer.

Table 4 Fruit baited tracking stations description

Name of stations	Number of days	Number of stations	Number of morning	Number of afternoon	Landscape
<i>Teimoso 1</i> (No 1)	5	2	8	8	Cabruca
<i>Teimoso 2</i> (No 2)	4	3	14	14	Forest
<i>Teimoso 3</i> (No 3)	5	2	7	7	Forest
<i>Almada 1</i> (No 4)	5	2	15	15	Cabruca
<i>Almada 2</i> (No 5)	4	2	6	6	Cabruca
<i>Almada 3</i> (No 6)	5	4	3	3	Forest
<i>Voerico 1</i> (No 7)	4	2	10	10	Cabruca
<i>Voerico 2</i> (No 8)	4	2	8	8	Forest
<i>Guaranta 1</i> (No 9)	5	2	5	5	Cabruca
<i>Guaranta 2</i> (No 10)	5	2	3	3	Forest
TOTAL	46	22	79	79	

A more detailed analysis using the habitat variables, and a detailed analysis of fruits consumers will provided important insights on collared peccary ecology within the community of frugivores.

D. Population analysis

A total of 32 km divided into 28 trails have been opened. The trails have been marked at 50m intervals. All of the different types of habitats present in the study areas are represented on the trails. Transects are being walked (0.5-1 km/hr) out, followed by a minimum one hour wait, and then walked back. Transects have been walked starting at sunrise by the several team members since the end of March 2004. During the year 430 km have been walked.

Records are of all large mammals encountered as well as one species of reptile (Tegu lizard – *Tupinambis merianae*). Records include: perpendicular distance of first sighting to the trail, group size, group composition, habitat type, and activity. Thirteen species have been recorded on the transects. Table 5 presents the name of the species sighted and the occurrence of sightings during this year.

Table 5. Names of species sighted and frequency of sighting occurrence

Common Name	Scientific Name	Very Often	Often	Not Often	Rarely
Collared Peccary	<i>Tayassu tajacu</i>		X		
Grey brocket deer	<i>Mazama gouazoubira</i>	X			
Red brocket deer	<i>Mazama americana</i>				X
Agouti	<i>Agouti paca</i>		X		
South American Coati	<i>Nasua nasua</i>	X			
Crab eating fox	<i>Cerdocyon thous</i>			X	
Armadillo	<i>Dasypus novemcinctus</i>			X	
Marmoset	<i>Callithrix kuhlii</i>	X			
Titi monkey	<i>Callicebus melanochir</i>			X	
Golden faced lion tamarin	<i>Leontopithecus chrysomelas</i>				X
Jaguarundi	<i>Herpailurus yagouaroundi</i>				X
Tree squirrel	<i>Sciurus aestuans.</i>			X	
Tegu lizard	<i>Tupinambis merianae</i>	X			

Very often: 0-20 km Often: 20-40 km Not often: 40-80 km Rarely: more than 80 km
 Very often means, the species or group is sighted very often at least every 0-20 km of transect walked.

Between March 2004 and October 2004 collared peccaries have been sighted from the transect 21 times this means 1 sighting every 20.4 km of transect walked.

Densities will be estimated using the "DISTANCE sampling" method provided a sufficient number of observations is obtained.

In the study sites the Collared Peccaries herds usually include 3-22 animals.

E. Habitat use

The Southeast Bahia study area presents a great variety of forest patches and cocoa *cabruca* agro-forestry system. Habitat use is being analyzed through sightings of collared peccaries on transects. Habitat use by collared peccaries will be analyzed at several scales: from the landscape scale using satellite imagery down to a micro analysis of habitat components using a detailed description of the transects.

Description of microhabitat will be conducted in February 2005 and July 2005 (in the peak of the dry season and in the peak of the wet season, respectively). Two observers will walk the trails together and characterize every 50m of trail according to a pre-established list of variables. We will use these variables to relate collared peccary populations to habitats using resource selection functions.

Information on habitat use will also be gathered from the habitat description and variables described during the fruit baited tracking stations study.

2.2 Planed activities for next period

2.2.1. Planed activities for CR4 in 2005

For the year 2005 the following activities planed for CR4 are:

- Finish building interactive key using DELTA *software* for the micro analysis of feces
- Build an interactive key using DELTA *software* for seeds of fruits in collaboration with researchers from Earthwatch
- Conduct macro-analysis of feces collected in the Manduvi study area.
- Prepare microhistological slides 834 slides of faecal samples (for each sample 2 slides from 1 mm sieve material and 1 slide from the 0.57 sieve material)
- Conduct microhistological analysis for both study areas
- Conduct the skull analysis
- Increase sample size of interviews.
- Analysis and write up of the study.

2.2.2. Planed activities for CR3

CR3 resolved almost all the field data collection problems. New study sites were found and serious and continuous field data collection began and has progressed well in 2004. In 2005 analysis of feces samples will continue, at least 450 km of transects will be walked and fruit baited tracking stations will continue to be conducted.

2.2. Comparison of achieved objectives and stated objectives.

The objectives for the Pantanal study site are being attained and the targets set out are being met. In addition in the context of research on the collared peccary diet and due to the extension of the project CR4 researchers in collaboration with EMBRAPA Pantanal will develop a complete interactive key for the identification of plants in wild/domestic animals diet.

The objectives for the Bahia study site are now being attained and the targets set out will be met.

2.3 Problems experienced

No major problems were experienced by CR4. CR3 resolved almost all the field data collection problems.

3. List of deliverables

Deliverable Title	Delivery date
1. Publication on the population structure and production of CP in different habitats	30
2. Preliminary report on keystone and limiting resources for CP in habitats with CP ranching potential	24
3. Preliminary findings on nutritional reasons for differences in CP production	24
4. Preliminary results on potential for harvesting CP in two different ecosystems	24
5. Recommendations for improving CP production in cattle ranches and abandoned cocoa plantations	36

We have experienced a delay in delivery of deliverables as projects in the two study areas, Bahia and the Pantanal are at different levels of advancement. However CR3 has made significant progress in 2004. As the delay continues we can either wait until the end of 2005 or we can hand in deliverables separately for both study areas. This will depend on the decision of the INCO PECARI Project coordinator.

4. Plans for Use and Dissemination

4.1. Potential, direct and indirect applications of results

Results will be used by landholders, government research institutions, conservation organizations, and wildlife management agencies.

The interactive key developed by EMBRAPA Pantanal and CR4 will become an essential tool for the center to research herbivore diet of both domestic and wild animals. This will be an important tool for extension work with landowners regarding management decisions of both domestic and wild animals and will certainly have direct conservation applications.

The socio-economic survey of current peccary harvests will help determine, the feasibility of the proposed extensive ranching activity as well as the potential market for the results.

4.2 Dissemination of the results.

The results will be disseminated in the form of written reports, publications and presentations in conferences. The interactive key developed by CR4 and EMBRAPA Pantanal using DELTA *software* will be published in a manual accompanied by a CD-ROM containing the software and illustrated interactive key.

5. Management and co-ordination aspects

5.1 Project meetings and coordination of activities

5.1.1. CR4 Project meetings.

1. Arnaud Desbiez and Richard Bodmer met and worked together at the University of Kent at Canterbury, UK, during January and February 2004.
2. Early May, Marie-Noël de Visscher and Mathieu Bourgarel visited EMBRAPA Pantanal, to define task II work priorities, assess the work so far conducted, exchange ideas and present a model being developed by CIRAD and Zé Carlo Chavez to model collared peccary populations in the Pantanal. In May Arnaud Desbiez met with Conservation International / Earthwatch researchers Camila Iotte Donatti and Renato Matos Marques to present and discuss fieldwork methods, and results from their different study sites.
3. Arnaud Desbiez met with WP6 team members Mathieu Bourgarel, Ubiratan Piovezan, Zé Carlo Chavez and Elizabete Marques de Jesus Costa at the end of May in Campo Grande to discuss the Model developed by Jose Carlos and CIRAD.
4. Mathieu Bourgarel and Arnaud Desbiez at the end of May reviewed and discussed analysis methods for data collected in Nhumirim by WP5. Mathieu Bourgarel also lent Arnaud Desbiez a copy of his thesis.
5. Between April and June Arnaud Desbiez had regular meetings with Alexine Keuroghilian. Both researchers are coordinating their activities to compare the findings from their study areas.
6. Early June Arnaud Desbiez was trained by Professor Mauro Cavalcanti in the use of DELTA *software*.
7. In June Arnaud Desbiez planed and agreed with Conservation International / Earthwatch researchers Alexine Keuroghilian and Camila Iotte Donatti to collaborate and share fruit seed collections to establish together an interactive key to identify fruit seeds.
8. In September members of the INCO PECARI met in Iquitos Peru, for the V Latin American Congress of wildlife management.

5.1.2. CR3 Project meetings

Informal INCO PECARI meeting at Iquitos Peru, September 2004

5.2 Collaborations

5.2.1. CR4 collaborations

Activities and collaboration within WP5 study sites are still challenging. This is mainly because research activities between both sites are at different levels of advancement. However communication between Arnaud Desbiez and Gaston Gine through e-mail have taken place.

Collaboration between CR4 and WP6 has greatly improved. The visit from CIRAD researchers Dr Marie-Noël de Visscher and Dr Mathieu Bourgarel to EMBRAPA Pantanal has been instrumental in this process. More meetings have taken place and are scheduled to take place.

Collaboration between Arnaud Desbiez and Dr Ubiratan Piovezan (WP6) remain excellent.

Collaboration between WP5 and EMBRAPA Pantanal continues to be excellent. Within EMBRAPA the study is under the supervision of Walfrido Tomas who continues to provide logistical and technical advice to the field researcher. Field research in the EMBRAPA Pantanal Fazenda Nhumirim continues to take place. In Corumba, Arnaud Desbiez has access to the laboratory to conduct microhistological analysis of faecal samples. Collaboration with Dr Sandra Santos and her team is invaluable for the progress of the plant identification and construction of the interactive key. Many of the materials used have been previously collected by Dr Santos' team. Without her help and time, this work could not be achieved.

A new collaboration between Dr Mauro Cavalcanti from Federal University of Rio de Janeiro (UFRJ), Dr Sandra Santos and Arnaud Desbiez, has begun for the creation of a manual and illustrated interactive key for the identification of plant species through cell characteristics.

Close collaboration between Arnaud Desbiez and Dr Alexine Keuroghilian has intensified. Dr Alexine Keuroghilian, who is considered the authority on peccaries in Brazil, has over 10 years of direct field experience with these animals. Collaboration is increasing as CR4 now has two years of field data and has begun to analyse results enabling researchers from both sites to compare the findings from their study areas. In Iquitos, Peru results from both study sites on habitat use of white lipped peccary collared peccary and feral pigs were presented together. Furthermore, researchers from both sites will be conducting interviews in order to increase area covered.

Collaboration with Paulo Andre Lima Borges during two field expeditions (May and November 2004) to walk transects in the Manduvi study area.

Collaboration between CR4 and Conservation International / Earthwatch remains excellent. Researchers from both sites will be sharing share fruit seed collections to establish together an interactive key to identify fruit seeds.

5.2.2. CR3 collaborations

No new collaborations

5.3 Manpower.

5.3.1. CR4 Manpower

There are no important differences between scheduled and actual manpower used for the tasks for CR4. This is mainly because close collaborations with other institutions have increased the manpower for the research.

Collaboration between CR4 and EMBRAPA Pantanal, in particular Dr Sandra Santos and her team, is invaluable for the progress of the plant identification progress and construction of the key.

Collaboration within EMBRAPA as well as Conservation International / Earthwatch researchers is extremely important for the collection of plant and seed materials for the interactive keys. Furthermore, Dr Alexine Keuroghilian has been conducting interviews in the Rio Negro region, using the data sheets developed by CR4. This has increased the number of interviews conducted, as well as the area covered.

Collaboration with Paulo Andre Lima Borges in two field expeditions (May and November 2004) has been extremely productive and helped increase sample size of transects in the Manduvi study area.

5.3.2. CR3 Manpower

The CR3 field personal team was incremented with four new researchers:

1. Gaston Giné,
2. Tatiana Senra Motta,
3. Érico de Sá Petit Lobão
4. Carlos Alberto Batista Santos.

Along with Sérgio Luiz Gama Nogueira-Filho, WP5 regional coordinator, the team has been in the field during almost the whole year.

5.4 Future meetings

In January Arnaud Desbiez and Richard Bodmer will be meeting at the university of Kent, DICE to analyse results and discuss future steps.

6. Conclusion

The extension of the project during 2005 will be useful for CR4 to conclude the study and strengthen partnerships for new future initiatives. No problems are foreseen for the next year, as almost all the field data has been collected, therefore the aims and objectives for the CR4 Pantanal study site will be successfully accomplished.

After experiencing some serious delays in the first two years of the project CR3 is now progressing well and collecting a substantial amount of data. The extension of the project will be very useful for CR3 to conclude the project and attain goals set out.

It is expected that both CR3 and CR4 will successfully complete their studies by the end of the extension period.

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ANNEXE 6 – WP6 ANNUAL REPORT

WP6: Experimenting innovative schemes of CP harvest under quasi-natural conditions

Appendixes to Annex 6 :

Appendix 1: Report by Tatiana Ono from CO1 in Fazenda Campo Lourdes

Appendix 2: Report from CR3 in Fazenda Teimoso, Bahia

Appendix 3: Report from CR8 in Fazenda Nhumirim

Appendix 4: Report from CR8 concerning WP6.4

Appendix 5: Draft of D6.1 (Report on effective trapping techniques for the capture and management of CP herds)

Appendix 6: Communication presented to the 6th International congress on Wildlife Management in Amazonia and Latin America, Iquitos (Peru), September 2004

ANNEXE 6 – WP6 ANNUAL REPORT

Third Annual Report of the INCO PECARI

NOVEMBER 2004

Work Package Number 6: Experimenting innovative schemes of CP harvest under quasi-natural conditions



Work Package leader: Dr Ferran JORI, CIRAD EMVT, C01

Participants:

C01 - Pantanal Study Site: Fazenda Campo Lourdes

Dr. Mathieu Bourgarel, CIRAD EMVT

Dra. Elisabete Marques da Costa, PRP

Dra. Tatiana Ono, CIRAD/PRP

CR8 - Pantanal Study Site: Fazenda Nhumirim

Dr. Ubiratan Piovezan, Embrapa Pantanal

Jose Carlos Chaves, Embrapa Gado de Corte

CR3 - Bahia Study Site

Dr Sergio Nogueira, UESC, Brazil

Gaston Gine, UESC, Brazil

Executive Summary

The INCO PECARI project aims to develop different exploitation systems of CP through farming (small scale) or ranching (large scale) that could provide an economic alternative for rural and periurban populations in Latin America through the production of CP products such as meat, leather or breeding stock. The goal of this WP is to examine the technical feasibility of CP ranching as an alternative of small scale production, developed on Task I of the project. In that sense, the project intends to experiment on innovative extensive CP production schemes that can be implemented within private lands such as cattle ranches from the Pantanal and/or abandoned cocoa plantations in Bahia State. For that purpose, WP activities have been focused on the capture and monitoring of free ranging CP herds. The scope of the activities was to modify the herd structure in different ways (herd composition or carrying capacity of the environment) in order to increase the overall productivity of the CP herd managed in private land as a production unit. All this strategy is based on the development of capture and management techniques of free ranging CP herds that are technically viable, adapted to socio-economical conditions (and therefore potentially replicable) and ecologically sustainable in the long term.

Activities during 2004 have been developed in two private properties in the Pantanal and one private state in Bahia, basically around WP6.1. Eight baiting stations have been established and monitored in the Pantanal and 5 in Bahia, with the purpose to test the attraction potential of different available baits (salt, corn and local available fruits). Different herds were successfully habituated to visit the trapping sites in both areas. In the Pantanal, white lipped peccaries and feral pigs, were equally visiting the baiting sites to the extent of competing with CP and chasing CP from the baiting sites. Four different kinds of trapping systems have been tested: corral pens, box traps and drop nets. They all showed different levels of success depending on the method used and the characteristics of the study area. Box traps and corral pens were the most successful: In one Pantanal area, corral pens allowed the capture of 4 CP and 67 WLP, suggesting that the method is useful to capture and manage peccary herds. Four CP individuals were also captured with box traps by CR8. In Bahia, the corral pen and the drop net system provided promising results with the capture of two individuals. In the Pantanal, current results show, CP, WLP and FP can be equally captured with the same technique and baits. Nevertheless, the methods to survey and monitor the composition and evolution of CP herds according to different manipulations have so far failed, compromising a great deal the outcome of WP6.2 and WP6.3. Indeed, 5 of the 6 radio ear tags implanted on CP in 2004 have fallen after one week, suggesting that this technique is probably inappropriate. The use of radio collars, often used by other authors, appeared as a frequent cause of death of collared individuals in our study. During 2005, activities will continue in the Pantanal (CR8) and in Bahia (CO1), with the goal of increasing capture experiences and improving the information related to CP herd structure and composition.

In order to provide some information on the viability of CP large scale production systems, CR3 has identified in Bahia what can be considered the largest CP production system described to date. This system, allows the exploitation of captive 450 CP herd exploited in semi-intensive conditions. CO1 and CR3 consider the possibility to analyse in more detail, current production performances of this initiative and possible ways of improvement and replication of this production system as a part of WP6 activities during 2005.

Concerning the construction of a computer model to monitor CP populations in the Pantanal (WP6.4), an important number of information concerning CP ecology is being provided by the project and available to be integrated in the model. The complex vegetation from the Nhecolandia area is being represented and geographical data on the study site have already been digitalized and integrated in the model. During 2005, a preliminary simplified version of the model should be build up to be presented in the next annual meeting in the Pantanal.

1. Objectives and strategic aspects of WP6 for 2004

The INCO PECARI project is based on the economic utilisation of non domesticated terrestrial animal species with a market interest and the study of its reproduction, feeding and husbandry in full captivity, partially restricted or semi-natural conditions. **Task I** concentrates on the establishment of a viable system to exploit CP populations under intensive farming conditions that are adapted to poor inhabitants in tropical forest areas. Alternatively, **Task II** examines exploitation of CP populations in more natural environments, with the final goal to produce information on the viability of large scale commercial production of CP and their products. Activities have mainly focused on the management of free-ranging CP herds in private properties of the Pantanal and Bahia. In that sense, activities of WP6 have basically provided data and information on possible methods to be used for the capture and management of CP herds in private estates.

2. Scientific and Technical assessment during 2004

2.1. Overview of technical progress

As for WP5, all the experiments are being carried out simultaneously in two different areas of Brazil (except for experiment WP6.5) . CO1 and CR8 will work in cattle ranches of the Pantanal and CR3 will work in cocoa plantations in Bahia.

Preliminaries

- During 2004, work in the Pantanal, was developed in two different study areas quite different between them:
 - Fazenda Nhumirim, Embrapa Pantanal research station where WP5 is being implemented and located in the Nhecolandia region, representative of a Pantanal landscape with sandy soils and without permanent running water courses, except for seasonally flooded savannah areas during the rainy season.
 - Fazenda Campo Lourdes, representative of the Rio Negro area, with alluvial soils, a permanent water course (Rio Correntoso) and located in the transition area between the Pantanal plains and the surrounding heights. Two thirds of the property were composed of natural vegetation of riparian forest. A large proportion of the property is covered by water during 5 months a year.
- In Bahia, CR3 selected Fazenda Teimoso, a property representative of the predominant Cabruca vegetation in the South eastern are of Bahia state.

WP 6.1. Set up effective trapping devices for the capture and management of CP herds

Baiting and capture operations have finally taken place in the three study sites, though with different levels of advancement. Nevertheless, different methods of baiting and capture of CP are being tested and are leading to interesting results.

Fazenda Nhumirim (CR8)

Four baiting stations have been created and regularly maintained since December 2003, in areas where CP were regularly seen. Habituation of the animals was facilitated by the offer of potable water

during the dry season. (see appendix 1: CR8 Annual Report). Manioc was distributed daily during 22 days, until they were obvious signs of regular visits of collared peccaries in the baiting sites. A presentation of this attraction system was presented in the VI Congress of wildlife management in Latin America last September).



The capture is being done with the use of box traps of 1.5 m x 0.8 m x 0.6 m made of iron bars, with a wooden falling door and a trigger. Captures occurred mainly at the end of the dry season. Box traps proved to be effective for the capture of CP.

Considering the pre-baiting effort with water as being of 40 trap nights during a period of 3 months, the capture success for this method was 0.1 CP captured/trap-night.

This can be considered as a good performance compared to the results observed for corral traps in Fazenda Berenice (see INCO annual report 2003).

Date	Identification	Sex	Local
26/08/2004	Sheyla	F	Trap 2
28/08/2004	Kamilo	M	Trap 3
28/08/2004	Aresta	F	Trap 2
06/10/2004	Bira	M	Trap 4

Table 1: Sex and date of animals captured between August and October 2004

In Fazenda Campo Lourdes, four baiting sites have been maintained since the end of 2003 and regularly monitored by CO1. Baites such as corn, salt and local fruits have been used and their capacity of attraction has been monitored. In terms of bait acceptance, corn salt and local fruits showed a very high consumption, and more than 90% of the offered bait was consumed at every visit. No difference of acceptance was noted among the different kinds of local fruits offered. Salt proved to be an efficient attractant for all suiform species, suggesting that a lack of mineral salts might exist in Pantanal soils.



Wild suids were the species of mammals more frequently visiting the traps: CP, WLP and to a lesser extent feral pigs. Both species of peccaries visited the traps regularly, with a higher frequency of CP. Different species of birds were frequently visiting the traps.

Name of baiting site	Collared peccary	White-lipped peccary	Feral pig	Birds	Others	No tracks
Fedegoso	96.36	21.81	0	76.36	0	1.81
Caranda	60.71	21.81	3.58	55.36	1.79	12.50
Bocaiuva	36.36	69.09	1.81	30.90	0	0
Paratudo	25.45	63.63	10.90	20.0	3.62	1.81

Table 2: Observed frequency of visits of different species at baiting sites

This data show that there exists overlapping between both species of peccaries. The low frequency of visits of feral pigs is surprising, if we consider the success of attraction of the same method in Fazenda Berenice.

Capture operations started in April 2004. Despite higher frequency of visits from CP, WLP was captured more regularly and easily. With exactly the same trap effort, 67 WLP and 4 CP have been captured, ear tagged and equipped with radio transmitters. That means that capture success was 17 times higher for WLP than CP, probably because CP became far less common in the trapping sites. No feral pigs was captured. 50% of the peccaries were captured in the same trap (52% of WLP and 100% of CP) and 91,55 % of the animals were captured in the early morning.

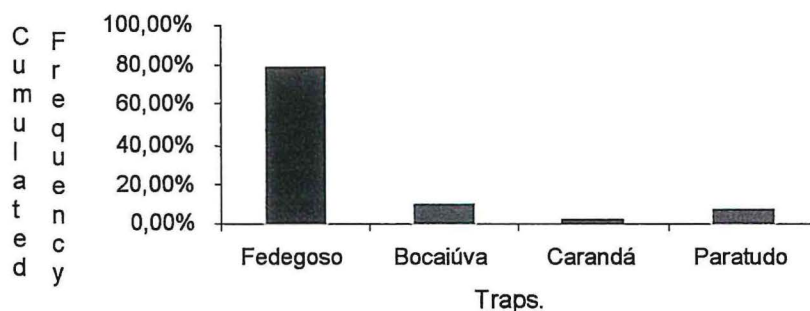
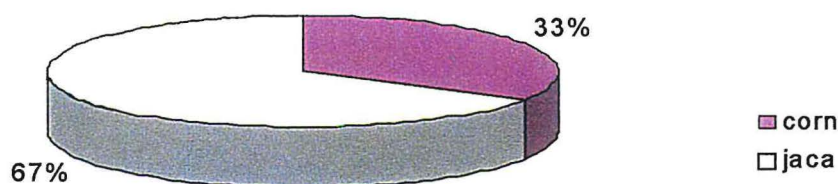


Figure 1: Cumulated Frequency of captured white lipped peccaries in Fazenda Campo Lourdes.

Capture pens have proved to be quite efficient in the process of attracting and capturing several individuals of peccary herds, particularly for WLP. CP has most of the time been captured in pairs, while the mean number of WLP individuals captured together was 6 (n=11, range:1-13) Nevertheless, they only allow to capture one part of the peccary herds, and therefore more than one capture has to occur to get a large proportion of animals from the same herd individually identified.

In Fazenda Teimoso, CR3 monitored several 6 baiting sites: Among 25 control surveys, only one feeding point showed regular CP tracks, which could be observed after 7 days of leaving the bait. The most successful bait, when comparing jaca fruits, salt an corn, was by far jaca, which was taken on 77% of the cases. Corn was taken on 19% of the cases and salt had low success and was practically untouched (4%). Corn consumption increased during the study. The time of response to baits for CP was quick and in less than 7 days, a CP herd had already visited the baiting site.

Figure 2: Percentage of consumption from offered baits in Fazenda Campo Lourdes



Among 6 baiting traps, only one received regular visits of CP herds. Capture was attempted using corral traps such as the ones used by CIRAD in the Pantanal and drop nets. Both systems worked effectively and led to the capture of two CP (one specimen with each capture method). A report compiling most of the information produced to date on the capture of CP and sympatric species by the project is being compiled on the DL6.1. A draft of this report can be found in appendix 3.

WP 6.2. Modification of herd structure to increase CP productivity.

The goal of this WP was of CP herds dynamics based on the monitoring of CP herds equipped with radio transmitters. This WP included the following activities : Density estimation in Fazenda Campo Lourdes and monitoring herds with radio telemetry equipment.

6.2.1. Animal abundance estimation in the areas of study

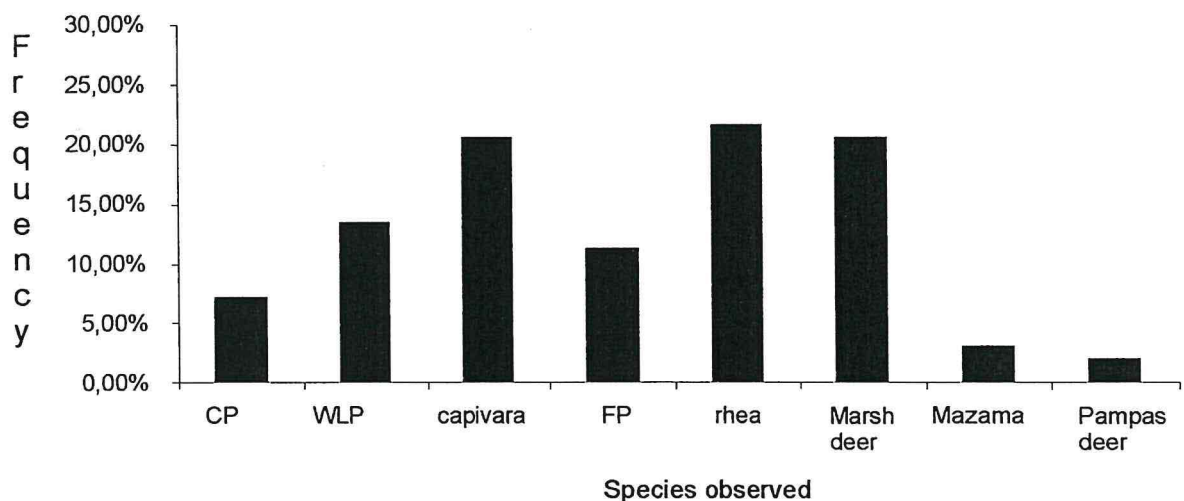
Estimating animal abundance in the capture site is necessary in order to interpret capture success in different areas. In Fazenda Nhumirim, an excellent an exhaustive work on the study of densities of CP and other terrestrial mammals has been performed by CR3 in WP5. In Fazenda Campo Lourdes, 4 transects were opened during the end of 2003, using when possible the same methodology of WP5, but on horse back .

Almost 23 Km of transects have been covered on an average speed of 5 to 6 km/hour, twice a month during early morning and late afternoon, during 5 months. A total of 218 Km were walked. Data recovered are species observed, time of observation, group size and composition and behavior.

Encounter rates with terrestrial mammals are not high enough to allow an estimation of density. So, far we can only establish a relation of observed frequencies for certain species. Preliminary results are the following : Capivaras, rheas and marsh deer were the species typically representative from flooded habitats, were more frequently observed. No significant differences were observed between observations of species in the morning or evening walks except for feral pigs (more frequently observed in the morning) and capivaras (more frequently observed in the evening).

WLP was the species more commonly observed, encompassing 13% of the observations. FP was observed with a frequency of 11% and CP was only observed with a frequency of 6.5%

Cumulated frequency of main mammal species observed in Campo Lourdes



In Fazenda Teimoso (Bahia) , 8 km of transect were opened representing different habitats in the state. Those are being walked at a speed of 0.5 to 1 km /hour and 156 Km have been already walked. Nevertheless, more data need to be collected. Information obtained so far, only allows the confection of a list of mammals present in the property and their frequency of observation during transect walks.

6.2.2. Monitoring of CP herds equipped with radio transmitters.

Due to the important mortality registered last year in captured CP equipped with radio collars, we decided to test the efficiency of radio ear tags commercialized by the Swiss firm Wegner®. Those tags had a weight of 30 gr. (0.2% of CP weight), an expected lifespan of 18 months and there was no reference in the literature of previous use in CP.

In Fazenda Nhumirim, four animals were equipped with radio tags by CR8, between August and September 2004. A total of 11 localizations were taken. Unfortunately, three out of four animals lost their tags after a few days. Another animal was reported disappeared.

In Fazenda Campo Lourdes, another three animals were equipped with ear transmitters by CO1. Only one individual could be followed for 4 months allowing the collection of 27 localizations. Animals could be tracked easily. Nevertheless, only one animal could be monitored during three months.

The other two lost their tags after 24 hours of being tagged.

Date of capture	Location	Sex	Weight (kg)	N° of localizations
26/8/2004	Nhumirim	F		1
28/8/2004	Nhumirim	M		5
28/8/2004	Nhumirim	F		3
06/10/2004	Nhumirim	M		5
27/05/2004	Campo Lourdes	F	16	27
29/05/2004	Campo Lourdes	F	19	2
08/10 2004	Campo Lourdes	M	18	0
08/10 2004	Campo Lourdes	M	14	0

Since the capture of WLP proved to be much easy and regular than for CP, 4 WLP were captured and equipped with radio collars. So far, only a total of 27 localizations have been recorded in CP and 19 in WLP. No signs of death have been observed in WLP after 6 months of monitoring, suggesting that the model of collar used by the project (Telonics Mod 500, 570 grs.), is more suitable for WLP than for CP.

In Fazenda Teimoso, two animals of 15 and 19 Kg were captured respectively. Nevertheless, none of them was "collared" since they were judged too light in weight for the 570 gr available collar.

Conclusions

Despite much hope was expected from the use of transmitter ear tags, those have not provided good results. Indeed, among 6 animals equipped with transmitter ear tags, 5 of them were lost in a period ranging from 24 hours to three months. Despite a certain number of locations were taken those were insufficient to be able to monitor herds in the long term. Nevertheless, they give a rough estimation of CP home range in the Campo Lourdes area during the end of the dry season which gives a home range estimation (Minimum Convex Polygon) of 1.3 Km². This value is within the range of other home range values calculated for CP in other areas.

WP 6.3. Enrichment of the habitat to increase the carrying capacity for CP.

Two grain feeders were set up in Fazenda Campo Lourdes to test their potential of attraction among CP herds. Unfortunately, relative humidity in this property is much higher than in Pantanal of Nhecôlandia (Fazenda Berenice). Under extreme humid condition, corn was regularly compacting in the exit of the barrel thus, collapsing corn distribution. As a result the experiment was abandoned.

On the other hand, the difficulties experimented in the capture and monitoring CP herds did not allow the regular survey of grained and natural herds. In the current situation of WP6, it is highly unlikely that this WP task will lead to some results in free-ranging herds.

WP 6.4. Monitoring the impact of harvesting on the CP demography

A CR8 scientist, Jose Carlos Chaves is involved in a PhD thesis at the University of Minas Gerais in Brazil. Between January and April 2004, he spent 3 months in Montpellier with CO1, in order to receive additional training on SMA modelling, get further with the conceptualisation of the computer model and represent one of the area of study (Fazenda Nhumirim) on computerised SIG database. This training period was funded by the EC through another existing project (ALFA project).

In addition, several at least one meeting between the CR8 scientist and other partners of the INCO project are have occurred and CR8 has involved himself in a long term basis for the construction of this model through the winning of a Brazilian grant to undertake his PhD on that subject at the federal University of Minas Gerais.

2.3. Comparison of planned activities and actual work accomplished

WP 6.1. Set up effective trapping devices for the capture and management of CP herds

This WP task is being accomplished as programmed in the Pantanal and in Bahia. A draft of Deliverable DL6.1., expected by Month 18 can be found in the appendix of this report. As capture operations will carry on during 2005, the document will be completed with the results during the following months. A complete final document will be submitted at the end of the project.

WP 6.2. Modification of herd structure to increase CP productivity.

A gross estimation of animal abundance was gathered in Fazenda Campo Lourdes (Pantanal) and Fazenda Teimoso (Bahia). A total of eight CP were captured and equipped with ear tags with VHF transmitters. Unfortunately, an insufficient number of localizations were obtained due to the fact that CP were able to remove ear tags from their ears very easily. A total of 27 localization were obtained between June and November 2004. They will provide a very rough idea of the home range of CP in the Rio Negro area during that time of the year.

Extraction of surplus males wont be possible due to the low success of capture operations and the difficulties in marking and monitoring free ranging CP herds in the long term.

WP 6.3. Enrichment of the habitat to increase the carrying capacity for CP.

Grain feeders were tested in Fazenda Campo Lourdes as programmed to increase carrying capacity of the herds, but they did not provide good results under conditions of extreme humidity.

WP 6.4. Monitoring the impact of harvesting on the CP demography

Jose Carlos Chaves came to get some training for the 2nd time at CO1 in Montpellier during three months with funding from another EC project (ALFA). Some progress has been made by CR8 on gathering geographic information from Fazenda Nhumirim and the representation of different vegetation types within the model. In Bahia, an SIG data base on Fazenda Teimoso has been also built up by CR3. So far, sufficient information exists to start building a model in Fazenda Nhumirim. Nevertheless, the first prototype of the model has not yet been build up as expected, basically due to technical difficulties in representing the complex reality in a virtual manner.

2.4 State of the art review

Results obtained so far in the capture and monitoring of free ranging CP herds are interesting. However, their progress is slow and they will hardly contribute to come up with an exploitation system able to develop large scale commercial production systems. In that sense, it would be useful to fulfill one of the main goals of this WP: the description and analysis of large scale CP production experiences that are being developed on a commercial basis. CR3 has identified a CP production farm which can be considered, to our knowledge the largest scale CP production system described to date. CO1 and CR3 consider the possibility to analyse in more detail, its current production performances, the possible potential of improvement and the possibilities of replication of this production system in other areas of Latin America, as a part of WP6 activities during 2005.

For that purpose, additional funding has been required to the French Embassy in Brazil and we are at the moment awaiting for an answer.

2.5 Planned activities for the next period

The activities of WP6 for 2005 should focus around two main topics:

- a) The continuity of the activities going on around the capture and monitoring of free ranging CP populations in Pantanal (CR8) and Bahia (CO1).
- b) The analysis and collection of data concerning the viability of large scale production systems of CP in semi intensive or extensive conditions.

WP 6.1. Set up effective trapping devices for the capture and management of CP herds

There are still a lot of activities that could be developed around this topic. Unfortunately, money is running out and CO1 collaboration with our main partner in the Pantanal through FFEM (French Global Environmental Fund) is getting to an end in May 2005 and with it, CO1 logistic support in the area. CR8 activities are dependant on their ability to manage the remaining funds from the INCO project during the last year of the project. If CR8 manages to justify enough money in the next financial report, capture activities should continue in order to equip a larger number of animals with VHF transmitters. In Bahia, baiting and capture activities will continue in Fazenda Teimoso. A different method (drop net) should be tested in addition to the corral traps.

WP 6.2.

Monitoring of free ranging CP herds by radio telemetry should continue in the Pantanal (CR8) and in Bahia (CR3). Specific herds should be captured, marked and monitored for one final year to complete home range data and herd dynamics and composition. Data gathered during 2004 should be sent to CR8 for analysis with a copy to CO1. To prevent failures in the process of telemetric monitoring, we recommend to equip with radio collars animals with a weight higher than 25 Kg. Animals lower than 20 Kg should not be radio collared, with the 570 gr. model. Nevertheless, fixing the ear tags into collars could allow to radio collar animals with a lighter weight. A maximum of information should be recovered on the structure and composition of CP herds in the Pantanal (Nhumirim and Rio Negro) and in Bahia by herd observations in the field.

In Bahia, a large scale commercial farm will be visited and the composition, structure and sex ratio of the 450 animals herd will be analysed. If external funds are available, surplus males will be separated and female productivity will be monitored before and after male removals to detect any effects on female productivity within the herd. If this experience is undertaken a report on herd structure modification to improve productivity will be written to fulfil D 6.2

WP6.3.

No activities will be developed in this WP task during 2005. Deliverable D6.3 will not be completed due to lack of data.

WP 6.4.

If CR8 is able to manage his funds in a way of continuing field activities in 2005, it will be possible to gather enough geographic and ecological data to build up an SMA model based on Fazenda Nhumirim experience. Equally, data gathered by CO1 can also be used for the Rio Negro area. On the other hand, CR8 and CR4 have developed a collaboration with other researchers working on CP ecology in the Rio Negro area. The PhD student from CR8 should get in contact with all those actors to study the possibilities to develop his model based on the ecological information provided by the project and the geographic information available in the Nhecolandia area and/or Rio Negro areas. Efforts should be maximized during 2005 in order to build up a functional prototype of the model that could be presented to the final meeting in the Pantanal in August 2005.

3. List of deliverables

Deliverable N°	Title	Expected Completion Month	Probable Completion Month

D 6.1	Report on effective trapping techniques for the capture and management of CP herds	18	48
D 6.2.	Report of different crop enrichment methods to improve the productivity of CP	24	None
D 6.3.	Report on herd structure modification to improve the productivity of CP	30	Depending on external funding
D 6.4.	Recommendations to improve productivity of CP ranching schemes	36	48
D.6.5	Submission of a computerized model to predict different scenarios in the harvesting of CP	24	48

Among this list, only deliverable D 6.1 is now being compiled with information gathered from the project. It will be completed by CR8 and CR3 during 2005 and will be ready on month 48.

The project could not get any relevant information to be able to complete D 6.2.

If external funding is obtained, C01 and CR3 will work in a large scale CP ranch in Bahia to gather information on the herd structure modification in captive conditions, that could be used at the end of the project compile some data for D 6.3. Equally, at the end of the project, it will be possible to write a report concerning the viability and perspectives of CP ranching schemes.

Finally, by the end of the project, CR8 should be able to build up a preliminary model on the ecology of free ranging CP herds in Fazenda Nhumirim, by using the information recovered by WP5 and WP6.

4. Plans for Use and Dissemination

4.1. Potential, direct and indirect applications of results

Results concerning free ranging populations of CP will be used by landholders, government bodies, research institutions, conservation organizations, and wildlife management agencies.

Results from large scale production systems will be certainly of great use to wildlife producers in Brazil and Peru (particularly those involved with the peccary leather trade), but also development and conservation agencies working in Latin America.

4.2 Dissemination of the results.

All the scientific publications issued from this WP, will be mentioned in the TIP and will be available in the "Products" section from the INCO PECARI Website.

- DL 6.1. A document already exists. It will be completed with experiences gained by CR8 and CR3 during 2005 and a completed version will be submitted at the end of the project.
- Piovezan, U. Rocha, F.L. and Desbiez, A. Uso de água potável para a atração de catetos *Tayassu tajacu* na Fazenda Nhumirim, Pantanal, Brazil. Presented in VI international Congress on wildlife management in the Amazon and Latin America, Iquitos, September 2004
- Nogueira-Filho, S. ; Nogueira, S.; Mendes, A. & Jori, F. 2004. a description of a large scale commercial production of collared peccary (*Tayassu tajacu*) from Bahia, Brazil. Game and Wildlife Science (Accepted for publication)
- Jori, F. ; Nogueira-Filho, S.; Nogueira, S. & Mendes, A. 2004. El manejo colectivo de grandes grupos de pécari de collar (*Tayassu tajacu*) nacidos en cautividad. Un paso hacia el

"ranching"? Presented in VI international Congress on wildlife management in the Amazon and Latin America, Iquitos, September 2004

5. Management and co-ordination aspects

5.1 Project meetings and coordination of activities

1. From January to March, a scientist of CR8 (Jose Carlos Caves from Embrapa CNGP), visited Montpellier and worked together with CO1 in the training and initial conception of the model, the possibilities of representing Pantanal vegetation and the building of SIG support of Fazedan Nhumirim to be integrated in the model.
2. Early May, Marie-Noël de Visscher and Mathieu Bourgarel (CO1) visited EMBRAPA Pantanal, to define Task II work priorities in the Pantanal, assess the work so far conducted, exchange ideas and present a model being developed by CIRAD and Zé Carlo Chavez to model collared peccary populations in the Pantanal.
3. WP6 team members Mathieu Bourgarel, Ubiratan Piovezan, Zé Carlos Chavez and Elisabete Marques de Jesus Costa met with Arnaud Desbiez (CR4) at the end of May in Campo Grande to discuss the SMA model under development at Embrapa Gado de Corte in Campo Grande (CR8).
4. Mathieu Bourgarel and Arnaud Desbiez at the end of May reviewed and discussed analysis methods for data collected in Fazenda Nhumirim by WP5.
5. In the beginning of July 2004, CR3, CO1 and CR6 members met in Paris during the 6th International Wildlife Ranching Symposium.
6. At the end of July, members of CO1 (Ferran Jori), CR2 (Manel Lopez Bejar), CR7 (Robert Mauget) and CR4 (Richard Bodmer), met together in Barcelona during the presentation of the PhD thesis of Pedro Mayor in the Veterinary Faculty of Barcelona.
7. In September all members of the INCO PECARI except for CR7, met in Iquitos Peru, during the VI Latin American Congress of wildlife management. They were involved in several round tables and workshops.

5.2 Collaborations

With CR3

A very close level of collaboration exists between CO1 and CR3, with very regular contacts by e-mail and phone, for the presentations of common papers. Several direct exchanges occurred during the celebration of scientific events in Paris (July) and Peru (September). Further collaboration is expected in the monitoring of zootechnical performances of large scale semi-intensive production ranch in Bahia State. A joint visit to the farm is expected in March 2005.

With CR4

Collaboration between CR4 and WP6 in the Pantanal has improved in the field not only with CR8 but also among members of the local CO1 research team. The continuity of this collaboration is necessary particularly around the sharing of ecological information of CP provided by the project that could be used to be integrate in the construction of the computer model. Equally, it would be beneficial for the whole project and for the general knowledge of Tayasuids and suiforms in the Pantanal, organize a meeting all involved researchers in that subject (including CO1) with the purpose to build up a common database and exchange data and information on the subject.

With CR8

The visit of Marie Noël de Visscher from CO1 in 2004 helped to improve communication between and from the project Coordinator in 2004, helped to improve the level of collaboration between CO1 and CR8. Embrapa Gado de Corte finally resigned to continue in the project. This decision has the advantage to make relations with CR8 more simple and direct. Nevertheless, the continuity of on going activities with Embrapa Gado de Corte such as the SMA model, are seriously compromised. An official communication concerning this decision has not yet been obtained despite several requests.

5.3 Manpower.

5.3.1. CO1 Manpower

The CO1 team increased with the integration of new researchers: Elisabete Marques, Tatiana Ono and Dionisio Ramirez performed most of the field work in Fazenda Campo Lourdes. All of them were staff of the Regional Park of the Pantanal. Logistic support was given by Dr. Mathieu Bourgarel and the regional Park of the Pantanal where he is based. Elisabete Marques left the team in September 2004.

5.3.2. CR3 Manpower

The CR3 field personal team was incremented with four new researchers: Gaston Giné, Tatiana Senra Motta, Érico de Sá Petit Lobão and Carlos Alberto Batista Santos.

Along with Sérgio Luiz Gama Nogueira-Filho, WP5 regional coordinator, the team has been in the field during almost the whole year.

5.3.3. CR8 Manpower

The CR8 team leader and the scientific partner of the project is Dr. Ubiratan Piovezan. He has been assisted by several field assistants such as Fabiana Rocha. José Carlos Chaves, from Embrapa CNPQC is a PhD student working on the computer modelling of CP populations in Fazenda Nhumirim.

5.4 Future meetings

CO1 will visit Bahia in March 2005 in order to visit a large scale production farm, collect specimens on herd structure, in order to start monitoring productivity of a large herd of CP under production.

All the INCO partners will meet in the Pantanal in August 2005 for the organization of the INCO final meeting, three months before the closing date.

6. Conclusion

Very little research has been undertaken so far around large scale production of CP in a semi-natural environment. The benefits can be important for the leather industry and for the development of CP production in a commercial scale. Nevertheless, the potential of such a possibility is still unknown. In that sense, this WP was certainly one of the most ambitious in the project considering the low level of knowledge in this field. As a consequence, a certain degree of risk lies in the large space devoted to innovations.

So far, we can say that due to the elusive nature of free ranging CP, the capture and management of CP is not an easy task and requires substantial efforts and technical skills. The natural densities of CP observed in the Pantanal and Bahia, do not allow us to be very optimistic concerning the economic viability of an eventual exploitation of this species alone. Nevertheless, in the case of the Pantanal the same method designed for CP is allowing with the same effort, the capture and management of sympatric species with a comparable economic value for its meat, such as the feral pig and the white lipped peccary. In that sense, and despite the fact that further research should be undertaken, we can

say the methods developed in this WP are promising from the technical point of view, to exploit and manage free ranging populations of suiforms, including tayasuids and feral pigs.

In addition, this WP has mainly focused on the management of free ranging populations of CP. Nevertheless, this does not need to be the only strategy for producing CP in the large scale. In that sense, during the last year of the project, CR3 and CO1 will investigate the potential viability of some ongoing empirical initiatives of large scale CP production with captive born individuals managed collectively in a closed environment in Bahia. WP6 proposes to explore and quantify the production potential of this initiative and the possibilities to improve in order to establish a model that could be replicated elsewhere.

Annexes

Appendix 1: Report by Tatiana Ono from CO1 in Fazenda Campo Lourdes.

Appendix 2: Report from CR3 in Fazenda Teimoso, Bahia.

Appendix 3: Report from CR8 in Fazenda Nhumirim.

Appendix 4: Report from CR8 concerning WP6.4.

Appendix 5: Draft of D6.1 (Report on effective trapping techniques for the capture and management of CP herds)

Appendix 6: Communication presented to the 6th International congress on Wildlife Management in Amazonia and Latin America, Iquitos (Peru), September 2004

Appendix 1: Report by Tatiana Ono from CO1 in Fazenda Campo Lourdes



PARQUE REGIONAL DO PANTANAL
Campo Grande, 21 de Dezembro de 2004

RELATÓRIO ANUAL DO PROJETO INCO PECARI

I – Ecologia do cateto (*Tayassu tajacu* – Tayassuidae) no Pantanal do Rio Negro, Mato Grosso do Sul, Brasil.

II- Aspectos da dinâmica populacional e sanidade da população de queixadas da fazenda Campo Lourdes – Pantanal do Rio Negro – Aquidauana, Mato Grosso do Sul, Brasil.

**Autora : Tatiana Mieko Ono
Elizabete Costa**

1. Objetivos do Relatório

Informar todas as atividades realizadas pelo Projeto Inco, na Fazenda Campo Lourdes, município de Aquidauana, dentre o período de Janeiro à Novembro de 2004.

2. Objetivos gerais

Produção de conhecimentos sobre a ecologia de populações naturais de catetos (*Tayassu tajacu*) e de queixadas (*Tayassu pecari*) para o desenvolvimento de técnicas e viabilização de programas de manejo extensivo dos caititus no Pantanal sul-matogrossense.

Testar sistemas eficazes de captura e manejo dos bandos de cateto.

Agregar valor à áreas até então consideradas improdutivas nas propriedades pantaneiras, tais como capões e cordilheiras, mas essenciais à manutenção da fauna local.

2.1. Objetivos específicos

Análise sanitária das populações de queixadas e catetos, que consiste em:

- exame clínico geral;
- pesquisa sorológica das seguintes doenças: brucelose, leptospirose, peste suína clássica, doença de aujeszky e febre aftosa;
- exames coproparasitológicos.

Todas as análises sanitárias serão comparadas posteriormente com as análises das populações de porcos monteiros.

Constatação das alterações dos parâmetros fisiológicos ocasionados pelo estresse da captura e contenção física, comparando com catetos, queixadas e porcos-monteiro (*Sus scrofa*).

Registrar os padrões de atividades nas cevas-curral: qual é a seletividade desse equipamento, quais espécies a utilizam, a frequência de utilização, que alimentos consomem e em que quantidade.

Testar o uso dos dispersores automáticos de alimento como técnica alternativa para manejo das populações de catetos de forma extensiva no Pantanal.

Determinar a eficácia de brincos-transmissores e colares-transmissores, para posterior telemetria, nos catetos e queixadas. Demonstração da hipótese que o rádio-brinco é menos perturbador para os catetos que o rádio-colar.

Conhecer a atratividade de diferentes alimentos para serem utilizados como iscas na captura de caititus.

Conhecer a comunidade de mamíferos que desfrutam dos mesmos recursos alimentares que os caititus utilizam.

Determinar a área de vida e uso de hábitat de catetos e queixadas.

Determinar o padrão de deslocamento dos catetos e queixadas.

Comparar o crescimento individual dos animais com a recaptura.

3. Materiais e métodos

Os projetos foram realizados na Fazenda Campo Lourdes (21k 0654349, 7839074), no município de Aquidauana, estado de Mato Grosso do Sul. Os trabalhos nesta fazenda vem sendo efetuados deste outubro de 2004.

Vamos ao campo mensalmente, permanecendo em média 5 dias por mês. As cevas ficam armadas durante todo o período que permanecemos no campo, totalizando em média (entre o período de abril à novembro de 2004) 620 horas de captura. O trabalho que realizamos não foi desenvolvido de maneira contínua, devido aos sucessivos ajustes administrativos que sofreram o Parque Regional do Pantanal durante o ano decorrido.

As atividades no campo são distribuídas da seguinte forma: reconhecimento das áreas utilizadas pelos animais com transmissores, captura de catetos e queixadas para coleta de material biológico (sangue, fezes), aferimento dos parâmetros fisiológicos, biometria, colocação de transmissores e telemetria destes animais, utilização e eficácia das cevas.

O projeto vem sendo realizado com o auxílio do Parque Regional do Pantanal, EMBRAPA (Empresa Brasileira de Pesquisa Agropecuária), UFMS (Universidade Federal de Mato Grosso do Sul) e Iagro (Agência Estadual de Defesa Sanitária e Vegetal).

3.1 Área de estudos

A Fazenda Campo Lourdes, situa-se no município de Aquidauana, no estado de Mato Grosso do Sul. É uma típica fazenda de pecuária extensiva inserida no Pantanal do Rio Negro. Cerca de dois terços da fazenda corresponde à vegetação totalmente nativa; tanto os pastos quanto a vegetação arbórea e arbustiva.

A Oeste é banhada pelo Rio Correntoso, alagando permanentemente boa porção desta área. Seu aspecto meândrico corresponde ao esperado para a região, formado por longas cordilheiras que bordejam baías temporárias ou permanentes. Estas baías temporárias encontram-se cheias de água por ocasião do período da cheia, mas depois secam e torna-se campo disponível à pecuária extensiva. O turismo ecológico está em ascensão nesta fazenda, que já faz parte da associação das pousadas pantaneiras.

Dentre os mamíferos presentes na Fazenda Campo Lourdes, estão os tayassuídeos ou porcos-do-mato, *Tayassu tajacu* (cateto ou caititu) e *Tayassu pecari* (queixada), estes últimos observados freqüentemente. Nesta área também se iniciará o Projeto Onça – Valorização e Conservação das Onças no Pantanal.

3.2 Reconhecimento da área e coleta de dados geográficos

Durante o estudo foi possível adquirir um banco de dados para a construção de um mapa cartográfico (anexo 1), utilizando o programa computacional ArcView 3.2, contendo o perímetro da propriedade, distribuição

dos habitats, posição dos transectos, principais pontos de água, pontos de ceva, e pontos de telemetria nos indicando o deslocamento do animal.

3.3 Cevas, Captura e Manipulação dos animais

A campanha de captura inicio-se em abril de 2004 e seguirá até 2005, como consta no relatório parcial. Os dados de consumo de alimentos "iscas" e identificação dos animais que as consumiram (animais visitantes) estão sendo coletados através de 4 cevas, chamadas de cevas currais, possibilitando captura passiva. As cevas possuem o seguinte nome: fedegoso, carandá, bocaiúva e paratudo. Portanto os pecarídeos estão sendo cevados, capturados, marcados e recapturados para monitoramento da população. As cevas consistem de dois portões, possuem 25 metros de perímetro por 2 metro de altura.



Figura 1. Gaiola e logradouro para contenção de pecarídeos e porcos monteiros.
Foto: Tatiana Ono.

Todas as cevas foram construídas em cordões de matas, também chamadas de cordilheiras, próximas aos lameiros (local onde os catetos e queixadas freqüentam para se refrescarem) (mapa das cevas no anexo 1).

As cevas estão sendo vistoriadas desde Dezembro de 2003, sendo abastecidas duas vezes por semana, com milho em grão (1 kg), sal comum (1 kg) e por vezes com frutas locais (manga, laranja, abóbora, acuri). Durante o abastecimento das mesmas ocorre a vistoria.

Na inspeção são registradas as quantidades fornecidas, consumidas, e presentes de cada alimento, e identificada as espécies que visitaram a ceva através de seus rastros e restos alimentares. Para identificação do animal visitante é utilizado o manual de campo desenvolvido por Becker e Dalponte (1999) e a experiência pessoal adquirida pelos “mateiros” da região.

Possuímos transmissores nas cevas, que quando desarmadas são acionados, portanto a chegada na ceva é rápida. A equipe permanece em silêncio ao chegar na armadilha, cobrindo com uma lona preta todo o perímetro da ceva. O bando permanece calmo após tais procedimentos, não colidindo na tela de arame e não ocorrendo ferimentos.

Os procedimentos são efetuados com rapidez e eficiência, provocando o mínimo de estresse possível. Os animais capturados nas cevas são encaminhados até o logradouro e depois para a gaiola, onde são contidos com cordas e mordanças. Devido à experiência da equipe quanto à contenção física, optamos por não utilizarmos mais a contenção química, diminuindo desta maneira o tempo de manipulação e os riscos de morte destes indivíduos. Em média o tempo de manipulação utilizado é de 10 minutos/ animal.

O animal é colocado em decúbito lateral. Os olhos e ouvidos dos animais são tampados para que o estresse da contenção seja amenizado. Utilizamos água gelada no abdômen de todos os catetos para diminuir a temperatura corporal, já

que é freqüente os casos de hipertermia desses animais; nas queixadas empregamos tais procedimentos somente nos dias de muito calor, por observarmos que são animais mais resistentes. Posteriormente redigiremos um protocolo descrevendo todos os passos que devem ser seguidos durante a captura destes pecarídeos.

Os animais estando contidos, realizamos a biometria, mensuração do peso e exame clínico geral. Todos os animais são identificados com um brinco em cada orelha (brincos auriculares numerados para suínos), sendo utilizada uma cor por ceva; realizamos microchipagem em todos os catetos (devido ao risco de perda dos brincos) e também nas queixadas que receberão colares transmissores. Os microchips são inseridos atrás da orelha esquerda.



Figura 2. Colocação de brinco nas queixadas. Foto: Tatiana Ono

3.4 Análise sanitária

A coleta de sangue é realizada na veia jugular, na femural ou na mamária (fêmeas prenhes). A sorologia é efetuada pela médica veterinária Rita de Cássia do Iagro. Também estamos efetuando a sorologia dos porcos monteiros em outro projeto em paralelo ao Inco.

Dentre as doenças pesquisadas estão a brucelose, peste suína clássica, leptospirose, doença de aujeszky e febre aftosa.

A Peste Suína Clássica (PSC), também conhecida como febre suína ou cólera dos porcos, é uma doença viral altamente contagiosa que acomete os animais membros da família *suidae* (suínos domésticos, selvagens e javalis). Considerando-se que porcos silvestres e suínos domésticos são igualmente susceptíveis à doença, PSC endêmica em porcos silvestres é um reservatório importante do vírus para suínos domésticos. Frequentemente os surtos em suínos têm início quando suínos domésticos entram em contato com material infectado originado de porcos silvestres.

A leptospirose é considerada a mais importante em termos econômicos para a suinocultura. A leptospirose é uma doença infecciosa bacteriana de caráter zoonótico e de grande importância econômica, que acomete diversas espécies animais, especialmente os mamíferos.

Diversos estudos indicam que provas diagnósticas para brucelose têm sido realizadas em suínos selvagens e em javalis utilizando como provas sorológicas: a prova do Antígeno Acidificado Tamponado e o teste de Aglutinação em Placa Tamponado, ambos recomendados para o diagnóstico da brucelose em suínos domésticos.

A Febre aftosa ataca todos os animais de casco fendido, principalmente bovinos, suínos, ovinos, caprinos e exemplares silvestres, como porco monteiro, javali, veado e capivara. Raramente atinge o homem. Os porcos são responsáveis por uma grande parte da produção de aerossóis, sendo que sua exalação tem 30 a 100 vezes mais vírus do que a de ovelhas e gado.

3.5 Transectos lineares

Também foram realizados transectos durante cinco meses: dezembro, fevereiro, março, abril, maio e junho.

3.6 Telemetria

Nos catetos adultos e sadios (no caso de fêmeas, não podem estar em período de gestação) colocamos brincos-transmissores para posterior telemetria, possuímos 7 brincos para serem empregados. Esses brincos pesam 30 gramas (em média, corresponde a 0,2% do peso do animal) e são equipados com rádio emissor da marca suíça Wegner®.

O uso deste material é uma inovação, já que não existe referência da utilização deste tipo de marcação telemétrica em catetos na literatura. Outrossim, pensamos que oferece maiores garantia de sucesso que a marcação com rádio-collar. Esta nova atividade não representa maiores riscos, exceto a possibilidade de que os animais percam os brincos durante o seguimento.

Nas queixadas adultas e sadias (no caso de fêmeas, não podem estar em período de gestação) colocamos colares-transmissores.

Vários pesquisadores já constataram que os catetos e queixadas são simpátricos na maior parte da América do Sul, o que nos motivou a hipótese de fazer a telemetria das duas espécies, já que os colares-transmissores, que outros pesquisadores estavam utilizando nos catetos, estavam sem uso.

4. Resultados e Discussões

4.1 Reconhecimento da área e coleta de dados geográficos

O resultado da coleta de dados geográficos pode ser visto no mapa no anexo 1.

4.2 Cevas, capturas e manipulação dos animais

Dentre os alimentos “iscas” utilizados, o milho, as mangas, os acuris e abóboras tiveram aceitação plena, mas, a oferta de laranja não foi tão aceita. Porém, a visitação das cevas pelas aves, com grande consumo das iscas atrapalha, sendo recomendado para outros estudos o uso de cevas teladas na parte superior (teto), impedindo as aves de se utilizarem das mesmas.

As cevas currais têm se mostrado bastante eficientes na atração e captura de animais sociais. Dessa forma, captura-se não todo, parte do grupo familiar, e por ser passivo, não acarreta em grande estresse para os animais.

Tabela 1. Tempo de atividade, frequência e número de visitas em cada ceva, durante o período de estudo.

Ceva	Tempo ativa (dias)	Número de visitas	Frequência das visitas (visitas/tempo)
Fedegoso	327	85	3,84
Carandá	327	85	3,84
Bocaiúva	327	85	3,84
Paratudo	327	85	3,84

A sobreposição espacial no uso do hábitat e as diferentes percepções de escala no uso de recursos por queixadas e catetos está sendo evidenciada, com dados sugerindo uma sucessão temporal no uso de hábitat. Isso vai de encontro ao registrado em outros locais (Fragoso 1999), onde se evidencia um padrão de uso de hábitat e recursos com granulação fina para catetos e de granulação mais grosseira para queixadas. Isto também prejudica os padrões de deslocamento das duas espécies, sendo os catetos movimentando-se bastante porém ocupando áreas menores, e queixadas deslocando-se a grandes distâncias entre grandes manchas de recursos.

É possível que os próximos dados demonstrem que as duas espécies utilizarão os recursos disponíveis nas cevas de forma alternada, tendo a população de catetos maior influência da sazonalidade das inundações.

O uso dos dispersores automáticos não foi muito eficiente na região do pantanal, até o momento, devido a alta umidade do ar, o que deixava os grãos de milho úmidos e se condensavam em blocos, não ocorrendo a dispersão dos grãos. Algumas modificações nos dispersores estão sendo estudadas para nova utilização. A atração dos animais foi evidenciada pela presença de pegadas.

Desde abril foi possível a captura de 4 catetos, 67 queixadas, e nenhum porco monteiro. A única ceva onde foi capturados os catetos foi a fedegoso. A ceva que se mostrou mais eficiente na captura de queixadas, durante o período de seca, foi a Fedegoso, entretanto a ceva Carandá foi a mais eficiente no período de cheia.

Tabela 2. Captura de catetos e queixadas em todas as cevas durante os meses de maio, junho, setembro, outubro e novembro.

Cevas	Catetos					Queixadas					Total
	mai	jun	set	out	nov	mai	jun	set	out	nov	
Fegegoso	2	0	0	2	0	20	11	0	0	0	35
Carandá	0	0	0	0	0	0	2	0	0	20	22
Bocaiúva	0	0	0	0	0	2	1	0	0	3	6
Paratudo	0	0	0	0	0	0	3	5	0	0	8
<i>Total</i>	2	0	0	2	0	22	17	5	0	23	

Os meses de julho e agosto não constam na tabela pelo fato de não ter ocorrido capturas nesses meses devido às suspensões das viagens por motivos administrativos.

Tabela 3. Quantidade de queixadas machos, fêmeas, adultos e jovens capturados nas cevas.

Cevas	Jovens	Adultos	Machos	Fêmeas
Fedegoso	9	22	10	21
Carandá	5	17	4	18
Bocaiúva	1	5	2	4
Paratudo	3	5	1	7
Total	18	49	17	50
Porcentagem	28,87 %	73,13 %	25,37 %	74,63 %

‘Dos quatros catetos capturados, todos eram adultos, sendo 2 fêmeas e 2 machos, dando uma proporção de 50% para machos e 50% para fêmeas, e 100% de adultos capturados. Das 67 queixadas, 74,63% eram fêmeas e 25,37% eram machos, nos dando uma proporção de 2,94 fêmeas para 1 macho. Desses animais a porcentagem de adultos foi de 73,13%, e a de jovens 28,87%.

As capturas ocorreram com maior freqüência quando as cevas permaneciam armadas durante a noite. Não manipulamos as queixadas durante a noite devido aos riscos de acidentes com a equipe. As capturas são cessadas ao pôr-do-sol (aproximadamente 18:00) e retornam ao amanhecer (05:30).

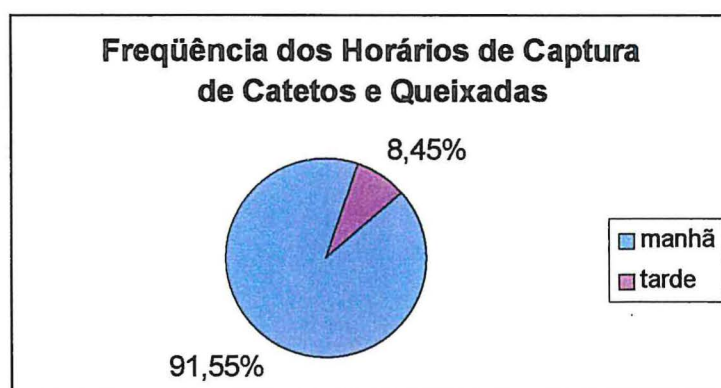


Figura 3. Freqüência dos horários de captura (manhã e tarde) de catetos e queixadas.

A média do peso das queixadas capturadas foram de 27,1 kg. Não foi capturado nenhum filhote, apenas jovens e adultos. A média de peso dos jovens é de 16,05 kg, e a dos adultos é de 31,16 kg.

Realizamos aferições das alterações fisiológicas em 10 animais até o momento, sendo 8 queixadas e 2 catetos, devemos coletar mais dados para que se torne possível uma análise dessas alterações. A temperatura dos catetos (aferida na mucosa retal) foi de 39,5°C e 40,5°C, a de queixadas variou de 39,1°C à 41,3°C, nos fazendo concluir previamente, um grande aumento ocasionado ao estresse de contenção.

A frequência cardíaca dos catetos foi de 112 e 140 bpm (batimentos por minuto), a de queixadas variou de 108 à 168 bpm. A frequência respiratória dos catetos foi de 16 e 20 mpm (movimentos por minuto), a de queixadas variou de 24 a 52 mpm. Estes dados serão analisados mais detalhadamente e mais dados serão coletados.

4.3 Transectos lineares

A distância acumulada dos quatros transectos foi de 218,252 quilômetros. Com a saída da bióloga do projeto, não foi possível a continuidade dos transectos. Os dados obtidos são escassos, sendo possível apenas fazer uma relação das frequências de observação das espécies (Figura 4), sendo as capivaras, emas e cervos as espécies mais frequentemente avistadas.

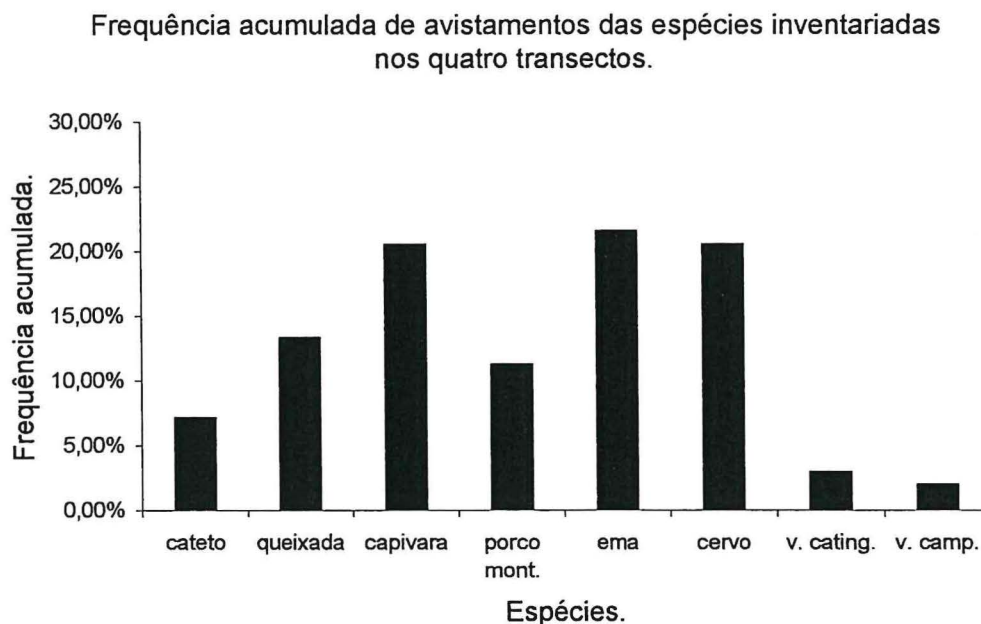


Figura 4. Frequência acumulada de avistamentos dos vertebrados inventariados nos quatro transectos, no período de dezembro de 2003 a junho de 2004.

Essa frequência de avistamentos aparentemente não sofre forte influência do período matutino ou vespertino, especialmente catetos e queixadas. Os dados até então corroboram estudos anteriores de atividade regular ao nascer e pôr-do-sol, a exceção de porco-monteiro (*Sus scrofa*), forma feral, e capivaras (*Hydrochaeris hydrochaeris*), que sugerem maior atividade em um ou outro período (Figura 5).

Os avistamentos ao longo dos meses, sugerem uma maior frequência das espécies cujos atributos ecológicos as permitem utilizar habitats alagados, tais como cervos, capivaras e queixadas, talvez devido ao excesso de chuvas, mesmo em meses caracteristicamente secos, aumentando a superfície alagada da área de estudos, e independente dos períodos matutino e vespertino (Figura 6).

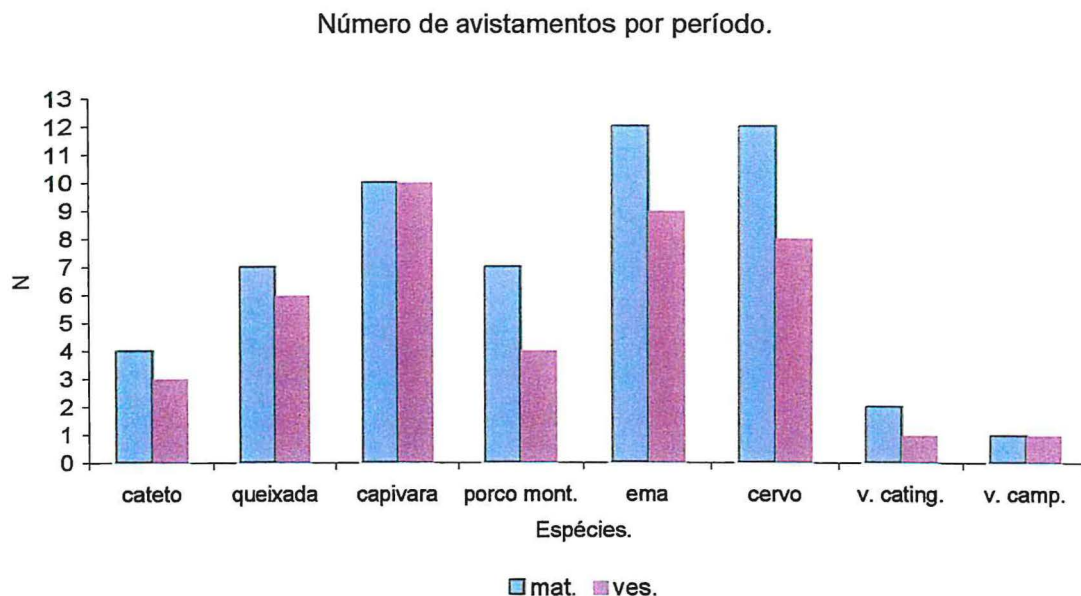


Figura 5. Frequência acumulada por período (matutino e vespertino) de avistamentos dos vertebrados inventariados nos quatro transectos, no período de dezembro de 2003 a junho de 2004.

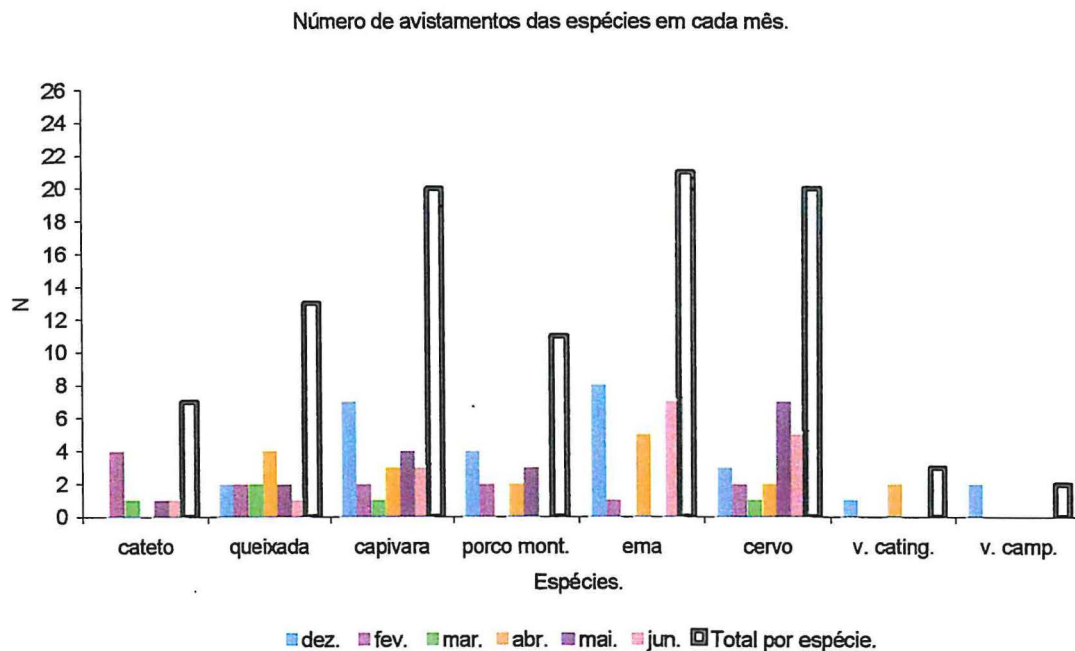


Figura 6. Frequência de avistamentos dos vertebrados inventariados nos quatro transectos, em cada mês amostrado e por período (matutino e vespertino) entre dezembro de 2003 a junho de 2004.

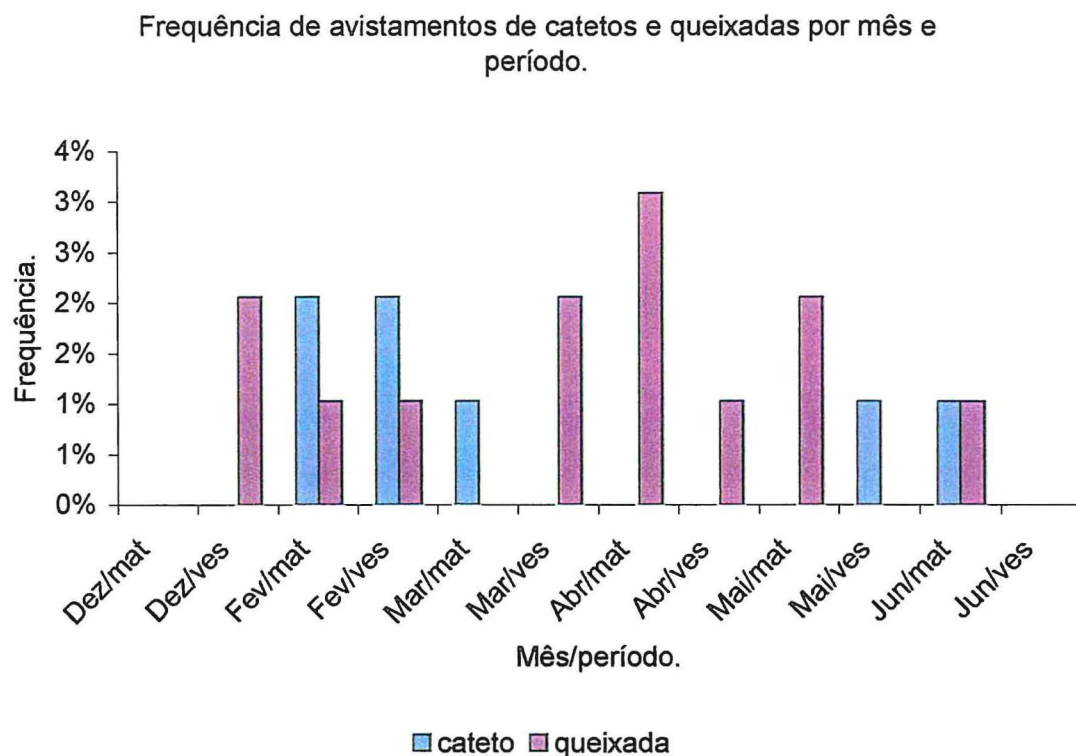


Figura 7. Frequência de avistamentos de catetos e queixadas por mês e período, nos quatro transectos, entre dezembro de 2003 a junho de 2004.

4.4 Telemetria

Destes animais foram colocados brincos-transmissores em 3 catetos e colares-transmissores em 4 queixadas. Foram capturadas também antas (2 fêmeas adultas e 1 filhote), cutias e veado catingueiro.

Na primeira captura dos catetos foram contidos 2 fêmeas adultas e na segunda dois machos adultos, pesando respectivamente 16, 19, 18 e 14kg. Colocou-se brinco-transmissor em 3 desses animais; caíram os três brinco, devido ao peso do mesmo, nos mostrando ser ineficiente este tipo de transmissor nos catetos por ser muito pequena e delicada a orelha do cateto.

Os brincos encontrados estava todos amassados e riscados, nos indicando o incômodo causado aos animais e o esforço do indivíduo para a retirada do rádio. Estamos pensando na possibilidade de colocarmos estes brincos em colares menos pesados do que os das queixadas, e testá-los em 2005.

O animal identificado como “1”, permaneceu por mais tempo com o brinco-transmissor, o que nos permitiu realizar um número maior de localizações. Não foi possível intensificar a telemetria devido à saída da bióloga Elizabete, o que deixou nossa equipe desfalcada quanto às localizações e análises dos dados. Temos também dados telemétricos de um cateto que recebeu colar em 2003. deste animal foi possível retirar 61 localizações, o que nos permitiu estimar uma área de vida preliminar de 1,47 km² para o bando acompanhado

Nas queixadas foram utilizados os colares-transmissores. Estes colares, posteriormente, já tinham sido utilizados nos catetos por outra equipe, se mostrando ineficiente. O peso do colar, provavelmente, foi o que ocasionou a morte dos catetos em curto espaço de tempo, devendo ter ocorrido um grande incômodo aos catetos. Já as queixadas que são animais maiores e mais resistentes, estes colares nos provaram ser eficientes. Quatro queixadas receberam o colar, e apenas uma não foi possível localiza-la até o momento.

Tabela 4. Animais que receberam rádio-transmissores.

Animal	Frequência	Sexo	Localizações	Período de estudo
Cateto - 01	149.152 mhz	fêmea	27	28/05 à 08/10/04
Queixada – 75	148.650 mhz	fêmea	13	02/07/04 até hoje
Cateto - 02	149.027 mhz	macho	02	08/10/04
Cateto - 03	149.127 mhz	macho	00	08/10/04
Queixada - 89	148.675 mhz	fêmea	04	09/11/04 até hoje
Queixada - 90	148.600 mhz	fêmea	00	18/09/04 até hoje
Queixada - 93	148.700 mhz	macho	04	12/11/04 até hoje

Devido à marcação telemétrica das queixadas tivemos que estender nosso projeto à área da Fazenda São Francisco, para onde os bandos migraram durante o período da seca. A principal atividade desta fazenda é a pecuária extensiva, e ela faz fronteira com a fazenda Campo Lourdes, ficando à sudoeste da mesma. Esta área é banhada pelo Rio Correntoso, ocorrendo o deslocamento dos bandos para as proximidades deste rio durante o período de seca.

A queixada 75, cuja frequência é 148.650 mhz, foi capturada na ceva fedegoso, no mês de Junho, a última localização foi realizada no final de novembro, nos mostrando uma distância de 5 km entre o local de captura e última localização. Em oposição, os catetos que possuíam transmissores, eram sempre localizados próximos às áreas de captura, nos fazendo concluir, previamente, que as queixadas se deslocam a longas distâncias e os caititus em curtas distâncias.

Esse grande deslocamento da queixada ocorreu na época da seca, e o animal se dirigia para as proximidades do Rio Correntoso em busca de água; com a volta das chuvas no final de Outubro, as queixadas começaram a retornar em direção aos locais de captura.

4.5 Análise sanitária

Juntamente com os catetos e queixadas foram analisadas as amostras sanguíneas dos porcos monteiros do Pantanal do Rio Negro (em média 200 animais). Ainda não temos todos os resultados dos exames de sorologia, temos apenas os de Peste Suína Clássica e Brucelose. Para peste suína clássica foi utilizada a prova de Elisa, e até agora, todos os catetos, queixadas e porcos monteiros se mostraram negativos ao exame.

Para o exame de brucelose utilizamos como primeira prova o acidificado tamponado rápido, posteriormente dos animais reagentes foi feita a prova lenta, e como terceira prova o 2-mercaptoetanol. Todos os catetos e porcos monteiros foram negativos para brucelose. Das 64 queixadas, 6 foram positivas para a primeira prova de brucelose, já na segunda prova, 4 foram comprovadamente positivas.

Posteriormente existe a possibilidade de construirmos uma ceva para captura de porcos monteiros na fazenda São Francisco (ao lado da Fazenda Campo Lourdes), já que a população de porcos na Fazenda Campo Lourdes é muito pequena. Através da construção desta ceva queremos constatar se esses porcos monteiros que utilizam do mesmo hábitat que as queixadas, estão ou não contaminados. Realizaremos também exames de alguns bovinos da fazenda.

Para os exames coproparasitológicos, coletamos amostras do reto, 3 a 4 gramas e acondicionamos em solução de formol a 10%. As amostras de fezes são direcionadas à UFMS, onde o Dr. Fernando Paiva realiza os exames. Não foram realizados todos os exames de fezes, alguns destes resultados estão na tabela abaixo:

Tabela 5. Resultado do exame de fezes pela técnica de centrífugo-flutuação em açúcar.

Animal (nº)	Espécie	Sexo	Idade	Resultado
76	Queixada	Fêmea	Adulto	Cocc +++, STG +
80	Queixada	Fêmea	Jovem	Cocc ++, STG ++
102	Queixada	Fêmea	Adulto	Cocc+, STG +
103	Queixada	Fêmea	Adulto	Cocc+, STG +
104	Queixada	Fêmea	Adulto	Negativo
105	Queixada	Fêmea	Jovem	Cocc+, STG +
106	Queixada	Fêmea	Adulto	STG +
107	Queixada	Fêmea	Adulto	Negativo
108	Queixada	Fêmea	Adulto	Negativo
109	Queixada	Fêmea	Adulto	STG +
110	Queixada	Fêmea	Jovem	Negativo

Abreviaturas: STG= ovos tipo estrôngilos; Cocc= oocistos de coccídeos (*Eimeria spp* ou *Isospora spp*)

Infelizmente quando capturamos os catetos ainda não realizávamos os exames de fezes.

5. Atividades previstas e executadas durante o ano de 2004

- avaliação da eficácia dos dispersores automáticos no pantanal, que se mostrou ineficaz;
- teste dos brincos-transmissores nos catetos, nos mostrando ineficazes para a espécie;
- teste dos colares-transmissores nas queixadas, nos mostrando ser muito eficiente para adquirirmos dados sobre padrão de deslocamento, uso de hábitat e área de vida;
- realização dos testes sorológicos e coproparasitológicos, que já nos proporcionou alguns dos resultados;
- detecção das alterações nos parâmetros fisiológicos dos animais devido ao estresse por contenção física;
- realização da análise da eficiência das cevas.

6. Atividades previstas para o ano de 2005

- construção de ceva na Fazenda São Francisco (ao lado da Campo Lourdes), para captura de porcos monteiros para exame de brucelose, e também realização de exames em alguns dos bovinos da fazenda;
- coletar sangue de outros prováveis animais que freqüentam a ceva, como cutia, veados, tatus, etc; para realização de exame para brucelose;
- Testar protocolos anestésicos nas queixadas, para posteriormente utilizá-lo nos catetos; com aferição de dados fisiológicos a cada 5 minutos, também testar sensibilidade e tempo de recuperação. Um dos protocolos testados será o citado pelo Fowler, 2004.
- Coletar mais dados sobre alterações fisiológicas causadas pelo estresse de contenção dos catetos, e compará-las aos dados das queixadas e porcos monteiros;
- Modificar os rádios-brincos-transmissores para colares mais leves e testá-los nos catetos;
- Continuar a telemetria dos animais que estão com transmissores e analisar área de uso, uso de hábitat e padrão de deslocamento; Intensificar a telemetria dos animais, com a ajuda de um estagiário (ir ao campo duas durante duas semanas por mês, em vez de uma única semana);
- Realizar juntamente com o pesquisador Ubiratan Piovezan (EMBRAPA), a telemetria por 72 horas, das queixadas com transmissores e também de catetos, e comparar com os animais da Fazenda Nhumirim;
- Redigir um protocolo minucioso com todos os procedimentos de captura de pecarídeos e porcos monteiros;
- Intensificar as recapturas para comparação de aumento de peso, taxa de crescimento, e repetição dos exames sorológicos;
- Realizar exames corproparasitológicos em catetos e queixadas em cativeiro (criadouros, zoológicos), para compararmos com os animais de vida livre;
- Continuar testando a seletividade, eficácia e freqüência dos animais nas cevas;
- Analisar dados de biometria dos animais.

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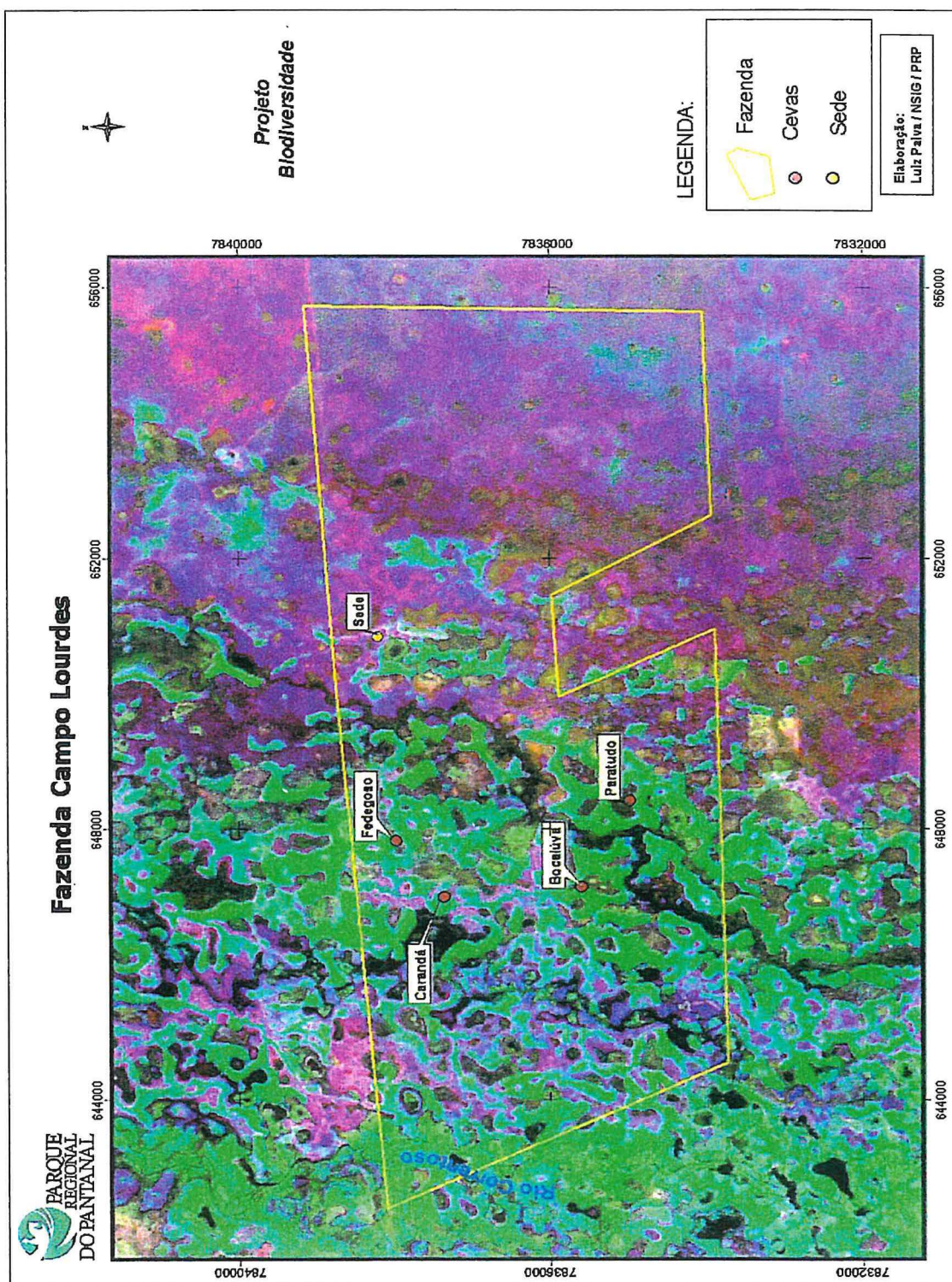
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Anexo 1. Mapa da fazenda Campo Lourdes, com a disposição das cevas.



Appendix 2: Report from CR3 in Fazenda Teimoso, Bahia

Ilhéus, 22 de novembro de 2004

RELATÓRIO ANUAL DO PROJETO INCO PECARI

WP6 : Studying the ecology of CP herds under quasi natural conditions

Autor: Gastón Andrés Fernandez Giné

1 Objetivos do relatório

Este relatório foi escrito com o objetivo de informar as atividades realizadas na Fazenda Teimoso, durante o período de 29/01 a 20/11 de 2004, e detalhar os avanços obtidos.

1.1 Objetivos gerais

Obter conhecimentos sobre a ecologia de populações naturais de caaitus (*Tayassu tajacu*) para o desenvolvimento de técnicas e viabilização de programas de manejo extensivo dos caaitus na Mata Atlântica.

1.2 Objetivos específicos

- Estudar qual é o melhor local (hábitat) e mês para a implantação de cevas e realização de capturas na Mata Atlântica;
- Conhecer a atratividade de diferentes alimentos para serem utilizados como iscas na captura de caaitus;
- Conhecer a comunidade de mamíferos que desfrutam dos mesmos recursos alimentares que os caaitus utilizam;
- Determinar a densidade de mamíferos terrestres no local de estudo utilizando transectos lineares.

2. Material e métodos

O presente trabalho foi realizado na “Fazenda Serra do Teimoso” durante o mês de janeiro a novembro de 2004, totalizando 786 horas de atividades no campo distribuídas da seguinte forma: reconhecimento da área (exploratórias), coleta de

dados geográficos, utilização de cevas, armadilhas de rastros, transectos lineares e tentativas de captura para colocação de rádio colar.

2.1 Área de Estudo

A “Fazenda Serra do Teimoso” está situada no Município de Jussari, região sul da Bahia (15° 15' 4,6" S; 39° 52' 3,51" W). Nesta região, encontram-se as maiores áreas de Mata Atlântica do nordeste, considerada pelos cientistas como um “hotspot”, e pela UNESCO como Patrimônio Natural Mundial e zona núcleo da Reserva da Biosfera da Mata Atlântica. A propriedade possui uma Unidade de Conservação (UC), reconhecida pelo IBAMA desde 1997, denominada “Reserva Natural da Serra do Teimoso”, categorizada como uma Reserva Particular do Patrimônio Natural (RPPN). Esta categoria é classificada pelo Sistema Nacional de Unidades de Conservação (SNUC, 2000) como sendo de uso indireto, ou seja, na área da reserva não é permitida a utilização dos recursos naturais existentes, sendo permitida apenas as pesquisas científicas, educação ambiental, ecoturismo e lazer.

A implementação e manejo da “Reserva Natural da Serra do Teimoso” tem sido utilizada como exemplo pelo Instituto de Estudos Sócio - Ambientais do Sul da Bahia (IESB), e pela Associação dos Proprietários de Reservas Particulares da Bahia (PRESERVA) para incentivar proprietários e ampliar o número de reservas e superfície protegida nesta região. A criação de RPPNs no sul da Bahia tem sido considerada uma forte aliada na estratégia de implementação do Corredor Central da Mata Atlântica (Ayres *et al.*, 1997), uma estratégia de conservação que tem por objetivo restabelecer e conservar a conectividade ecológica entre os fragmentos florestais localizados ao longo do litoral norte do Espírito Santo e sudeste da Bahia.

A extensão territorial total da “Fazenda Teimoso” é de 520 ha, sendo 200 ha de RPPN, e o restante de uso para a agricultura familiar, com zonas de cultivo de cacau, cana-de-açúcar, café, mandioca, feijão, milho e frutíferas. O cultivo agrícola está implantado nas áreas baixas da fazenda, enquanto que a RPPN e a Mata Atlântica, preservadas da base da serra até o topo, com altitudes de 250 a 850 m, respectivamente. O cultivo do cacau em sistema agroflorestal, denominado “cabruca”, margeiam os limites da mata e freqüentemente fazem parte da reserva, pois houve áreas em que a cultura foi abandonada devido à “crise do cacau” em 1995. Desta forma, estas áreas podem ser consideradas em regeneração e, ao

longo do tempo, passaram a ter um aspecto típico de “capoeira”, de vegetação cerrada, por onde a fauna encontra abrigo, alimento e facilidade de movimentação.

A vegetação na reserva pode ser caracterizada como transição entre Floresta Úmida Latifoliada, nos topos de morros, e Semi-decídual, na encosta até a base (Berbert, 2001) ou ainda, como transição entre Floresta Ombrófila Densa e Floresta Ombrófila Mista, respectivamente (Mesquita e Leopoldino, 2002). Devido a esta combinação de dois tipos de vegetação esta é uma área rica em endemismos, e de grande diversidade e importância ecológica (Thomas, 1999, citado por Berbert, 2001).

O município de Jussari é geomorfologicamente caracterizado em duas partes: depressão de Itabuna-Itapetinga e Serras e Maciços pré-litorâneos, sendo a “Fazenda Teimoso” localizada próxima a estas. Os solos na parte alta da reserva são do tipo Latossolo Vermelho – amarelo e na encosta ocorrem Litossolos não muito profundos, com afloramento de rochas gnáissicas. O clima da região varia de úmido a sub-úmido, com uma temperatura média anual de 23,5°C. Segundo dados obtidos no setor de climatologia do Comissão Executiva do Plano da Lavoura Cacaueira (CEPLAC/CEPEC/SERAM/CLIMATOLOGIA), a precipitação anual média entre os anos de 1981 e 2001 foi de 1211mm, sendo que em média nos meses de outubro a maio (meados da primavera até meados do outono) a precipitação mensal tem sido maior que 80mm, caracterizando o período chuvoso, e nos meses de junho a setembro (inverno e início da primavera) menor que 80mm, caracterizando um período mais seco, embora as chuvas sejam distribuídas durante todo o ano.

2.2 Reconhecimento da área e coleta de dados geográficos

Durante o estudo foram feitas exploratórias para o reconhecimento da área e coleta de dados geográficos, com auxílio de um aparelho GPS. Isto permitiu adquirir um banco de dados suficiente para a construção de um mapa cartográfico (anexo 1), utilizando o programa computacional ArcView 3.2, contendo o perímetro da propriedade, distribuição dos habitats, posição dos transectos, principais pontos de água, pontos de ceva, pontos onde se visualizaram caixas, e pontos onde ocorreram rastros desta espécie (tocas, pegadas, fezes, latrinas, banheiras, e pontos de alimentação). Também, através da ajuda do mapa foi possível posicionar os transectos lineares da maneira mais aleatória possível, porém fazendo com que estes cobrissem a maior diversidade possível de habitats, elementos hídricos, e de topografia, como recomendado por Cullen Jr. e Rudran (2003)

As exploratórias possibilitaram conhecer bem a área de estudo e propriedades vizinhas que fazem fronteiras com a fazenda, adquirir experiência na identificação de rastros e identificar alguns locais onde os animais se refrescaram (lameiro), sendo um deles bastante freqüentado.

Foram coletados dados de presença de filhotes, através das pegadas encontradas e observação direta dos bandos de caititus, e tamanho de grupo, através de observação direta. Adicionalmente foram registradas todas as espécies de mamíferos encontradas fora dos transectos, data, hora e locais (hábitat) de avistamento, tamanho de grupo e algumas observações de atividade.

2.3 Cevas e armadilhas de rastro

Os dados de consumo de alimentos “iscas” e identificação dos animais que as consumiram (animais visitantes) foram coletados através de 5 cevas, em diferentes localidades da propriedade (Anexo 1).

A ceva 1 localizava-se dentro de uma clareira utilizada para o cultivo de mandioca. As cevas 2 e 5 estavam localizadas embaixo de jaqueiras concentradas em áreas de “cabruca” as quais margeiam a Mata Semi-decidual. E as cevas 3 e 4 estavam localizadas dentro da Mata Semi-decidual, na encosta da serra, sendo que a ceva 3 estava abaixo de uma plataforma de observação de dossel (32 metros) e a ceva 4 próxima a um lameiro (banheira onde caititus freqüentam para se refrescar), locais onde não há presença de frutíferas exóticas como as jaqueiras.

Todas as cevas eram abastecidas semanalmente com jaca (5 a 10 Kg), milho em grão (1kg) e sal comum (0,3kg) e vistoriadas uma vez ao dia durante uma média de três dias seguidos. As cevas 1, 2 e 3 foram vistoriadas durante o período de 29/01 a 29/09/2004, a ceva 5 de 12/02 a 18/10/2004 e a cevas 4 de 06/03 a 18/11/2004.

Os alimentos foram colocados separadamente dentro de uma área de 20 m². Todas as cevas recebiam os três tipos de alimentos (jaca, milho e sal), exceto a ceva 4, que não recebeu jaca, devido à dificuldade de acesso.

As jacas eram coletadas em frutíferas da fazenda e colocadas maduras ao centro de armadilhas de rastro, com o objetivo de capturar rastros de pegada de animais que se aproximassem. Estas armadilhas consistiram na limpeza de uma superfície de 3m² através da remoção de folhas e outros resíduos; remoção de uma

Tabela 1 – Características dos transectos da RPPN da Serra do Teimoso, Jussari (BA).

Número do Transecto	Azimute (°)	Comprimento (m)	Habitats Predominantes
1	280	2100	Mata semidecidual e mata úmida
2	220	1260	Capoeira e cabruca
3	290	1400	Cabruca e mata semidecidual
4	200	1400	Mata semidecidual
5	230	380	Capoeira, cabruca e áreas cultivadas
6	260	700	Cabruca e áreas cultivadas
7	290	840	Capoeira e cabruca
Total		8080	

Tabela 2 – Comprimento e porcentagem dos habitats representado pelos transectos.

Tipo de habitat	Comprimento (m)	Porcentagem (%)
Mata úmida	600	8,2
Mata semidecidual	3440	46,6
Capoeira	1870	25,3
Cabruca	1350	18,3
Agricultura	120	1,6
Total	7380*	100

* o transecto 6 ainda não foi caracterizado

A preparação dos transectos lineares consistiu na abertura, limpeza e marcação das trilhas, e demandou em média um tempo de aproximadamente 13,5 horas por quilômetro preparado, quando executado por duas pessoas (tabela 3). Uma série de fatores influenciou na velocidade de preparação do transecto, como o tamanho da equipe, o tipo de habitat, formações rochosas, e a declividade predominante ao longo deste, explicando a grande variação dos dados de demanda de tempo por quilômetro preparado (8,57 a 19,5 h/km).

Após a preparação dos transectos esperou-se 15 dias para iniciar a coleta de dados, a qual aconteceu a partir do dia 07/06/2004, sendo que até o presente momento, foram percorridos neste local um total de 156 km.

O registro de dados para a estimativa de densidade está sendo feito por observadores que percorrem sozinhos e a pé os transectos a uma velocidade de 0,5 a 1 km / hora, e ao atingirem o final do transecto é esperado no mínimo uma hora para o regresso pelo mesmo. O banco de dados consiste do número do transecto percorrido, data, hora inicial e final, condições climáticas, identificação da espécie de mamífero observada, a distância perpendicular da trilha ao animal do primeiro avistamento, horário e posição da observação, tamanho de grupo, e observações adicionais, que estão relacionadas ao tipo de contagem (total ou parcial), proporção de sexo e estrutura etária do grupo, comportamento e atividade do(s) animal(is).

A estimativa da densidade será feita futuramente utilizando o programa 'DISTANCE sampling' (BUCKLAND *et al.* (1993) e LAAKE *et al.* (1994).

Para o estudo de rádio telemetria foi solicitado ao IBAMA a autorização para captura e liberação de 10 caititus em três áreas experimentais, entre elas a Fazenda Serra do Teimoso. Esta licença foi expedido apenas em 10 de julho de 2004, quando então foram iniciados os preparativos para captura e acompanhamento de animais nesta área. Para este fim, foi montada uma armadilha de metal (0,8 x 0,8 x 1,2 m) com porta guilhotina acionada por observador instalado em um posto de observação a 20 m de distância e a 3 m de altura do solo em um "jirau". Esta armadilha foi montada inicialmente na ceva 5, sendo utilizada jaca como atrativo. Após 30 dias no local foi movimentada para a ceva 2. Também foi testada a captura através de rede de *nylon* (malha de 2,5") armada acima da ceva 5.

3 Resultados e Discussão

3.1 Reconhecimento da área e coleta de dados geográficos

O resultado da coleta de dados geográficos pode ser visto no mapa em anexo (anexo 1). Foram coletados dados geográficos de 35 pontos diferentes e independentes de locais onde foram encontrados rastros de presença dos caititus.

3.2 Cevas e armadilhas de rastro

As cevas receberam quantidades variadas de visitas, totalizando 56 visitas. Aquelas que tiveram o maior número e frequência de visitas foram as cevas 2 e 5, as quais se diferenciavam por estarem instaladas embaixo de jaqueiras.

O tempo de resposta à ceva, caracterizado pelo tempo à primeira visita, variou bastante entre as cevas (1 a 12 dias). Destaca-se o fato, porém, de que os caititus na ceva 5 responderam rapidamente (<7dias), logo no primeiro fornecimento.

Comparando os resultados das cevas 1 e 3 com as cevas 2 e 5, percebemos que a frequência e o número de visitas feitas por animais foi maior nas cevas 2 e 5, e que a ceva 5 teve maior sucesso em atrair caititus. As cevas que tiveram maior frequência e número de visitas por caititus foram aquelas localizadas embaixo de árvores produtoras de jaca (jaqueiras). Vale ainda ressaltar que nas proximidades da ceva 5 existem várias jaqueiras. Neste local foi observada a ocorrência frequente de rastros de caititus, e também o consumo da produção residual de frutos por estes animais.

As armadilhas de rastro em solo arenoso das cevas 1, 2 e 3 não foram tão eficientes como aquela construída na ceva 5 em solo argiloso, as quais deixavam marcas de pegadas evidentes. Este fato, foi contornado com a adequação da metodologia ao tipo de solo utilizado e condições de trabalho.

Quanto à atratividade dos três tipos de alimento, observou-se através dos resultados, que a jaca foi o alimento mais eficiente em atrair os animais para a ceva, pois em 77% das visitas houve o consumo de jaca (Figura 1).

Figura 1 - Porcentagem de consumo dos alimentos "iscas" em relação as visitas em geral

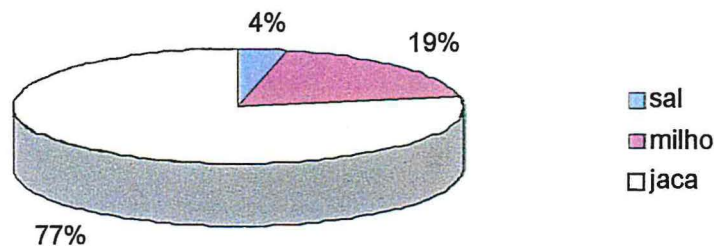
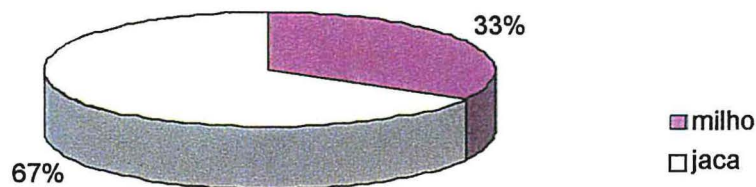


Figura 2- Porcentagem de consumo dos alimentos "iscas" em relação as visitas feitas por caititus



Em relação ao consumo dos alimentos por caititus, observou-se que na maioria das visitas esta espécie consumiu jaca e não houve consumo de sal (Figura 2). A jaca é um fruto bastante pesado (3 a 7 kg) que possui muitas sementes macias, e uma polpa suculenta e doce, altamente energética (4,2 kcal/kg) e bastante apreciada pelos animais, fato este determinado pelo consumo voluntário em cativeiro que foi em torno de 3% do peso vivo em matéria seca. Além disso, é uma fruta que possui um odor característico que se espalha facilmente pelo ambiente quando se encontra madura. As jaqueiras disponibilizam grandes quantidades de frutos e energia no ambiente, pois produzem muitos frutos por árvore, durante quase o ano inteiro (relato do moradores locais), dados sobre a fenologia desta e de outras espécies frutíferas na região estão sendo obtidos no WP5 deste projeto de pesquisa. Assim, não é surpreendente que tenha sido este o alimento de maior atratividade nas cevas, pois apesar de ser uma fruta exótica ao ambiente de Mata Atlântica, foi

introduzida na região há mais de 100 anos e os animais consomem grandes quantidades destas nas áreas de “cabruca”, sendo que foi observado um consumo total de 60 frutos inteiros por caititus, somente na ceva 5, o que equivale a um consumo médio de 300 kg deste fruto durante o período amostral apenas nas cevas.

O consumo de milho por caititus foi em média o de 20% do milho disponível, em torno de 200g em cada visita, nos primeiros três meses de coleta de dados. A partir da habituação dos animais a este alimento seu consumo foi crescente. Não é recomendado, contudo, o uso deste alimento como atrativo em áreas onde não seja feito o seu plantio, como é o caso da região em questão.

A inexistência do consumo de sal e atratividade deste alimento para os caititus leva a suspeitar que estes animais em vida livre possuem suas necessidades nutricionais de sódio supridas através dos alimentos, ou fontes minerais, que encontram na natureza. Na região foram encontrados diversos “barreiros ricos” locais de afloramento de sal mineral. Talvez esse tenha sido o motivo do sal não ter sido um atrativo eficiente no local.

3.3 Transectos lineares

Os dados obtidos através dos transectos lineares ainda são escassos, sendo possível apenas fazer uma relação das espécies de mamíferos já observadas neste estudo na Fazenda Teimoso (Tabela 2).

Tabela 2 – Espécies de mamíferos observadas neste estudo na Fazenda Teimoso.

Nome Comum	Nome Cientifico	Tipo de Observação
Primatas		
Guigó ou Sauá	Callicebus melanochir	direta
Titi monkey (inglês)		
Mico-leão-de-cara-dourada	Leontopithecus chrysomelas	direta
Golden faced liom tamarin (ing.)		
Mico-estrela	Callithrix kuhlii	direta
Wied's marmoset (ing.)		
Mamíferos Terrestres		
Tatu galinha	Dasypus novemcinctus	direta

Serelepe, caxinguelê	<i>Sciurus aestuans</i>	restos alimentares e
Tree squirrel		direta
Coati	<i>Nasua nasua</i>	direta e rastros
Coatimundi (ing.)		
Paca	<i>Agouti paca</i>	restos alimentares
Paca (ing.)		
Caititu, cateto	<i>Tayassu tajacu</i>	Direta, rastro, fezes,
Collared peccary (ing.)		sonorização e restos
		alimentares
Jaguarundi	<i>Herpailurus yaguaroundi</i>	foto de captura e
		observação direta
Graxaim, raposa	<i>Cerdocyon thous</i>	direta
Crab-eating fox (ing.)		

3.3 Rádio telemetria

Dentre os alimentos "iscas" utilizados, a jaca foi o mais consumido e o mais procurado em todas as visitas feitas pelas espécies de mamíferos em geral e também por caititus (*Tayassu tajacu*), evidenciando ser a "isca" mais atraente e por este motivo foi utilizada para a captura com intenção de colocação de rádio colar. No entanto, os animais mostraram-se arredios quanto à aproximação da armadilha, consumindo apenas o alimento encontrado ao redor da ceva e não o do interior da armadilha. Nesta, apenas animais de pequeno porte, com menos de 10 kg, entraram e a armadilha não foi acionada uma vez que não suportariam o peso do rádio-colar (500g).

Devido ao fracasso do uso da armadilha foi testado o uso da rede de *nylon* disposta acima da ceva 5 e também acionada por observador localizado nas proximidades da mesma. Esta prática mostrou resultado positivo que possibilitou a captura de uma fêmea com 16 kg de peso vivo, que foi solta imediatamente uma vez que também não suportaria o peso do rádio-colar. Novas tentativas estão sendo realizadas para dar início ao acompanhamento da movimentação destes animais nesta e nas demais áreas autorizadas pelo IBAMA.

4. Atividades previstas e executadas durante o ano de 2004

- foram iniciadas as coletas de campo em uma das áreas experimentais previstas na proposta do projeto, sendo abertos transectos lineares e testadas diversos tipos de iscas para capturas de indivíduos e grupos de caititus;
- as cevas foram monitoradas e os resultados possibilitaram a determinação da melhor isca para o local. No entanto, esta isca não se mostrou efetiva na captura de grupos ou mesmo indivíduos quando utilizada gaiola de metal, mas foi efetiva quando da utilização de rede suspensa sobre a ceva;
- estava prevista a construção de duas armadilhas do tipo curral, mas problemas operacionais (dificuldade de obtenção de caminhão para o transporte do material: mourões e telas de alambrado) impediram a montagem desta armadilha. Estes problemas foram contornado e o material já está no local sendo no momento transportado para sua montagem ao redor da ceva 5 e da ceva 2, locais de maior frequência de caititus no local;
- estava previsto o início do acompanhamento dos animais através do uso de rádio-telemetria, mas dificuldades na captura impossibilitaram o início da atividade até o momento. Este problema foi resolvido com modificações no método de captura e novo esforço de captura está previsto para o período entre dezembro de 2004 e janeiro 2005, tanto na área da Fenda Serra do Teimoso como em mais outras duas áreas.

5. Atividades previstas para o ano de 2005

- construção de duas armadilhas do tipo curral na Fazenda Serra do Teimoso e outras duas nas proximidades da Fazenda Caititus em Serra Grande para avaliar a efetividade deste método na captura de grupos de caititus. Na Fazenda Serra do Teimoso o material já está disponível e sendo iniciada a montagem do curral. Na Fazenda Caititu o material ainda será transportado e é prevista o início de sua montagem no mês de janeiro de 2005;

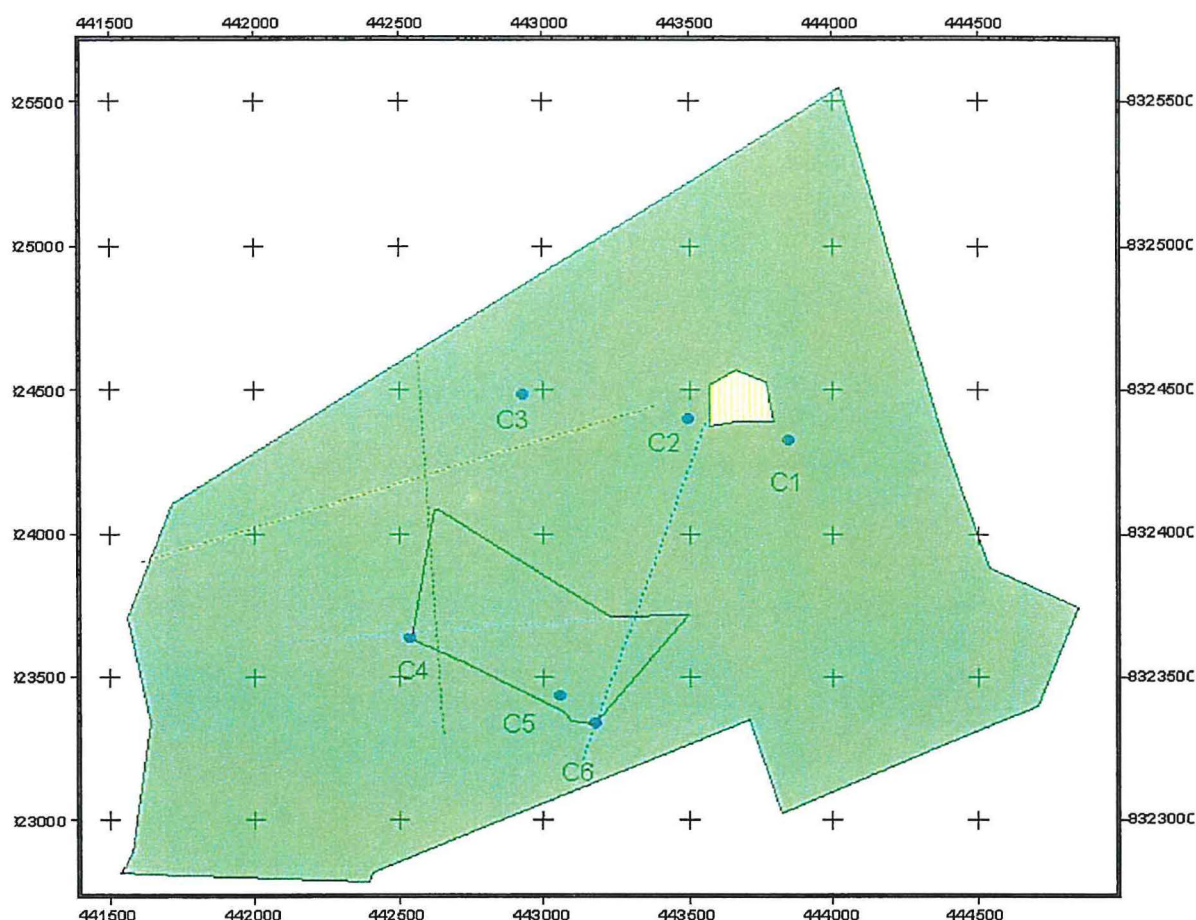
- espera-se que com a montagem das armadilhas currais seja possível a captura de um maior número de animais e, com isto, viabilizar, a seleção de animal com peso superior a 20 kg e que suporte o peso do rádio-collar. Paralelamente será dada continuidade à utilização da rede para captura de indivíduos.
- está sendo executado e será dada continuidade à um projeto de pesquisa para avaliar em cativeiro as alterações comportamentais de caititus monitorados com rádio-collar e propor modificações para reduzir os problemas já detectados. O principal problema é o de o animal prender um de seus membros anteriores no collar e com isto ficar imobilizado. Para evitar este problema está sendo utilizado uma coleira peitoral de cachorros que até o momento evitou este problema, confirmando dados de estudo anterior.
- em razão dos caititus no sul da Bahia provocarem sérios prejuízos agrícolas em cultivos de subsistência regional (mandioca) foi iniciado um estudo para verificar os métodos empregados pelos produtores rurais para o controle dos danos e está sendo testado o uso de cercas eletrificadas. Este estudo será conduzido paralelamente ao do atual projeto em razão do fato de que uma das áreas de coleta de dados (Fazenda Serra do Teimoso) teve sua população de caititus reduzida em razão do abate de animais promovido pelo proprietário vizinho que cultivava mandioca. O problema já foi sanado com a implantação de cerca elétrica ao redor da área de cultivo, o que levou ao proprietário a abandonar a prática de contratação de caçador profissional.

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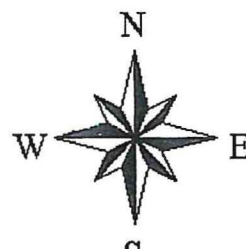
RPPN DA SERRA DO TEIMOSO



500 0 500 1000 Meters

escala = 1:20000

- transecto 1
- transecto 2
- transecto 3
- transecto 4
- cevas
- Sede
- limite da propriedade
- área de vida



Appendix 3: Report from CR8 in Fazenda Nhumirim



RELATÓRIO DE ATIVIDADES PROJETO INCO PECARY – Dez 2003 - 2004
SCIENTIFIC REPORT OF WORK PACKAGE 6
ATIVIDADES SOB RESPONSABILIDADE DA COLABORADORA EMBRAPA PANTANAL

Neste documento relatamos as atividades realizadas pela Embrapa Pantanal, no período entre Dezembro de 2003 e Novembro de 2004, como parte das informações a serem incluídas no relatório do WP6 – Experimenting innovative schemes of collared pecari harvest under quase-natural conditions, inserido no projeto “Development of different production systems for the sustainable exploitation of the collared peccary (Tayassu tajacu) in Latin America”

A atração de animais vem sendo realizada de maneira freqüente desde dezembro de 2003 na fazenda Nhumirim, em pontos que apresentaram indícios da presença do cateto. Apesar dos esforços que vimos empreendendo, até meados de maio, os animais só visitaram as cevas eventualmente. Após esse período as cevas se tornaram mais eficientes, provavelmente em consequência da seca observada na região. Realizamos em maio de 2004, uma reunião do projeto na Embrapa Pantanal, com a presença da Dra. Marie de Visscher e do Dr. Matieu Bougarel, a fim de delinear novas metas para os trabalhos sob a responsabilidade da embrapa. Nesta oportunidade ficou estabelecido que iríamos marcar animais com rádio brincos na fazenda Nhumirim (03) e que também se tentaria instalar colares convencionais em alguns animais. Estabelecemos, para tanto, três novos pontos de ceva e as atividades de campo foram intensificadas com a contratação de um bolsista. Atualmente estamos operando com 2 gaiolas móveis nas tentativas de captura (Figura 1) e um curral cercado com 25m² área foi construído. Além dos trabalhos de atração de animais para captura e



marcação, realizamos a limpeza de 2 trilhas de 4 km de comprimento, áreas que já vem sendo monitoradas com auxílio de estagiários do laboratório de fauna da EMBRAPA PANTANAL.



Figura 1 – Imagem de gaiola móvel construída para a captura do cateto. À esquerda o reservatório de água utilizado para a atração dos animais durante a seca.

Descrição de atividades realizadas

Capturas

Com o final das chuvas na região da fazenda Nhumirim nós reiniciamos as atividades de atração de *Tayassu tajacu*. Em 3 locais onde foram encontrados indícios da presença desses animais estabelecemos estações para o registro de seus rastros e pegadas. Em duas estações foram colocados reservatórios com água (Figura 1) e todas elas receberam diariamente pequenas quantidades de mandioca, totalizando um esforço de 22 cevas-dia (Figura 2). No dia 30 de setembro de 2004 uma nova ceva foi estabelecida na área de reserva da fazenda Nhumirim (ceva 4).

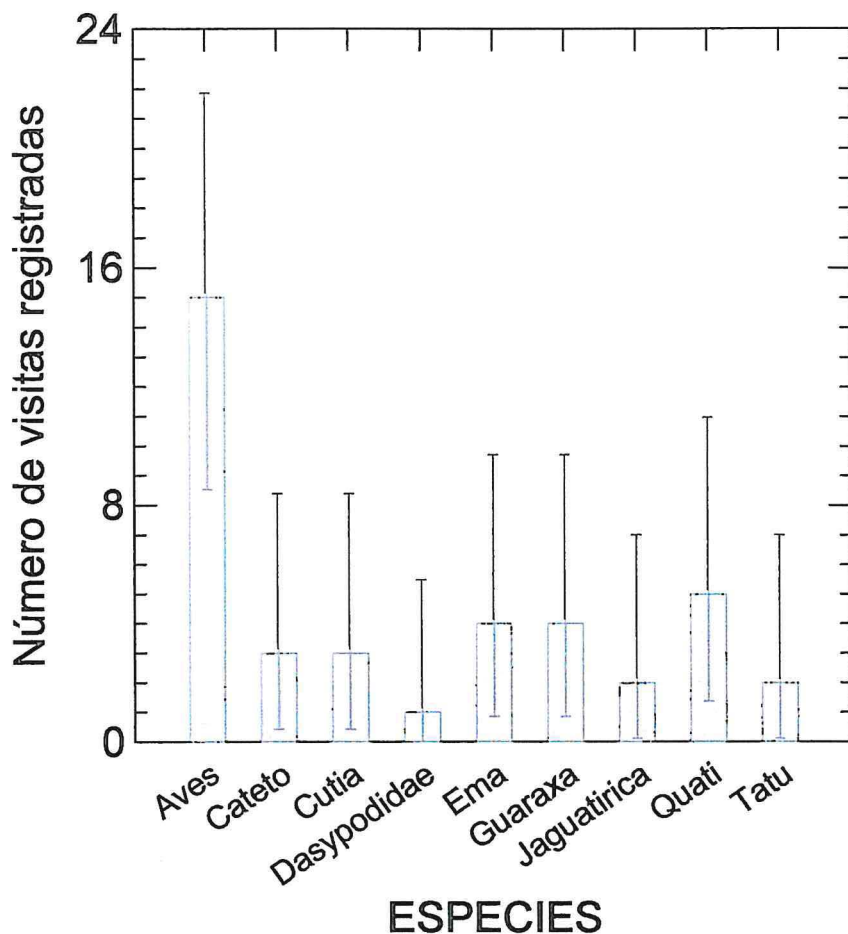


Figura 2 – Número de visitas por espécie observada. Esforço de 22 cevas/dia incluindo as cevas 1, 2 e 3, entre maio e agosto de 2004.

Os pontos para atração foram determinados pela presença de indícios dos catetos: pegadas, trilhas, fuçadas e camas, bem como fatores como o tipo de habitat, a disponibilidade de alimentos e água e, principalmente, a ausência de vestígios de porco monteiro e de queixadas. O solo teve que ser preparado diariamente para a impressão das pegadas (Figura 3).



Figura 3 – Foto das gaiolas móveis. À esquerda, a área preparada (limpeza e hidratação do solo) para a impressão de pegadas. À direita, um caititu comendo dentro da gaiola (após a captura de 2 animais neste mesmo local).

A iniciativa de investirmos em locais livres da presença de outros suiformes nos pareceu acertada, uma vez que a experiência de colegas que trabalham com catetos no Pantanal demonstra que esses animais podem se manter longe das cevas, se estas forem visitadas com frequência por queixadas ou pelo porco Monteiro. Este procedimento associado ao uso da água durante a seca nos permitiu enviar um trabalho para o “VI congresso internacional sobre manejo de fauna silvestre em la Amazonia y Latinoamérica: lecciones aprendidas”, relacionado à atração seletiva do cateto em detrimento à de outras espécies similares. O referido trabalho foi apresentado na manhã do dia 07/09/2004 no Symposium: Tapires y Pecaries, tendo como título: “Uso de água potável para a atração de catetos (*Tayassu tajacu*) na fazenda Nhumirim, Pantanal, Brasil” (anexo 1).



Devido ao grande número de baías com água distribuídas por toda fazenda Nhumirim, a frutificação em massa da palmeira *Acrocomia acutifolia* (bocaiúva) e a existência fontes de alimento disponíveis em toda região, o trabalho de ceva não pode ser considerado muito eficiente este ano. No entanto, a nossa expectativa de que a atratividade das cevas melhoraria à medida que a seca avançasse se confirmou. Julgávamos que os animais estariam procurando mais avidamente os locais de ceva ao final do mês de setembro, mas iniciamos as tentativas de captura ainda no mês de agosto. Desde o dia 26 de agosto de 2004 até o presente momento capturamos quatro animais nas cevas estabelecidas. Um resumo dessas capturas e a situação de cada animal são apresentados na Tabela 1.

Tabela 1 – Resumo da situação dos animais capturados no período.

Data Captura	Identificação (nome)	Sexo	Local captura	Localizações válidas	Situação Atual	Observações
26/08/2004	sheeleia	F	Ceva 2	1	Brinco perdido	Falha no fecho do rádio-brinco fez com que este caísse em menos de 24 h (Fêmea foi capturada juntamente com filhote).
28/08/2004	kamilo	M	Ceva 3	5	Brinco perdido	Brinco soltou-se próximo à toca do animal, numa região com muitos caraguatzeiros (Figura 4)
28/08/2004	aresta	F	Ceva 2	3	Desaparecida	Animal não localizado nos limites da fazenda, pode ter migrado para corixos à Noroeste da área de captura (12 km)
06/10/2004	bira	M	Ceva 4	5	Brinco perdido	Animal se livrou do brinco ao coçar-se em acuri (Figura 5)



Brinco encontrado

Figura 4 – Local de recuperação do brinco instalado no cateto kamilo.



Figura 5 – Local de recuperação do brinco instalado no cateto bira.



Considerações finais

Os resultados obtidos até o momento evidenciam algumas particularidades da espécie com relação à utilização de rádio-transmissores. As mortalidades observadas por nossa equipe e também pela equipe que trabalhou na fazenda Santa Maria em 2003 demonstraram que, com o uso de colares convencionais, pode ocorrer uma elevada mortalidade de animais marcados. A aquisição de rádio-brincos, que nos pareceu uma alternativa muito interessante inicialmente, já se mostra como uma prática que deve ser melhor avaliada, uma vez que os brincos instalados não têm permanecido junto aos animais por longo tempo. A captura e a lesão provocada pela instalação dos transmissores no ouvido dos animais representa um risco que deve ser considerado de forma parcimoniosa em nossa proposta.

Assim como foi observado na fazenda Nhumirim, caititus marcados na Fazenda Lurdes também se livraram dos brincos, o que corrobora nossa impressão sobre a eficiência questionável desta nova alternativa de marcação.

Considerando o atual cenário, acreditamos que a próxima tentativa de manter os transmissores nos animais deve ser feita com uso de coleiras e coletes fabricados à base de cabos-de-aço e revestidos com borracha. Esse material deverá estar pronto até as primeiras capturas que realizaremos em 2005.

Ubiratan Piovezan
Pesquisador II – Embrapa Pantanal



Anexo 1 – Resumo enviado ao VI congresso internacional sobre manejo de fauna silvestre em la Amazonia y Latinoamérica: lecciones aprendidas.

**Uso de água potável para a atração de catetos *Tayassu tajacu* na Fazenda Nhumirim,
Pantanal, Brasil.**

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Currais de alimentação são utilizados para atração de ungulados e amplamente empregados na captura de pecarídeos. Nas regiões onde espécies de suiformes ocorrem em simpatria os currais são pouco seletivos e espécies abundantes são mais prontamente atraídas. Duas espécies nativas de pecarídeos: *Tayassu tajacu* (cateto), *Tayassu pecari* (queixada) e uma espécie introduzida de Suídeo: *Sus scrofa* (porco monteiro) ocorrem no Pantanal brasileiro. O porco monteiro pode tornar-se "trap happy", afastando o cateto das armadilhas. Como alternativa, selecionamos locais isolados de fontes de água na fazenda Nhumirim (região da Nhecolândia), a fim de evitar a atração do porco e, também, locais afastados de grandes áreas florestadas, a fim de evitar a visitação por queixadas. Os locais escolhidos foram trilhas utilizadas pelo cateto durante a seca. Nesses pontos instalamos reservatórios plásticos com água (25 litros), nivelados à superfície do solo. Junto dos reservatórios colocamos gaiolas (1,5m x 0,8m x 0,6m) e dentro delas oferecemos pequenas quantidades de mandioca (*Manihot utilissima*). A estratégia baseou-se na hipótese de que os animais parariam na trilha por causa da água e, ao investigar as imediações, localizariam o alimento. O método mostrou-se eficiente para atração de catetos em detrimento à de outros suiformes. Os reservatórios de água foram utilizados por *T. tajacu*, inclusive para banhos. O processo descrito vem sendo aperfeiçoado e será utilizado em tentativas de captura durante a estação seca de 2004. Este trabalho tem apoio financeiro da Comunidade Européia, através do projeto Inco Pecari - CIRAD - Fr.

Appendix 4: Report from CR8 concerning WP6.4

Relatório das atividades do WP6 (Modelagem da dinâmica da população de *Tayassu tajacu* na porção sul do Pantanal mato-grossense).

José Carlos C. Santos

O objetivo do WP6 é a construção de um modelo computacional da dinâmica populacional do *Tayassu tajacu* na porção sul do Pantanal mato-grossense, mais precisamente na sub região da Nhecolândia e Rio Negro onde estão sendo coletados os dados de campo.

O modelo vem sendo desenvolvido com base em dados bibliográficos e informações pessoais dos pesquisadores que estão coletando os dados.

Treinamento

Durante o ano de 2004 inicio-se com o treinamento para manipulação da plataforma Cormas, realizado no Cirad FR. Durante o mês de agosto foi realizado um curso de UML pela Universidade federal de Minas Geras - BR. Com isso estamos trabalhando no aprendizado das línguas dos agente o Smalltalk e plataformas Cormas para programar os agentes., que suportar sistemas do mult-agente.

Progressos e dificuldades

O modelo vem sendo trabalhado durante este ano, no sentido de aprimoramento do técnico para o desenvolvimento de habilidades em sistemas mult-agente, que possam ser usadas na conclusão do mesmo. As dificuldades encontradas até o momento foram quanto à adaptação das informações bibliográficas às particularidades as quais estão submetidas às populações de *Tayassu tajacu* no Pantanal, o que pode distanciar o modelo da realidade, pois a paisagem a ser simulada é um mosaico complexo de habitat que incluem logos temporários e permanentes, campos que são sazonalmente inundados, "ilhas" de vegetação arbóreas com porte de floresta. Outra dificuldade é que ainda encontro dificuldade transformação das informações em modelo propriamente dito. A diagramação em UML continua a mesma de junho de 2004, ver o painel.

Podem ser observados no modelo as seqüentes características:

- Variação sazonal dos recursos alimentares, influenciados pela fenologia e clima.
- Períodos de restrição de território, causado por inundações.

Apresentação do trabalho em evento

O trabalho foi apresentado, em forma de painel (a seguir), no seminário da pós – graduação da Universidade Federal de Minas Gerais, no dia 4 de novembro de 2004 em Belo Horizonte –MG.

Para o ano de 2005

- Adicionar as informações de campo ao modelo, como por exemplo; densidade populacional, composição de bandos, utilização de habitat, comportamento sexual, época reprodução e habito de forrageio.
- Cursos pretendidos*:
 - Dinâmica Espaço Temporal de Populações: Uma Introdução À Heterogeneidade Espacial.
 - Modelagem Computacional Baseada em Agentes

* Os dois cursos serão oferecidos no programa de verão da Pós-Graduação do LNCC (Laboratório Nacional de Computação Científica), localizado em Petrópolis-RJ, no período de janeiro e fevereiro de 2005.

Conteúdo do Painei



Introdução

O objetivo deste trabalho é de desenvolver um modelo computacional, por intermédio do uso de técnicas de sistemas multiagentes, para simular a dinâmica populacional de Caititu/Cateto (*Tayassu tajacu*), no Pantanal Mato-Grossense.

O *T. tajacu* tem uma distribuição que vai desde o Texas (EUA) até o norte da Argentina. Pode ser encontrado em uma ampla variedade de habitat desde florestas tropicais úmidas até florestas de altitude. No Brasil, ocorre em todo o território nacional. Em regiões onde conservam grandes extensões com vegetação natural, como na Amazônia e no Pantanal, as densidades populacionais variam de 0,5 a 2 indivíduos por hectare.

No Pantanal, a fauna depende dos 30% de área com bosques para a manutenção de suas populações. Entretanto, estas áreas estão sendo modificadas por meio do desmatamento que é consequência direta da pressão do mercado para o aumento da produtividade da pecuária na região.

Sistemas multiagente têm sido usados para modelar fenômenos complexos, utilizando paisagem artificial composta por agentes. Tais agentes podem ser representados como entidades computacionais independentes, um objeto, capaz de receber e enviar mensagens e se

modificar dependendo do estímulo. Desse modo, é possível examinar as relações entre agentes, simulando a dinâmica da espécie-alvo em seu ambiente natural. O protótipo construído, por intermédio da plataforma CORMAS, é capaz de proporcionar a simulação das relações ecológicas de populações do Caititu e variáveis ambientais tais como: recursos alimentares, dinâmica de secas e cheias no Pantanal. Após ser aperfeiçoado, o modelo será capaz de proporcionar a simulação da dinâmica das populações selvagens de *Caititus* em uma paisagem artificial mais realista. Em consequência disso, ações de manejo e conservação do Caititu promoverão a ocupação efetiva dessas áreas naturais, protegendo-as do desmatamento, beneficiando assim outras espécies da fauna local.

Metodologia

Área de estudo

O trabalho será desenvolvido no Pantanal da Nhecolândia uma sub-região que representa 19,48% da área do Pantanal Mato-Grossense. O clima da sub região da Nhecolândia é tropical sub úmido Aw baseado em (Köppen) com estações chuvosas bem definidas. A precipitação anual pode oscilar entre 800 a 1400mm. A temperatura média mensal oscila entre 18° a 28° C, sendo 26° C a média anual. A vegetação do Pantanal é um complexo mosaico com influência do Cerrado, Floresta Amazônica, Chaco e Floresta Meridional Atlântica. Na sub-região da Nhecolândia a fisionomia predominante é o Cerrado, com formações arbóreas nas áreas não inundáveis e campos nas áreas inundáveis.

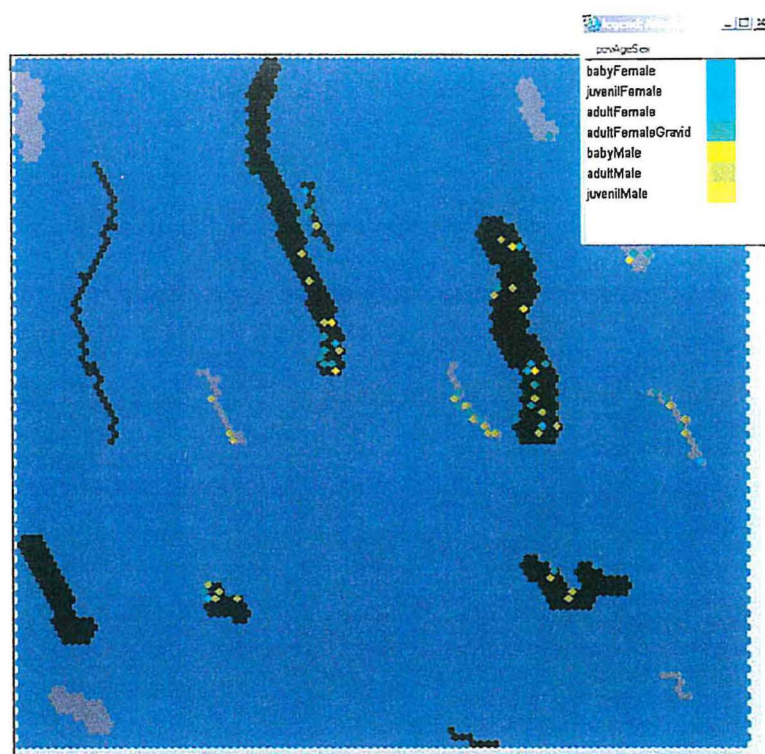


Figura 1 – Janela da plataforma Cormas da paisagem artificial em um período de cheia no Pantanal Mato-Grossense. As porções mais escuras da figura representam ilhas de vegetação e os pontos coloridos são indivíduos de *Tayassu tajacu*, em diferentes faixa etárias, conforme a legenda acima.

Coleta de dados no campo

Os dados de campo referente à biologia e ecologia do *T. tajacu* estão sendo coletados desde 2002, pela equipe do projeto "Development of different production systems for the sustainable exploitation of the collared peccary (*Tayassu tajacu*) in Latin America" no Pantanal da Nhecolândia. Esses dados alimentarão o programa com a finalidade de simular a história de vida, assim como, a dinâmica da população.

As atividades de campo compreendem: reconhecimento da área (exploratórias), construção e monitoramento dos currais armadilha, captura e marcação dos indivíduos, transetos lineares, construção do mapa da vegetação e telemetria.

Modelo (Protótipo)

O modelo está sendo desenvolvido no software Cormas, com base na biologia e ecologia do *Tayassu tajacu*, sobre uma paisagem artificial de 1000 ha da planície pantaneira (Figura-1 e 2). Esta é uma simplificação da realidade, composta de células de um hectare, a qual recebe os seguintes atributos: recursos alimentares e altitude. O recurso alimentar

em cada célula é representado pela produção de frutos proveniente de um sub-conjunto de 14 espécies de árvores frutíferas utilizadas pela espécie de acordo com a fenologia (Tabela-1). As árvores estão distribuídas sobre as porções de terras mais elevadas com altitude entre 100 a 200cm.

Para o protótipo do modelo também está sendo considerada uma taxa de mortalidade diária m , a qual varia diretamente com a idade do indivíduo e inversamente com a disponibilidade de alimento. O modelo é uma série temporal que inclui as variações sazonais do Pantanal registradas nos últimos 100 anos, sendo 21% dos anos com pequenas cheias, 32% de cheias normais e 11% excepcionais, sendo 36% dos anos secos. O modelo está sendo estruturado usando a linguagem UML (Unified Modeling Language) e posteriormente escrito em Smalltalk, uma linguagem de programação usada na plataforma Cormas.

Desde a primeira versão o modelo está sendo preparado para receber informações atualizadas obtidas no campo, bem como da literatura.

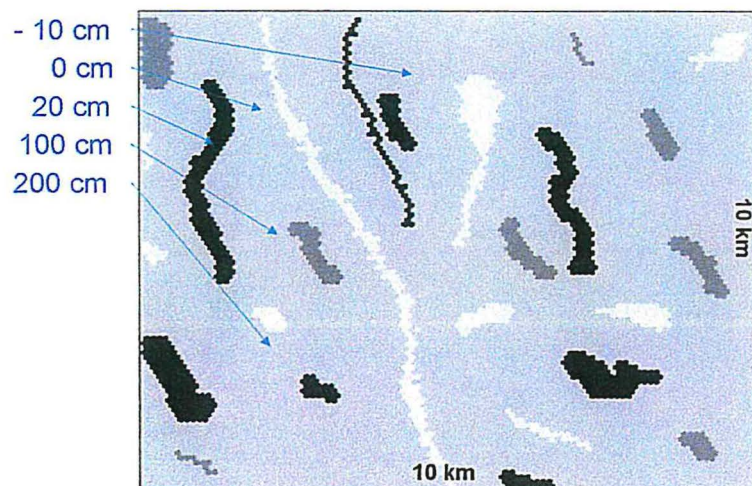


Figura 2 - Paisagem artificial simplificada de 10 x 10 km, compostas por células de 100m², representando diferentes altitudes Pantanal Mato-Grossense num cenário de 1000ha.

Tabela -1 Fenologia das espécies frutíferas utilizadas como recurso alimentar pelo *Tayassu tajacu* e implementadas no protótipo do modelo da dinâmica de população no Pantanal Mato-Grossense.

Tabela –1 Fenologia das espécies frutíferas utilizadas como recurso alimentar pelo *Tayassu tajacu* e implementadas no protótipo do modelo da dinâmica de população no Pantanal Mato-Grossense.

Frutíferas			Período "chuvoso"						Período "seco"					
Família	Nome científico	Nome Regional	out	nov	dez	jan	fev	mar	abr	mai	jun	jul	ago	set
Anacardiaceae	<i>Spondias lutea</i>	Cajá												
Apocynaceae	<i>Hancornia speciosa</i>	Mangaba												
Bromeliaceae	<i>Bromelia balansae</i>	Gravata												
Caryocarceae	<i>Caryocar brasilienses</i>	Pequi												
Cecropiaceae (Moraceae)	<i>Cecropia pachystachya</i>	Embaúba												
Hippocrateaceae	<i>Salacia elliptica</i>	Siputá												
Leguminosae (Caesolpinioidae)	<i>Hymenaea stigonocarpa</i>	Jatobá												
Leguminosae (Faboideae)	<i>Dipteryx alata</i>	Cumbaru												
Opiliaceae	<i>Agonandra brasiliensis</i>	Tinge cuia												
Palmae (Arecaceae)	<i>Copernicia alba</i>	Caranda												
Palmae (Arecaceae)	<i>Scheelea phalerata</i>	Acuri												
Palmae (Arecaceae)	<i>Acrocomia aculeata</i>	Bocaúva												
Rubiaceae	<i>Genipa americana</i>	Jenipapo												
Verbenaceae	<i>Vitex cynosa</i>	Tarumã												

Resultados Preliminares

O protótipo desenvolvido está representado na Figura-4 em forma de um diagrama UML, o qual mostra o conjunto de objetos, classes e associações que compõe o modelo. Esse diagrama ainda é uma versão simplificada das relações ecológicas sobre uma paisagem do Pantanal.

A construção do protótipo foi realizada em três etapas ou cenários:

- Primeiro foram considerados os elementos da tabela de vida do Caititu como, crescimento (aumenta com a idade), mortalidade (depende da idade e da fome), movimentação randômica e reprodução;
- Na segunda etapa, foi acrescido a anterior a capacidade de identificar áreas inundadas e as evitar;
- E por último, acrescentou-se a mortalidade dependente da obtenção de recurso alimentar (Figura -3).

As simulações das etapas na construção do protótipo resultaram em diferentes dinâmicas populacionais (Figura-5).

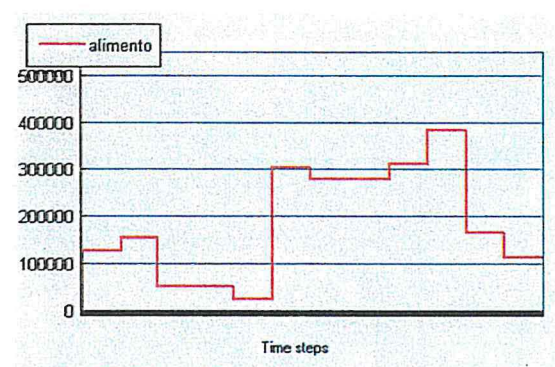


Figura – 3 Variação dos recursos alimentares, durante dez anos, produzido por 14 espécies arbóreas, em uma paisagem artificial gerada pelo Cormas.

Appendix 5: Draft of D6.1 (Report on effective trapping techniques for the capture and management of CP herds)

Delivery Report (DL 6.1.): Report on effective trapping techniques for the capture and management of CP herds

Introduction

The main goal of WP6 is to obtain a effective methods to exploit collared peccary herds living in semi free ranging conditions. The demonstration of effective methods to capture and manage CP herds are a preliminary and unavoidable step to reach that goal. In addition, efficient capture methods can have other applications: They allow to gain knowledge on the structure and composition of CP herds, and they also can be useful tools to obtain biological samples of the animals for health or genetic surveys . In this report, we present a survey on the available literature related to the capture of collared peccaries and other sympatric suiforms. In addition, we provide the results of two years of activity concerning the capture of collared peccaries and sympatric suiform species in the Pantanal of Mato Grosso do Sul and to a lesser extent in private properties in the South of Bahia.

1. Review of capture methods in peccaries

The capture of collared peccary herds is often required for studies on the ecology of natural populations, telemetry, management of the animals and health evaluations. The techniques we found in the literature are the following.

Physical capture

Among physical methods to capture animals, we can between distinguish passive and active methods. Passive methods are capture methods in which the animals are attracted to the capture point. Active methods are those methods where men is actively seeking or chasing the animals.

Passive

Among passive methods we can distinguish between those that make use of natural habits of the animals and those that are based on the attraction or baiting.

Snare Traps (Judas, 2001) can be classified in the first category. In that case, the trapping devices are located in natural areas regularly visited by the animals (natural paths, feeding or resting points). This technique has been used to capture ungulates in Europe and were tempted to capture collared peccary in French Guyana (Judas & Henry, 1999). Foot traps are placed in areas showing indicators of regular presence of the species. The number of captures was not proportional to the capture effort. Indeed, among 8594 trap /days, only 13 collared peccaries were captured through this technique within a period of 24months (one of them was a recaptured male)

Nevertheless, most passive methods of capture are based on the attraction (natural or artificial) towards the capture site. Several capture systems based on previous baiting are referred in the literature.

- Hide and wait

This method consists on waiting on a hidden platform in a tree, up to 10m away from a a baiting spot. Animals can be captured on site by darting them with an anaesthetic rifle. This method only allows to capture few animals at a time, and requires plenty of patience and time to await for the herd. Finding the darted animal after shooting can also be a possible difficulty, particularly in dense vegetation.

- Box traps

They have been used by several authors to capture both species of peccaries. Reported measures of the boxes are 1m long x 40 cm wide x 60 cm high (Margarido and Mangini, 2001). They need to be baited previously for some time. Several of those boxes might be placed in the same baited area leading to the capture of several individuals of the herd. Depending on the areas, some authors claimed high success in the capture of collared peccary with that method (Neal, 1959; Margarido and Mangini, 2001; Gabor et al., 1997). The capture systems has been also frequently used for the capture of feral pigs and wild boars (Gabor et al., 1997; Sweitzer et al., 1997; Vassant and Brandt,

1995). In the case of wild hogs, the success of this method is clearly biased towards the capture of young individuals (Jullien *et al.*, 1990). This traps have the advantage to be portable, so that they can be easily transported to different locations. They can be made of boards or wire mesh. They usually have a vertical sliding door on one end that is closed by means of a tripwire or trigger set off by the animal in the trap.

As suggested by Caley (1994) for feral pig, pre baiting for a certain period of time to accustom the animals to enter the trap is basic for this kind of capture to be successful.

- Corral traps or capture pens

This method is often mentioned in the literature as a successful system for the capture of several individuals within a herd of collared peccaries (Sowls, 1997; Neal, 1959). It has also been described as very successful for white lipped peccaries (Karesh *et al.* 1998, Margarido and Mangini, 2001), peccaries (Neal, 1959), feral pigs and wild hogs (Sweitzer *et al.*, 1997; Vassant and Brandt, 1995). It needs previous baiting with water or food. The pre-baiting process may take from one or two weeks to several months depending on the amount of alternative food resources available and whether or not pigs are subjected to anthropogenic pressure (Van Rensburg, 1993). Depending on the purpose of the capture, corral traps can be permanent or mobile (Nava & Cullen, 2004)

Active

Active methods in opposition to passive ones are based on active search and chase of the animals and on their location in their natural environment. They are methods that need the cooperation of several persons and domestic animals such as dogs or horses. They usually require an important organization of the staff operating in the field, and well trained animals.

Chasing with dogs

In this method peccaries are chased by dogs until the animals hide in a natural ground hole where they can be darted or physically restrained. This method is used by hunters in many areas in Latin America (Judas, 1999; Miserendino, 2000). It requires the use of trained dogs so that the animal is not bitten or overstressed when ambushed in a hole. Practically, this condition is very difficult to obtain, since dogs are usually trained for hunting and not for capturing the animals alive. In that sense, they will often ambush and bite the animals, with the subsequent important stress for the animals. Despite it can be efficient and has been described by some authors (Miserendino, 2000; Margarido and Mangini, 2001), it is not very recommended unless dogs are specifically trained to capture live animals (Taber *et al.*, 1994).

Lasso chasing

This method can be used in areas of extensive cattle ranching where local workers are used to manage and restraint free ranging animals on horse, with the use of a rope. Its is the case in the West of the USA but also in traditional cattle ranching areas such as the Pantanal or the Venezuelan Llanos.

Net trapping

This method has been tested in France providing excellent results for the capture of adult wild hogs (Jullien *et al.*, 1990). It was also tested by Judas(1999) in French Guyana but did not lead to successful results.

Handling live peccaries

Once captured in different ways, collared peccaries need to be handled in different ways in order to perform the necessary examinations, manipulations or sample collections. Restraint methods can be chemical or physical.

Chemical restraint

According to Sowls (1997), when immobilizing drugs are available, they are the safest and easiest way to handle live peccaries. Anaesthetic products used in collared peccaries in the literature are listed in the following table:

Produit	Dose	Référence	Results
Ketamine	10 mg/Kg	Judas and Henry, 1999 Gallagher et al., 1985	No comment High incidence of mortality and heat stress
Ketamine/Xilazine (2:1)	15mg/Kg	Ilse & Hellgren, 1995	Unsatisfactory (Hypertermia)
Sernylan	0,25-0,35mg/lb	Schweinsburg, 1970	No comment
Tiletamine/Zolazepam (Telazol)	4 mg/Kg 7,2 mg/Kg	Taber et al., 1994	Satisfactory
Tiletamine-Zolazepam /Xylazine	4,35±0,68 mg/Kg	Gabor et al., 1997	Safe immobilization
Tiletamine-Zolazepam /Xylazine	1.51 ± 0,29mg/Kg + 1.51 ± 0,29mg/Kg	Selmi et al., 2003	Not adequate for captive CP
Tiletamine-zolazepam	1.5 –5.0 mg/Kg	Margarido & Mangini, 2001 Fowler, 1993	Satisfactory

Physical restraint

Neal (1957) has described the use of a common hog snare to handle collared peccaries. A similar method was used by McCoy (1985) for handling collared peccaries in Costa Rica. Individuals were muzzled with ropes. In the case of corral traps, some authors recommend the use of portable chutes, that allows to recover and restraint the animals without physical restraint (Margarido and Mangini, 2001).

2. Materials and Methods

2.1. Study areas

The Brazilian Pantanal is a huge wetland encompassing 140.000 Km², which a huge diversity of landscapes which depend basically on soil, degree of flooding and the influence of the nearest biome (Mauro et al., 1997) such as Cerrado, Chaco, Amazon forest and Atlantic Forest. We performed experimental work in three different properties located in two ecological distinct areas of the Pantanal. Fazenda Berenice and Fazenda Nhumirim are located in the Nhecolandia Pantanal. This kind of Pantanal which is representative of 20% of the Brazilian Pantanal is mainly characterized by sandy soils. Vegetation is more similar from the typical cerrado vegetation and some plant families such as *Myrtaceae* or *Melastomataceae* are characteristic of that type of landscape. Flooded areas are invaded predominantly by graminean savannahs, and forest is predominant in more elevated areas.

Fazenda Berenice (3,000 ha) and Fazenda Nhumirim (3,800 ha) are typical properties of the Pantanal, only distant of 15km and belonging to the same kind of landscape. They don't have any alluvial soil and are not crossed by any river. Nevertheless, they encompass several bays or lagoons typical of the Nhecolandia, some of which contain salt water.

Fazenda Campo Lourdes

This area was a typical Pantanal cattle ranch, in the Rio Negro area encompassing 6500 ha. It is crossed by a small river, Rio Correntoso, an affluent of Rio Negro. Two thirds of the property were composed of natural vegetation of riparian forest. A large proportion of the property is covered by water during 5 months a year. Soil is mainly alluvial.

Bahia (Fazenda Teimoso)

This private property is located in the southern coast of Bahia state. It encompasses a surface of 520 ha, including 200 ha of very well protected Atlantic forest. The rest of the property is used for small scale agriculture, with cropping areas encompassing plantations of cocoa, sugar cane, coffee, manioc, beans and corn. Those are concentrated in the lower parts of the property, while the Atlantic forest remnants are located between 250 and 800 m height.

2.2. Feeding points and bait tests

As seen earlier, passive capture methods are based on attraction of the animals. This can be done using different methods.

In Fazenda Berenice

While choosing baiting areas, the potential of several baits to attract CP was evaluated by the number of times bait had been taken together with signs of presence of CP. Three corn dispensers (Game Feeder III, Link Audio, USA) allowing the distribution of corn daily at the same time, at 18-20 foot diameter circle, were installed in three baiting stations. Despite corn grain, other items such as manioc, corn cob, corn grain, salt, commercial swine food, salt and wild fruits (*Scheelea phalerata*) were offered as bait in order to identify favourite baits. This bait evaluation was qualitative and not quantitative. That means that a positive response was considered when the bait was taken by CP independently of the amount consumed and signs of presence of CP were present. Since September 2002, different kinds of bait have been tested in 4 FP by try and error: corn grain, corn cob, manioc, mineral salt, pig pellets or wild fruits

Bait evaluation was tested by signs of presence of CP (tracks) and sympatric species at every visit between September and December 2002.

Distance between feeding points was a maximum of 2,3 km and a minimum of 0,9 km (mean 1,4 km).

In Fazenda Nhumirim, animals were attracted in a different way. During the dry season, artificial water ponds were created with the use of plastic reservoir of 25 l., and bait (mainly manioc) was distributed in the traps. Water attracted the animals towards the baiting points. Manioc was distributed daily during 22 days, until they were obvious signs of regular visits of collared peccaries in the baiting sites.

In Fazenda Campo Lourdes

Since December 2003, they were baited once a week with one kg of corn grain, one Kg of common salt, and 1 kg of local fruits (mangos, palm fruits and oranges). During every control visit were recorded, the amount of bait that had been consumed, and the number of different species that had visited the trap, through the identification of animal tracks. The average distance between feeding points was 1.5 km and the four baiting sites were located in a perimeter of 7.2 km.

Fazenda Teimoso

Five feeding areas were established in different sites of the property. They were weekly furnished with 1-4 units of jaca fruits (*Artocarpus integrifolia*, L. Moraceae), one Kg of corn grain and 300 grs. of salt. CP readily took jaca fruits (77% of the time) and salt (33%). Consumption of corn grains could not be observed. The distance between feeding points was variable, averaging 0.8 km (range 0.3-1.5 Km).

2.3. Physical capture

Capture pens

In the Pantanal, three capture pens have been built around the most visited baiting stations (CP, WLP and FH). Wire mesh 1,8m high with a mesh size of 5 cm² and wire diameter of 2,5 mm (12 gauge) is disposed over resistant wooden boards and tight together with thick wire. So far, three of those capture pens have been built. They are equipped with a falling door that can be released manually or through a trigger. The trigger is made with wooden sticks tighten to a string that holds the trap door. It is elevated 30 cm from the ground so that only adult animals, who are always the last to enter the

pen, activate the trigger. The trap door can be removed and replaced with one-way entrance device, allowing the animals to trap themselves without any trigger or manual action of the sliding door. Approximate cost of every pen was 228 EURO (800 R\$).

Captures boxes

Those were used in Fazenda Nhumirim in September 2004. They were boxes of 1.5 m x 0.8 m x 0.6 m made of iron bars, with a falling door and a trigger.

Lasso chasing

Two persons were horse riding on the property during the beginning and the end of the day, particularly in areas where collared peccary sightings were common. Every riding operation for spotting peccaries had an average duration of 3 hours and involved two people. Therefore, every capture operation needed an average of 6 hour-men.

When a herd was observed, the animals were persecuted on horse until they were lassoed. A total of 30 lasso capture operations were organized between June and July 2003. One more animal was captured this way in Fazenda Nhumirim in October 2003.

2.4. Chemical and physical restraint

Within corral traps, animals were left in the pen as short as possible. The wire fences of the trap were wrapped with black plastic cover to create a physical barrier that prevented the animals to charge towards the fence. A portable chute and a holding pen were used to handle and separate the animals that were trapped in the capture pen. Once in the holding pen, animals were tagged in the ear and manipulations were performed as soon as possible.

When necessary, captured animals were chemically immobilized with Zoletil or with a combination of Zoletil and Xylazine.

3. Results

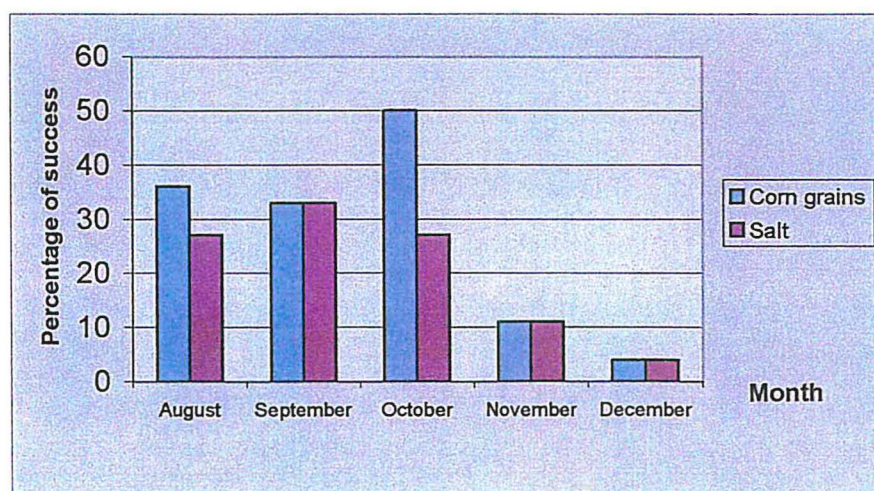
Baiting and attraction success in the Pantanal.

In Fazenda Berenice, 4 different kinds of bait were tested during 4 months in 2002. Among a total of 113 trials, baits that showed a better capacity of attraction were corn cobs (23%), salt (18%), corn grains (14%) and manioc (9.7%). None of the tested baits showed an outstanding success.

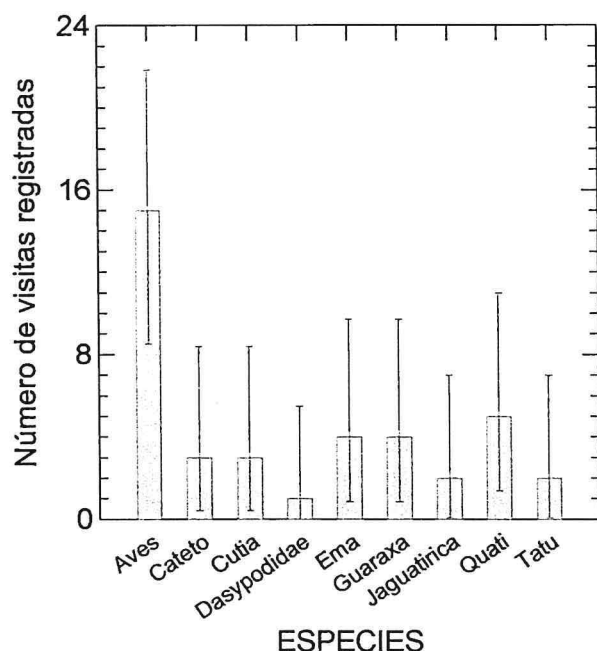
Concerning game feeders, those seemed to have some success in the process of habituation of peccaries and suiforms to capture pens. In three of the capture pens equipped with game feeders, one was frequented by collared peccaries and two were regularly visited by the same herd of feral pigs. In one of those sites CP tracks were initially found, but those disappeared with the irruption and colonization of feral pigs in the baiting site.

It is important to note that in December, bait consumption has considerably diminished compared to previous months.

Figure 1: Percentage of success of corn grain and salt during baiting months



In the baits disposed in Fazenda Nhumirim, the frequency of different species of animals could be compared after visiting the traps during 22 times. In that case, CP presence was not predominant. Birds were by far the most common species, followed by coati, rhea, crab eating fox and agouti.



Fazenda Campo Lourdes

Four baiting sites were monitored for the visits of different wildlife species present in the property. In terms of bait acceptance, corn salt and local fruits showed a very high consumption, and more than 90% of the offered bait was consumed at every visit. No difference of acceptance was noted among the different kinds of local fruits offered.

In terms of frequency of visits per species in every corral trap the distribution expressed in % was the following:

Name of baiting site	Collared peccary	White-lipped peccary	Feral pig	Birds	Others	No tracks
Fedegoso	96.36	21.81	0	76.36	0	1.81
Caranda	60.71	21.81	3.58	55.36	1.79	12.50
Bocaiuva	36.36	69.09	1.81	30.90	0	0
Paratudo	25.45	63.63	10.90	20.0	3.62	1.81

CP were very frequently visiting the baited traps together with WLP. Both species were visiting all traps simultaneously. A minor superposition with feral pigs was noted, although less than in other working areas. Different species of birds were frequently visiting the traps.

In Fazenda Teimoso (Bahia)

Among 25 control surveys, only one feeding point showed regular CP tracks, which could be observed after 7 days of leaving the bait. The most successful bait, when comparing jaca fruits, salt and corn, was by far jaca, which was taken on 77% of the cases. Corn was taken on 19% of the cases and salt had low success and was practically untouched (4%). Corn consumption increased during the study

Capture success

a) Fazenda Berenice

Basically, two methods were tested a sufficient number of times to be analysed: capture pens and lasso chasing on horse. Those can be summarized in the following table.

Capture of collared peccary in corral traps occurred between January and June 2003. One took place in January, three in April and two in May. Five out of 6 captures occurred in the same corral trap, frequently visited by collared peccaries and equipped with a corn feeder. Capture success with feral pigs was double during the same period of time and with the same effort, without considering recapture.

Corral traps

Among 216 night-traps, we could capture 6 collared peccaries et 10 feral pigs. Success with this system was 0,02 animals/trap night for collared peccaries and 0,035 individuals/trap-night for feral pigs. In feral pigs recapture success was high : 0.15 animals/ trap-night.

If we consider only the traps were tracks of CP were observed at least once, capture pour les pécaris success rises at 0,05 captured individuals/ trap-night.

Lasso chasing

Lasso capture was tested during the dry season of 2003 during 30 times. A total of 5 animals could be captured, which means a capture success of 0,16 CP/operation or 0,02 CP/person/exit.

Capture method	Capture effort	Animals captured	Capture success	
			Animals/men-time	Animals/attempt
Lasso	60 h-men	5 CP		0.16 animals/attempt
Corral trap	216 trap-night	6 CP	0.02 animals/men/attempt	0.035 animals /trap-night
Corral trap		10 FP	0.08 animals/h/men	0.02 animals/trap-night

Physical restraint within the traps

During the first year of capture attempts, mortality during the capture process and the physical restraint of the animals was important, reaching 45% of the animals captured. Mortality was higher in the case of lasso chasing than in the case of corral traps. As a general rule of thumb, time of manipulation and extenuation and stress of the animals must be reduced to a minimum in order to reduce mortality occurrence.

This is probably due to the abundance of wild fruit availability during this period, which will lasts until February or March 2003, and is supposedly the period when capture success should be the lowest.

Fazenda Nhumirim

Four animals were captured at the end of the dry season between August 26th and October 10th 2004 after 40 days of baiting the traps alternatively during since May 2004. Two of them were captured in the same trap at two days of interval while the two others were captured in different traps. Three out of four traps worked in different locations but only one individual was captured at a time.

<i>Date</i>	<i>Identification</i>	<i>Sex</i>	<i>Local</i>
26/08/2004	Sheyla	F	Trap 2
28/08/2004	Kamilo	M	Trap 3
28/08/2004	Aresta	F	Trap 2
06/10/2004	Bira	M	Trap 4

Fazenda Campo Lourdes

From April to June 2004 were captured a total of 64 animals, encompassed by 39 white lipped peccaries and 4 collared peccaries.

Among the four monitored capture pens, one was particularly successful in terms of capture, the one named Fedegoso, where an 95% of the captures took place. Only, 5% of the animals were captured in other pens. Among the animals captured, 72% were adults and 23% were young.

Species	April	May	June	July	August	September	October	November	December	Total
Collared peccary	0	2	0	0	0	0	2	0	0	4
White-lipped peccary	0	22	17							64
Total	0	24	17							

Fazenda Teimoso

Two kinds of capture were tested in Bahia: A corral trap and a drop net device. Both methods allowed the successful capture of two CP individuals.

Chemical restraint

According to the literature we started using a mixture of zoletil and xylazine since Gabor et al. (1997) had reported good results in both feral pigs and collared peccaries. Despite this combination proved successful to safely immobilize feral pigs, we did not find it to be as a safe option for CP. Indeed, despite time of onset for CP was similar, time of anaesthesia under the dosages recommended by Gabor et al.(1997) far too long in CP. Infact, this combination is not recommended to be used in captive CP in a recent publication in Brazil (Selmi et al., 2003).

Also, the reaction was highly variable depending on the individual, as shows the differences from reported animals in Table X. Indeed, the same dosage worked well in an animal (Individual 5), while it was lethal in another female with higher weight (Individual 6). Equally, when the dosage was doubled in another individual lighter in weight, time of anaesthesia was shorter (Individual 4).

Nº	Sex	weight (kg)	Total administered dosage	Dosage /Kg of lieving weight	Time of anesthesia
1	M	30	100 mg de Télazol + 40 mg Xylazine	3,3 mg Tiletamine/zolazepam + 1,3 de Xylazine	Died under anaesthesia
2	M	14	70 mg de Télazol + 30 mg Xylazine	5 mg de Tiletamine/zolazepam + 2 mg de Xylazine	8h
3	M	19	70 mg de Télazol + 30 mg Xylazine	3,6 mg Tiletamine/zolazepam + 1,6 de Xylazine	4h
4	F	13,5	80 mg de Telazol	6 mg de Tiletamine/zolazepam	2h
5	F	15	50 mg de Zoletil 50	3,3 mg deTiletamine/zolazepam	4h
6	F	19	50 mg de Telazol	3.3 mg de Tiletamine/zolazepam	Died under anaesthesia

Capture mortality

Despite using the same methods, mortality was much more important in the collared peccary than in other sympatric species such as feral pigs or white lipped peccaries.

Mortality rates during capture operations in Fazenda Berenice during 2003 was high, reaching 45% of the total of animals captured (3/5 of the animals lassoed et 2/6 the individuals captured in corral traps). Reasons were variable: traumatismos due to attempts to escape were the most common cause in the case of animals trapped in corral traps. In some cases, the lack of adequate logistic resources such as a car rendered capture operations difficult.

Nevertheless, collared peccary is a sensitive animal, very susceptible to stress independently of the method used. Therefore, all precautions to reduce mortalities are never enough (trap control at the coolest periods of the day, guarantee of all logistic support, immediate availability of the capture team when needed, availability of materials to guarantee safe restraint and stress reduction...

Despite all precaution taken, unexpected events can easily complicate capture operations.

In the case of animals captured by lasso, it is possible that this method discriminates towards weaker animals, that have most difficulty in running away. One of them presented several wounds and the other was very young. In addition, the capture method predisposes the animals to stress and extenuation, which are predisposing factors to capture related health complications.

Our experiences in chemical restraint did not led to very successful results. Different dosages of Telazol (Tiletamine/Zolazepam) and a combination or Telazol and Xylazine, as suggested by some authors in the literature (Gabor *et al.*, 1997), were experimented. In general the anesthetics use showed a time of recumbency from 3 to 5 minutes.

As seen in Table X, two animals out of six died under chemical restraint. On the other cases, time of recovery was far too long when using Telazol and the results were very variable depending on the individuals.

Discussion

The main goal of this work was to obtain a suitable method for the capture and management of free ranging CP herds in the Pantanal and in Bahia. Despite some good results in capture of wild pigs have been obtained, we have not been able to come across any method extremely efficient in the capture of that species.

Besides very good results in the capture of sympatric suiforms such as feral pigs and white lipped peccaries, corral traps did not show the same level of success with CP.

Margarido and Mangini (2001) already mentioned that corral traps worked better in the case of WLP than with CP. Nevertheless, according to the success of this method found in the literature (Neal, for the capture of CP, we would have expected more successful results.

Baiting

One point often disregarded is the logistic aspect. Trapping needs regular baiting and control of the traps and therefore regular presence in the field. If baiting spots are distant from base camps and food stocks, logistics can represent a serious challenge for the experience to succeed. Another point is the pre-baiting process. This one appears crucial for the success of corral and box traps. In the case of CP, the process of habituation is variable, ranging from less than 7 days in Bahia to several months in the Pantanal.

Our report shows that different kinds of baits have been used in the literature for the capture of CP and sympatric species. In our study, success was variable according to the areas. Variation in the rates of acceptability of different baits suggests that this one is variable depending on the interaction between peccaries and men. In that sense, water used as bait during the dry season is an interesting method of attraction to other baits. Indeed, if animals have been attracted to water, but did not take the bait, we can consider that attraction is definitely bad for the kind of bait tested.

In some cases, some baits that are successful in some areas are not in others. This is the case for instance of manioc, which seems to be very successful in areas were corn crops are predated.

Nevertheless, peccaries in the Pantanal did not take corn grain readily, since this item was probably new to them.

Equally, salt can be a good attractant in the Pantanal where mineral slats in the soil are scarce, while in Bahia, its capacity of attraction was almost nul. Wild fruit availability might be another factor influencing the attraction of animals for offered baits. According to Caley (1994), feral pig capture was much higher during the dry season in Australia when food availability was lower. This phenomenon has also been observed for wild hogs in France (Jullien *et al.*, 1991).

The choice of the baiting site might also play a role in baiting and capture success. In that sense, it is preferable to locate traps in areas with indicators that CP are using the area for feeding, bathing or resting.

Trapping

Lasso chasing, corral traps and box traps appear as successful methods for the capture of CP in the Pantanal. In the case, of traps both methods allow the capture of several individuals of the herd, specially considering that CP are territorial animals and that once they are used to feed the baits, they regularly come back to feed on baiting sites. Those methods appear as the most effective in opurcase, in order to promote the capture of several individuals of one herd and the management and monitoring of herd structure. One point that remains obscure is if the trapping pressure can have an effect on trapping success. Or in other words, does intensive capture deter the herd to enter the trap? This is definitely not the case with feral pigs, where several individuals of the same herd were regularly recaptured in Fazenda Berenice, including individuals of different age and sex. Nevertheless, our capture rates with CP were to low to take conclusions concerning recaptured animals.

In our study, trapping CP in the Pantanal appears less successful than capturing other sympatric species of suiforms such as feral pig and WLP. In Fazenda Campo Lourdes, capture success with the same traps and methods was twenty times higher for WLP than CP. Equally, capture success was two times higher for feral pigs than CP in Fazenda Berenice.

Two hypothesis:

- a) CP are more weary animals and therefore more difficult to trap,
- b) CP are chased by sympatric species which are larger in body and in herd size.
- c) CP are definitely less abundant than the other two species.

Concerning the restraint of the animals after capture, and due to the difficulties observed when restraining CP chemically, it was decided to limit the use of chemicals restraint to particularly aggressive animals and establish the method of physical restraint with ropes and a portable chute as a routine. Indeed, no obits were reported when handling the animals without chemical restraint. Therefore, we recommend physical restraint as the method of choice for Tayasuids.

On the other hand, we obtained very good results when using the combination Tiletamine/Zolazepam and Xylazine proposed by Gabor and colleagues (1997).

Sympatric species competition

Birds were regular visitors of baited traps as seen in figure X. This phenomenon was consistent in all trapping sites. In some cases, birds were able to consume substantial amounts of bait. In others, they would the trigger.

Competition of suiform species for baited traps was important. In the Pantanal of Nhecolandia, feral pig was a most common visitor in our traps and managed to colonize two out five traps.

In Campo Lourdes, feral pigs were far less common than white lipped peccaries. Those sere by far the species more frequently captured. They are able to share the same trap with CP.

Feral pigs and CP compete for food and resources.

- Feral pig seem more water dependant than CP, according to encounter rates between rainy and dry season.
- Attraction success of pigs with baits is much higher than with CP.
- As mentioned in the literature, CP capture might be also more difficult in periods of high fruit production.

Lessons learned and possible applications

Among different capture methods tested, lasso chasing, corral traps, box traps and drop nets, all proved useful for the capture of CP. The last three need pre-baiting periods that can be variable, but they all proved useful to capture several individuals of possibly the same herd or sounder.

In the case of CP, the different experiences of the INCO project suggest that once habituated to feed on the baits, and despite a certain capture pressure, the same herd can visit the trap repeatedly and therefore be captured. As it occurs in feral pigs, individuals are likely to get used to this kind of management, nevertheless the time needed for this habituation is probably longer than the project's remaining time..

Corral traps proved even more successful for the capture of feral pigs and white lipped peccaries.

Baiting combined with a trapping system appears as a possible option to capture and mark several individuals of the same herd or family. In terms of a possible exploitation scheme of wildlife in the Pantanal, this method can be interesting for studying suiforms. Nevertheless, logistics and field investment need to be seriously considered, since capture of wild suiforms is extremely time consuming.

The fact that the same method allows the capture of different species is an interesting point that needs to be considered in terms of exploitation. Indeed, with the same effort, three species can be equally monitored and potentially exploited.

The fact of capturing biasing the capture towards one species or the other probably depends on the location of the trap and the densities of different species in the study area.

Conclusions

Corral traps can be used for the recurrent capture of collared peccaries and other suiforms in the Pantanal.

Capture success was higher for sympatric species of collared peccaries such as the white lipped peccary or the feral pig than for the targeted species.

A process of habituation is necessary. The use of food dispensers and natural feeding points facilitates habituation process.

A high rate of humidity limits the viability of game feeders as food dispensers.

Attractants can vary from place to place depending on the resources available and the kind of relation between men and wildlife.

Once captured, the amount of time the animals remain in the pen should be as short as possible. Hotter periods of the day should be avoided. animals must stay a limited

Corral pens are effective for sympatric species such as feral pigs and white lipped peccaries.

Feral pigs can colonize the pen.

Both species of peccaries can share the same pen.

We do not know if traps are always used by the same herd or can be used by different herds.

Corral pens are a successful method for capturing and management CP herds.

They can be also useful for other species, specially feral pigs and white lipped peccaries.

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Appendix 6: Communication presented to the 6th International congress on
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El manejo colectivo de grandes grupos de pécarí de collar (*Tayassu tajacu*) nacidos en cautividad. Un paso hacia el "ranching"?

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Resumen: La cría extensiva o "ranching" de pécaris se define como la posibilidad de criar esta especie en grandes superficies, aumento su productividad de forma a explotar sus poblaciones de forma sostenible. Esta posibilidad es atractiva ya que teóricamente, permite reducir los costes de alimentación e infraestructura los cuales representan una parte muy importante de los costes de producción de esta especie. En el caso del pécarí labiado (Tayassu pecarí), existen en Brasil algunos ejemplos documentados de ranchos o propiedades privadas en las cuales varios centenares de individuos son manejados con finalidad productiva. No obstante, en el caso del pécarí de collar (Tayassu tajacu), no existe información publicada sobre el manejo colectivo de grupos importantes de individuos en espacios abiertos. A pesar de esto, los grupos familiares de pécarí de collar en cautividad, con una alimentación adecuada, desarrollan un crecimiento exacerbado de sus poblaciones hasta llegar a densidades muy elevadas. Este comportamiento demográfico, puede permitir el manejo de grandes grupos de pécarí de collar con finalidad productiva. Este hecho se ilustra con el caso de un rancho en Irecé, Estado de Bahia que alberga una población de 450 individuos en una área de 5 ha. Estos animales son manejados de forma colectiva para la producción plantel reproductivo para otros zocriaderos. Este ejemplo ilustra que es técnicamente viable manejar colectivamente grandes manadas de pécarí de collar en condiciones semi-extensivas y abre la posibilidad de experimentar este modelo para el desarrollo de sistemas mas extensivos de producción de esta especie en otros ecosistemas de América Latina, a partir de animales criados en cautividad.

El "ranching" o manejo extensivo de fauna se refiere al mantenimiento y reproducción de poblaciones silvestres en grandes áreas delimitadas por cercas, en las cuales los animales son manejados en su entorno natural. En muchos casos, se implementan modificaciones del hábitat (puntos de agua y de alimentación) para mejorar la eficacia de producción de la especie. Los animales son propiedad privada del criador, a partir del momento donde nacen y viven en su área de producción. El plantel inicial puede proceder de animales nacidos en libertad o en cautiverio. En Sudáfrica, esta actividad es una autentica industria con mas de 13000 ranchos de fauna, que constituyen casi 14% del territorio nacional, y albergan 2,5 veces mas fauna que las áreas protegidas (Chardonnet et al., 2003).

En el caso de América latina se han descrito actividades de "ranching" en Los Llanos de Venezuela con caimán de anteojos (*Caiman crocodylus*) y capibaras (*Hydrochaeris*

ANNEXE 7 - STUDY ON ECONOMIC VIABILITY OF CF FARMING IN BAHIA

ANEXE 7

A CRIAÇÃO DE CAITITUS (*Tayassu tajacu*) COMO ALTERNATIVA DE DIVERSIFICAÇÃO DE PRODUÇÃO E RENDA NA REGIÃO CACAUEIRA DA BAHIA, BRASIL *

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RESUMO

Para a implantação de uma atividade econômica é necessária uma avaliação econômica e financeira que apontem as oportunidades e os riscos inerentes ao projeto. Por este motivo, os objetivos deste estudo foram os de verificar os indicadores de rentabilidade dos investimentos para um projeto de criação comercial de caititus (*Tayassu tajacu*) na região cacaueira do sul da Bahia. Para esta análise foram determinados índices econômicos para a criação de 30 matrizes e oito reprodutores de caititus, em sistema semi-intensivo de produção, sob dois cenários econômicos. A aquisição de reprodutores (34%) e a construção das instalações (47%) foram os principais custos para a implantação da atividade. A alimentação representou 80% dos custos variáveis. A pequena necessidade de mão-de-obra, 18% dos custos variáveis, demonstrou ser esta uma das principais vantagens da criação destes animais. No que se refere ao índice de relação benefício custo, os resultados obtidos mostraram que para cada R\$ 1,00 de custo, esta atividade tem capacidade de fornecer um retorno de R\$1,15 a R\$ 1,26, dependendo do cenário adotado. A partir da implantação da atividade são necessários três anos para os saldos dos fluxos de receitas e despesas tornarem-se positivos. Os resultados obtidos indicam que a criação comercial de caititus na região cacaueira da Bahia, pode se tornar uma alternativa de diversificação de produção e renda para os produtores rurais, desde que sejam observadas as condições mínimas necessárias à viabilização do empreendimento, como a utilização de fontes alternativas de alimentos, disponíveis na região e com preços mais acessíveis.

* Este estudo foi realizado com auxílio financeiro obtido junto ao CNPq (Processo No. 463967/2000-3) e Comissão Européia (Projeto INCO-Pecari).

ABSTRACT

In order to begin a new economical activity it is necessary an economical and financial evaluation that points the opportunities and the inherent risks to the project. For this reason, the objectives of this study were to verify the investments profitability indicators for a project of commercial captive breeding of collared peccaries in the south of Bahia, Brazil. For this analysis they were certain economical indexes for the captive breeding of 30 females and eight males, in semi-intensive system of production, under two economical scenarios. The acquisition of reproducers (34%) and the building of the facilities (47%) represent the principal expenses to the activity implantation. The feeding represented 80% of the variable costs. The human labor represents only 18% of the variable costs. The benefit cost index, obtained showed that for each R\$ 1,00 (USA\$0.30 *ca*) of cost, this activity has capacity to supply a return of R\$1,15 to R\$ 1,26 (USA\$0.38 – 0.42 *ca*), depending on the adopted scenario. Since the activity begin, they are necessary three years for the balances of the flows of revenues and expenses turn positive. These results indicate that the commercial captive breeding of collared peccaries in the south of Bahia could be an alternative of animal production.

1. INTRODUÇÃO

A região cacauera da Bahia experimenta nos últimos anos um processo de forte recessão econômica, a exemplo de outras regiões que desenvolveram sua base produtiva alicerçadas na monocultura. A frustração de safras decorrentes de fatores climáticos adversos, do ataque de pragas e doenças e a instabilidade dos preços promoveram o desestímulo entre os produtores, com reflexos negativos para a economia regional.

Tal processo teve como conseqüências o aumento do desemprego e o êxodo rural, o enfraquecimento do comércio, aumento da criminalidade, dentre outras. Segundo estimativas de TREVISAN e SILVA (1995) a região apresentava um contingente de mais de 120 mil trabalhadores desempregados.

Por outro lado, o produtor rural na busca de alternativas tem destruído áreas extensas de matas, vendendo a madeira e implantando pastagens para a exploração da pecuária e, mais recentemente, a cafeicultura, resultando em enormes prejuízos ao meio ambiente (OLIVEIRA, 1997). De acordo com dados da CEPLAC apud MASCARENHAS(1997) a área de cacau da Bahia incluindo o Norte do Espírito Santo, correspondia, em 1989, a 622 mil hectares, num total de 29.361 empresas rurais. Dados de 1992 apontam uma redução de 16,3% da área de matas e um aumento da área de pastagens (CEPLAC, 1992 apud MASCARENHAS, 1997).

A criação de animais silvestres em sistemas de cabruca e, ou capoeiras na região cacauera, pode ser uma importante alternativa econômica, já que existe o hábito de consumo da carne destes animais, não sendo necessária a criação de um mercado desse produto em nível regional (ARGOLO, 2002). Além disso, existe demanda para carnes exóticas em grandes centros urbanos como São Paulo, Belo Horizonte e Brasília (NOGUEIRA-FILHO e NOGUEIRA, 2000).

A utilização de espécies silvestres adaptadas às condições ambientais locais favorecerá a conservação das matas, uma vez que não há a necessidade de se modificar o ambiente como ocorre com o processo de produção de espécies domésticas e seria, portanto, uma alternativa de diversificação de produção que causaria menores danos ao meio ambiente em relação à bovinocultura, por exemplo (NOGUEIRA-FILHO e NOGUEIRA, 2000).

Outro aspecto a ser considerado é a escolha das espécies de animais silvestres que poderão ser exploradas economicamente. Estas devem apresentar características como adaptabilidade, rusticidade e potencial de produção. Dentre as várias espécies de animais silvestres que poderiam ser utilizadas em criatórios comerciais na região, destaca-se o caititu (*Tayassu tajacu*). O caititu é conhecido vulgarmente como porco do mato e é encontrado em uma grande variedade de habitats, que vai do semi-árido às florestas tropicais. A espécie constitui uma das principais fontes de proteína animal para as populações indígenas e colonos da região amazônica (REDFORD, 1997). Além da carne, produz couro de elevada demanda no mercado internacional. Esta espécie é encontrada na região e é considerada pelos produtores rurais como praga agrícola, por consumir mandioca e pupunha. Por este motivo e pelo valor de sua carne é perseguida. Como adapta-se facilmente às condições de cativeiro e por consumir alimentos produzidos regionalmente esta é, entre as espécies silvestres brasileiras, uma das mais indicadas para serem criadas na região cacauera no sul da Bahia. Existe uma grande variedade e quantidade de alimentos que são produzidos na região, e que podem ser utilizados na alimentação de caititus, uma vez que os mesmos já apresentam o hábito de consumir estes alimentos em condições naturais. O aproveitamento dos produtos e

subprodutos regionais pode reduzir significativamente as despesas de alimentação em criatórios destes animais silvestres, proporcionando maior rentabilidade nesta atividade.

A criação comercial é apresentada no presente estudo como uma estratégia de conservação da espécie, pelo aumento do estoque populacional, diminuição de pressão da caça e do tráfico e pela conservação das áreas de cabruca, capoeiras e outras formações vegetais da região. Neste contexto, os objetivos deste trabalho foram os de verificar a viabilidade de criatórios comerciais na região cacaujeira através de uma análise econômica e financeira da atividade. Isto porque, para a implantação de uma alternativa econômica para uma determinada região são necessários estudos econômicos detalhados que apontem as oportunidades e os riscos inerentes ao projeto, visando subsidiar produtores rurais na tomada de decisões e órgãos de fomento, como o Banco do Nordeste.

2. MATERIAL E MÉTODOS

Para a análise econômica e financeira foram considerados os gastos para a implantação de uma unidade de criação de caititus, em sistema semi-intensivo de produção, com 30 matrizes e oito reprodutores. Esta criação foi iniciada com oito matrizes e dois machos reprodutores e plantel foi estabilizado no decorrer do terceiro ano da atividade com 38 animais adultos (Tabela 1).

Tabela 1 - Evolução e Estabilização do plantel de caititus.

Categorias/Ano	ANO 0	ANO 1	ANO 2	ANO 3	ANO N
Reprodutores	2	4	8	8		8
Matrizes	8	16	30	30		30
Desmamados/Ano	16	32	61	61		61
Total de Animais	26	52	99	99		99
Compras	10	0	0	0		0
Vendas		6	10	61		61

A criação seria estabelecida em uma fazenda produtora de cacau, onde os animais seriam confinados em três piquetes de 1500 m² de área cada, construídos ao longo dos três anos iniciais de implantação da atividade. Para isso, a área de cacau seria cercada com cercas de tela alamedada com 1,50 de altura, fio número 12 e malha de 2,5 polegadas. Esta tela seria sustentada por mourões de madeira a cada três metros. Na base da cerca, seria construído um baldrame de concreto com 0,4 m de altura e 0,05 m de espessura e, para evitar fugas por baixo da cerca, que são muito comuns para esta espécie. Este baldrame também propicia proteção contra a entrada de eventuais predadores e aumenta a durabilidade da cerca de arame. Em cada piquete haveria um bebedouro automático do tipo concha, modelo utilizado na suinocultura. Para o manejo dos animais seriam necessários uma gaiola de transporte, puçás e rede de contenção com a finalidade de manejo dos animais. No que se refere à mão de obra, necessária para alimentação e manejo animal, foi estimado o tempo de uma hora por dia na atividade. Os custos unitário e total de cada item são apresentados nas Tabelas 2 e 3.

Tabela 2 - Discriminação dos materiais utilizados nas instalações do criatório de caititus.

Especificação	unidade	preço un.	quantidade	preço total
Tijolos	mil	70,00	17	1190,00
Cimento	sc	16,00	26	416,00
Areia	m3	22,50	9	202,50
Mão de Obra	d/h	30,00	20	600,00
Tela de alambrado	m	4,00	380	1520,00
Estacas	un.	3,00	190	570,00
Ceva	Un.	150,00	1	150,00
Abrigos	un.	100,00	3	300,00
TOTAL				4948,50

Tabela 3 - Discriminação das máquinas e equipamentos a serem utilizados no criatório comercial de caititus.

Especificação	Unidade	preço unit.	quantidade	preço total
Rede de Contenção	un.	100,00	1	100,00
Balança - 150 kg	un.	250,00	1	250,00
Puçá	un	50,00	1	50,00
Comedouros	un	20,00	3	60,00
Bebedouros	un,	30,00	3	90,00
Gaiola	un,	300,00	1	300,00
Picadeira/Moinho(3500rpm)	un,	443,00	1	310,00
Motor Elétrico Trifásico (2 Cv)	un,	310,00	1	310,00
Total				1470,00

A análise econômica e financeira de um sistema comercial simples de caititus foi realizada tendo em conta dois cenários econômicos:

CENÁRIO A:

1. Aquisição de reprodutores de criatórios comerciais regularizados junto ao IBAMA;
2. Pagamento de assistência técnica de profissionais;
3. Utilização de uma ração comercial formulada para suínos.

CENÁRIO B

1. Início de atividade a partir da captura de animais na região, em locais onde causem prejuízos agrícolas;
2. Assistência técnica de órgãos de extensão, como EMATER ou CEPLAC;
3. Redução dos custos de alimentação em 10% com a utilização, além da ração comercial de suínos, de alimentos não convencionais e disponíveis na região.

2.1. Análise dos Custos e Receitas

A seguir são apresentados os índices estimados neste estudo para realizar a análise econômica e financeira da criação comercial de caititus nos dois cenários apresentados.

Custo Fixo Total (CFT)

Compreende os itens que independem da quantidade produzida, tais como, terra, depreciação, seguros, impostos, juros sobre o capital empatado, mão de obra permanente e custo da terra.

Custo Fixo Médio (CFMe)

Representa exatamente a razão do custo fixo pela quantidade produzida(q).

$$CFMe = CFT / q$$

Custo Variável Total (CVT)

Compreende os itens que variam diretamente com a intensidade do sistema ou a quantidade de animais produzidos, inclui os gastos com mão de obra, manutenção de equipamentos, alimentação, medicamentos, assistência técnica, entre outros. No que se refere à alimentação, foi considerada a utilização de ração comercial de suínos contendo 13,5% de proteína bruta e 3800 cal/kg de alimento (Tabela 21 em anexo).

Custo Variável Médio (CVMe)

Representa exatamente a razão do custo variável pela quantidade produzida(q).

$$CVMe = CVT / q$$

Custo de Oportunidade (CO)

Representa quanto o empresário está deixando de receber ao investir seu capital na criação comercial de caititus comparando-o com outra opção de investimento como, por exemplo, no mercado financeiro, rendendo-lhe juros.

O valor médio entre o valor inicial e final do capital é considerado para determinar o seu custo de oportunidade, fornecendo uma aproximação do montante total que ficou empatado durante a vida útil do empreendimento.

$$CO = V_{ic} + V_{fc} \cdot r / 2$$

Em que V_{ic} = Valor inicial do capital
 V_{fc} = Valor final do capital
 r = Taxa de juros do mercado (%)

Depreciação Anual (Da)

É um custo não monetário que reflete a perda do valor do capital com a idade, uso e obsolescência, também conhecido como sendo os fundos necessários para amortização do capital empregado

$$Da = V_{ic} - V_{fc} / t \quad \text{onde } t = \text{tempo de vida útil dos equipamentos (anos)}$$

Custo Operacional Total (CopT)

É a medida do custo que engloba o custo variável e a depreciação do capital investido na atividade.

$$CopT = CVT + Da$$

Custo Total do Empreendimento (CT)

É o somatório do custo fixo total e do custo variável total.

$$CT = CFT + CVT$$

Custo total médio (CTme)

Representa exatamente a razão do custo total pela quantidade do produto. No presente estudo, refere-se ao custo total por animal produzido.

$$CTme = CT / q$$

Renda Bruta Total (RBT)

Representa os ganhos monetários gerados pelo sistema.

$$RBT = N \cdot P$$

Em que N = número de animais vendidos como reprodutores
 P = preço por unidade do produto

Renda Líquida Total (RLT)

É calculada pela diferença entre a renda bruta total e os custos totais do empreendimento.

$$RLT = RBT - CT$$

Índices de produção

Para o estabelecimento da capacidade de produção da criação comercial de caititus, foram considerados os índices zootécnicos médios obtidos no Departamento de Zootecnia da ESALQ-USP, apresentados em NOGUEIRA FILHO e LAVORENTI (1997). Os índices médios de produção considerados são apresentados na Tabela 4.

Tabela 4 - Índices produtivos médios para caititus criados em cativeiro

Índices Produtivos	Valores
Nº médio de filhotes desmamados/ninhada	1,65
No médio de ninhadas/matriz.ano	1,30
Taxa de mortalidade do desmame ao abate (%)	5
Peso de abate (kg)	20
Idade de abate (dias)	300
Idade média da 1ª parição (dias)	450

Fonte: modificado de NOGUEIRA FILHO e LAVORENTI (1997).

Análise de Investimento do Capital

Foram analisados os principais indicadores disponíveis para o processo de avaliação de projetos: Taxa Interna de Retorno (TIR), Tempo de Retorno do Capital (TRC), o Valor Presente Líquido (VPL) e a Relação Benefício Custo (RBC).

Taxa Interna de Retorno (TIR)

É a taxa de juros máxima que o investimento poderá suportar, sem se tornar inviável, ou a taxa de juros que iguala o valor presente líquido a zero.

$$0 = \sum_{i=1}^t \frac{B_i - C_i}{(1 + r)^i} \quad \text{Onde:}$$

B_i = valor nominal das receitas no período i , $i=1, 2, \dots, t$

C_i = valor nominal dos custos no período i , $i=1, 2, \dots, t$

r = taxa de desconto que reflete o custo de oportunidade do capital

t = tempo de duração do projeto

Tempo de Retorno do Capital (TRC)

Representa o período de tempo necessário para que os saldos anuais gerados pelo empreendimento paguem completamente o capital total investido na sua implantação, fornecendo uma informação importante da liquidez do investimento.

$$TRC = k, \text{ tal que } \sum_{i=0}^k \frac{F_i}{(1 + j)^i} \geq 0$$

$$\sum_{i=0}^k \frac{F_i}{(1 + j)^i} < 0$$

É aplicável, sem restrições, a projetos convencionais de investimentos quando $F_0 < 0$ e $F_i > 0$ onde $i = 1, \dots, t$, e F_i é o fluxo de caixa no ano i definido por $B_i - C_i$, que por sua vez significam os fluxos de benefícios e de custos do projeto.

Valor Presente Líquido (VPL)

É o somatório do fluxo de caixa descontado, ao longo do horizonte do investimento. O fator de desconto é a taxa real de juros, que representa os custos de oportunidade do capital. Um investimento é considerado viável quando seu valor líquido presente for positivo.

$$VPL = \sum_{i=1}^t \frac{(B_i - C_i)}{(1 + r)^i}$$

Relação Benefício Custo (RBC)

É o somatório do fluxo de caixa do projeto dividido pelo montante investido. Quanto maior for o RBC, melhor o projeto será considerado, pois esta relação mostra o retorno para cada unidade monetária investida no projeto.

$$RBC = \frac{\sum_{i=1}^t B_i (1 + r)^{-i}}{\sum_{i=1}^t C_i (1 + r)^{-i}}$$

O critério utilizado para condição de “viabilidade do projeto”, é uma RBC maior ou igual à unidade.

4. RESULTADOS E DISCUSSÃO

Para análise de resultados, a princípio foi efetuada uma análise descritiva dos investimentos e dos custos de produção para a implantação do sistema, baseados na evolução e estabilização do plantel de animais adquirido inicialmente (Tabela 5) que se efetivou a partir do segundo ano de implantação. Para esta análise não foi considerado o custo de aquisição da terra, partindo do pressuposto de que o empreendedor é detentor de alguma forma de propriedade da terra. Os investimentos necessários para implantação dos criatórios, nos dois cenários econômicos são apresentados na Tabela 6.

Na análise dos investimentos necessários à implantação dos criatórios comerciais, para os dois cenários, foram consideradas as mesmas máquinas e equipamentos, assim como a mesma área de construção, 4500 m², divididos em três piquetes de 1500 m² cada, cercados com tela alambrado e baldrame. Os itens que compõe os custos de construção e de equipamentos encontram-se discriminados nas Tabelas 2 e 3.

Tabela 5 - Investimentos necessários (R\$) para a implantação do criatório comercial de caititus em dois cenários de custos alternativos

Especificações	CENÁRIOS ECONÔMICOS					
	A			B		
Ano	0	1	2	0	1	2
Aquisição do plantel	2500,00	0,00	0,00	400,00	0,00	0,00
Instalações	1800,00	1600,00	1600,00	1800,00	1600,00	1600,00
Equipamentos	1603,00	0,00	0,00	1603,00	0,00	0,00
Assistência Técnica	1500,00	0,00	0,00	0,00	0,00	0,00
TOTAL	7403,00	1600,00	1600,00	3803,00	1600,00	1600,00

O custo para a implantação de criatório comercial no Cenário B seria de apenas 51% dos recursos de capital a ser investido no Cenário A (Tabela 5). O que ilustra o dispêndio relativo à compra de reprodutores e os serviços de assistência técnica particular.

O custo das instalações representa 24% dos recursos investidos no cenário A e aproximadamente 47% no cenário B. Essa estrutura de custo constitui, portanto, um importante item para a operacionalização do empreendimento, o que implica na necessidade de se utilizar materiais mais baratos e disponíveis localmente (como madeira) para viabilizar que os pequenos produtores possam investir na atividade, ou o direcionamento de créditos subsidiados para estimular a atividade, como previsto na Lei de Proteção à Fauna Silvestre.

A necessidade de capital a ser investido e os custos de produção em criatórios comerciais de caititu são menores do que os necessários para o estabelecimento de uma suinocultura intensiva ou semi-intensiva, principalmente no que se refere às instalações físicas e equipamentos, mesmo sem levar em consideração os custos ambientais desta atividade.

De acordo com DALLA COSTA *et al.* (1995), o custo do sistema de criação de suínos confinados no Brasil, pode alcançar valores de até US\$ 700 por matriz instalada. O que significaria um custo total de US\$14000,00, ou R\$42000,00 ao câmbio de US\$1,00 = R\$3,00, somente em instalações e equipamentos para o estabelecimento de um plantel de suínos com 20 matrizes como o plantel descrito para a criação de caititus no presente estudo.

LEITE *et al.* (2001) estimaram em 1997 o custo de produção do sistema intensivo de criação de suínos ao ar livre como sendo US\$ 490,20 por matriz instalada, sendo considerados neste estudo, custos de construção da fábrica e depósito de ração e equipamentos para elaboração das rações, excluindo-se o valor da terra. Os autores verificaram que o custo de alimentação, neste mesmo sistema representa 80,2% dos custos variáveis, o que realça o peso dos custos variáveis em relação aos custos fixos neste sistema de produção.

Para caititus criados em sistema semi-intensivo, os custos fixos e variáveis estabelecidos para os dois cenários são apresentados na Tabela 6.

Tabela 6 Demonstrativo da estrutura de custos para os dois cenários econômicos da criação comercial de caititus

Despesas (R\$.Ano ⁻¹)	A			B		
	Ano			Ano		
	1	2	3	1	2	3
Custos Fixos						
Custo de oportunidade (C.O.) da terra	27,00	27,00	27,00	27,00	27,00	27,00
C.O. do capital investido	444,18	96,00	96,00	228,18	96,00	96,00
C.O. dos animais em estoque	312,00	624,00	1188,00	312,00	624,00	1188,00
Depreciação de instalações	180,00	340,00	500,00	180,00	340,00	500,00
Depreciação dos equipamentos	160,30	160,30	160,30	160,30	160,30	160,30
SubTotal (1)	1123,48	1247,30	1971,30	907,48	1247,30	1971,30
Custos Variáveis						
Alimentação	1200,55	2401,10	4569,41	1080,50	2160,99	4112,47
Mão-de-obra	953,00	953,00	953,00	953,00	953,00	953,00
Medicamentos	6,75	13,50	24,30	6,75	13,50	24,30
Energia	74,84	114,00	151,84	74,84	114,00	151,84
Conservação de equipamentos	80,15	80,15	80,15	80,15	80,15	80,15
Despesas gerais	23,15	35,62	57,79	23,15	35,62	57,79
SubTotal (2)	2338,45	3597,37	5836,49	2217,19	3354,86	5374,98
TOTAL (1+2)	3461,93	4844,67	7807,79	3124,67	4602,16	7346,28

Os custos fixos foram constituídos pelos custos de oportunidade da terra, do capital investido e dos animais em estoque e pelas depreciações das instalações e equipamentos, apresentando valores próximos para os dois cenários (Tabela 6). Para a determinação do custo de oportunidade da terra, foi considerado o valor médio de aluguel da terra, cobrado na região cacauzeira.

Nos custos de oportunidade do capital investido e dos animais em estoque, foi utilizada a taxa de 6% ao ano, que representa a taxa de remuneração média apresentada no sistema de poupança nacional. A depreciação das instalações, das máquinas e dos equipamentos, foi calculada em um horizonte de 10 anos, que é a expectativa de vida útil desses tipos de bens capitais.

O custo de oportunidade do capital investido constitui-se no item mais importante na composição de custos fixos do Cenário A, contrariamente ao que ocorre com o Cenário B, (Tabela 6).

Os custos variáveis referem-se as despesas com as necessidades anuais de insumos diversos na produção de caititu, sendo seus componentes ilustrados graficamente nas Figuras 1 e 2.

Cenário A - Custos Variáveis

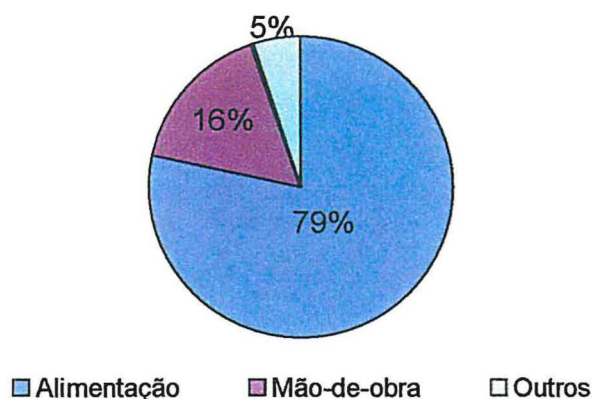


Figura 1 – Ilustração dos custos variáveis no cenário econômico A (utilização de ração comercial de suínos)

Cenário B - Custos Variáveis

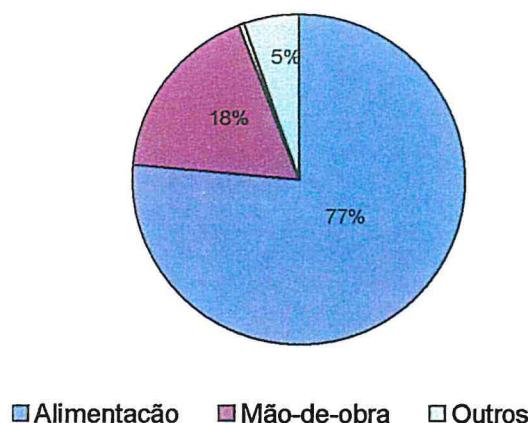


Figura 2 – Ilustração dos custos variáveis no cenário econômico B (utilização de alimentos alternativos além de ração comercial de suínos).

Os custos de alimentação foram os itens mais significativos na composição dos custos variáveis, correspondendo aproximadamente a 80% destes, para ambos os cenários analisados. Neste sentido, a utilização, em maior proporção do que a estimada neste estudo, de alimentos regionais mais baratos e disponíveis na propriedade, pode contribuir para a redução dos custos de produção dos criatórios. Alimentos como a banana, a mandioca, a jaca, pé de banana, a raspa de mandioca, o jenipapo, a casca de maracujá, dentre outros, poderiam ser utilizados com este propósito.

Para a estimativa dos custos de mão-de-obra foi considerado o tempo necessário para atender as necessidades de manutenção da criação, que se constitui basicamente no fornecimento de alimentos e a limpeza das instalações, comedouros e bebedouros, e algumas práticas de manejo como pesagens regulares do plantel, para acompanhamento do estado nutricional e sanitário do rebanho e para seleção do plantel para comercialização.

A necessidade de pouca mão-de-obra é uma das principais vantagens da criação de animais silvestres. Esta característica indica que não seria necessária a contratação de funcionários exclusivos para a atividade o que possibilitaria a utilização de mão-de-obra familiar ou de assalariados da propriedade.

Espécies de animais silvestres como o caititu, adaptam-se muito bem às condições ambientais da região e apresentam maior rusticidade em relação às espécies domésticas em geral, o que implica em menores custos com medicamentos (NOGUEIRA-FILHO & NOGUEIRA, 2000).

As estimativas de custos e de rentabilidade apresentadas na Tabela 7, tiveram como referência os valores estimados a partir do terceiro ano de exploração, quando se estabiliza o plantel. A partir deste ano os custos fixos para os dois cenários econômicos são os mesmos.

Tabela 7 Indicadores de rentabilidade da criação comercial de caititu em dois cenários econômicos diferentes

Parâmetros Econômicos	Cenários	
	A	B
Custo fixo total (R\$.ano ⁻¹)	1971,30	1971,30
Custo variável total (R\$.ano ⁻¹)	5836,49	5374,98
Custo total (R\$.ano ⁻¹)	7807,79	7346,28
Custo operacional total (R\$.ano ⁻¹)	6496,79	6035,28
Custo fixo médio (R\$.ano ⁻¹ .animal)	32,32	32,32
Custo variável médio (R\$.ano ⁻¹ . Animal)	95,68	88,14
Custo total médio (R\$.ano ⁻¹ . animal)	128,00	120,43
Custo Oper. médio (R\$.ano ⁻¹ . Animal)	106,50	98,94
Renda bruta total (R\$.ano ¹)	12200,00	12200,00
Renda bruta total por matriz alojada	406,66	406,66
Margem bruta total (R\$.ano ⁻¹)	6363,51	6825,02
Renda líquida operacional (R\$.ano ⁻¹)	5703,21	6164,72
Renda líquida total (R\$.ano ⁻¹)	4392,21	4853,72
Renda líquida total por matriz alojada	146,40	161,79
Índice de rentabilidade total (IRT)	1,56	1,66

O Cenário econômico A apresentou maior custo variável em função do maior dispêndio com a alimentação, o que determinou consequentemente, um maior custo total. Partindo da premissa de que em ambos os cenários iriam gerar produções iguais, o custo variável médio e o custo total médio são maiores no cenário A.

No presente estudo, a renda bruta total foi a mesma para as duas alternativas estabelecidas, sendo esta proveniente da venda de animais vivos a R\$10,00 por kg de peso vivo a intermediários que abatem e comercializam a carne de animais silvestres no Brasil, que chega ao consumidor ao redor de R\$38,00 por kg.

A carne é principalmente o couro de caititus podem se constituir em importante fonte de renda para os produtores rurais da região cacauzeira. O couro de pecaris é utilizado principalmente para a confecção de luvas, sapatos, cintos e correias de relógios, por apresentar como propriedades maciez e resistência, qualidades difíceis de serem encontradas em outros couros e que conferem ao couro de caititu uma demanda estável no mercado internacional

(BODMER e PEZZO, 1999). Países como Alemanha, Itália e Japão são os principais compradores.

Segundo BARBARÁN (1999), a Argentina exportou no período de 1980-1996, mais de 700 mil peles de caititu, representando uma importante fonte de divisas para aquele país.

De acordo com os dados apresentados por BODMER e ROBSON (1999), estima-se que 20 mil caititus são caçados, por ano, na região de Loreto, na Amazônia peruana, proporcionando uma renda anual de aproximadamente US\$ 270 mil dólares para o setor rural com a venda da carne, que neste país é cotada a US\$30,00 por animal adulto. De acordo com os autores a renda obtida da venda da pele em estado cru é de US\$ 4,00 a 7,00 e US\$ 45 em “wet blue” (fase inicial de industrialização do couro) a unidade. Os produtos confeccionados com o couro de pecaris são muito valorizados na Europa, sendo que um par de luvas, que utiliza menos de 0,25 m² por unidade, chega a ser comercializado por até US\$ 125 (NOGUEIRA-FILHO, 1999).

VALE et al. (1999), consideram que a análise de renda bruta total, isoladamente é pouco conclusiva, pois nem sempre as linhas de exploração que apresentam maiores rendas brutas, são as melhores do ponto de vista econômico. Torna-se necessário, portanto, comparar os custos associados, ou seja, o montante investido na produção.

A margem bruta total é o resultado do valor da produção obtida nos criatórios, menos os custos variáveis totais atribuídos ao processo de produção. Pelos valores obtidos da margem bruta total, nos dois cenários analisados têm-se a indicação de que o empreendimento estará compensando seus custos variáveis e gerando saldos positivos para a remuneração dos demais itens. Neste sentido, o cenário B apresentou uma margem bruta 7 % maior do que o cenário A (Tabela 7).

A renda líquida operacional é definida como sendo a diferença da renda bruta total e o custo operacional total e constitui a remuneração de parte dos fatores fixos da atividade. Observando a Tabela 7, verifica-se que a renda líquida operacional é positiva para os dois cenários econômicos considerados na análise.

A renda líquida total representa a diferença entre a renda bruta total e o custo total do sistema. No presente estudo, verificou-se que o cenário B apresentou uma rentabilidade superior em aproximadamente 10% em comparação ao cenário A, sendo que em ambos cenários a renda líquida mostrou-se positiva (Tabela 7).

O índice de rentabilidade também é um indicador da situação financeira dos criatórios. Com base neste índice pode-se verificar se o sistema estará em situação financeira lucrativa ou não. Pelos valores observados na Tabela 7, observa-se que a criação comercial de caititus no cenário B apresentou maior índice de rentabilidade (1,66) em relação ao estimado para o cenário A (1,56). Estes valores indicam o possível desempenho financeiro nas duas alternativas de produção comercial de caititus.

A Tabela 8 apresenta a análise de rentabilidade dos investimentos para os dois cenários, dentro de um horizonte de planejamento de 10 anos. Foram consideradas para esta análise duas taxas de desconto, de 6 e 12 %, valores assumidos como níveis médios para projetos agropecuários.

Ao aplicar a taxa de desconto de 6% no horizonte econômico de 10 anos, o Valor Presente Líquido (VPL) estimado para o cenário A foi de R\$2560,80, tendo apresentado uma Taxa Interna de Retorno (TIR) de 10 % e a Relação Benefício Custo (RBC) de 1,15. Nesta mesma taxa de desconto o cenário B apresentou VPL de R\$ 7067,84 com uma TIR de 19% e uma RBC de 1,26. Estes resultados evidenciam o nível de rentabilidade financeira para as duas

alternativas analisadas, indicando a viabilidade econômica de produção comercial de caititus na região cacaueira.

Tabela 8 Análise de rentabilidade dos investimentos em criatórios comerciais de caititu, em dois cenários econômicos

Fator de desconto	6%		12%	
Cenários Econômicos	A	B	A	B
Relação Benefício/Custo	1,15	1,26	1,06	1,18
Valor Presente Líquido (R\$)	2560,80	7067,84	-3682,12	238,92
Taxa Interna de Retorno (% a.a.)	10	19	4	13

Neste estudo, o retorno médio anual investido, representado pela TIR, remunera com folga quando aplicada a taxa de desconto de 6% como custo de oportunidade do capital, tendo alcançado maior retorno no cenário econômico B com 19%. No que se refere a RBC, os resultados indicam que para cada R\$ 1,00 de custo que o sistema absorve, ele tem capacidade de retornar como benefício, R\$1,15 no cenário A e R\$ 1,26 no cenário B.

Quando aplicada a taxa de desconto de 12% o cenário A apresentou VPL negativo. A TIR e a RBC, foram baixas, o que indica um baixo retorno para o empreendimento com este custo de capital. Nesta mesma taxa, o cenário B apresentou VPL de 238,92; com uma TIR de 13% e uma RBC de 1,18. De acordo com os resultados apresentados ao dobrar a taxa de desconto, verifica-se uma baixa rentabilidade econômica para o cenário B e a inviabilidade do empreendimento nas condições apresentadas do cenário A.

Efetuando-se a comparação entre os dois cenários econômicos, verifica-se uma melhor viabilidade para este investimento nas condições estabelecidas para o cenário econômico B, com baixo custo da aquisição de reprodutores, a assistência técnica de órgãos de extensão e com a redução dos custos de alimentação.

Tabela 9 Fluxos de receitas e despesas (R\$) dos criatórios comerciais de caititus no cenário econômico A (valores não atualizados).

Descrição	Ano 0	Ano 1	Ano 2	Ano 3	...	Ano 10
Investimento	7403,00					
Receitas (A)		1200,00	2000,00	12200,00		12200,00
Despesas (B)		5061,93	6444,67	7807,79		7807,79
Saldo (A-B)	-7403,00	-3861,93	-4444,67	4392,21		4392,21

Tabela 10 Fluxos de receitas e despesas (R\$) dos criatórios comerciais de caititus no cenário econômico B (valores não atualizados).

Descrição	Ano 0	Ano 1	Ano 2	Ano 3	...	Ano 10
Investimento	3803,00					
Receitas (A)		1200,00	2000,00	12200,00		12200,00
Despesas (B)		4724,67	6202,16	7631,49		7631,49
Saldo (A-B)		-3524,67	-4202,16	4568,51		4568,51

Os saldos dos fluxos de receitas e despesas para os dois cenários econômicos tornaram-se positivos a partir do terceiro ano de implantação da atividade (Tabelas 9 e 10). Estes dados são importantes no que se refere a expectativa de retorno do capital investido, servindo como referência para avaliar prazos de financiamento, principalmente no que se refere a períodos de carência para a amortização de empréstimos.

5. CONCLUSÕES

Os resultados apresentados indicaram que a criação comercial de caititus na região cacauera da Bahia, pode se tornar uma alternativa de diversificação de produção e renda para os produtores rurais, desde que sejam observadas as condições mínimas necessárias à viabilização do empreendimento, como assistência técnica por órgãos de extensão oficiais. Diversos fatores contribuem para o sucesso ou o fracasso da atividade. A aquisição de reprodutores e a construção das instalações foram os principais custos para a implantação da atividade. No que se refere aos custos variáveis, a alimentação foi o item mais importante na composição destes, o que demonstra a necessidade de se buscar fontes alternativas de alimentos, disponíveis na região e com preços mais acessíveis.

A viabilização dos criatórios comerciais de caititus, pode contribuir de forma decisiva na conservação ambiental, principalmente os remanescentes da mata atlântica e de áreas de cacau cabruca nas propriedades rurais da região, uma vez que provoca menores danos ao ambiente que outras alternativas de projetos agropecuários, uma vez que não requer o desmatamento destas áreas como aconteceria para implantação de pastos para a implementação de bovinocultura, por exemplo. Adicionalmente, a criação comercial pode ser considerada como uma estratégia de conservação da espécie, ameaçada pela caça comercial ilegal e pela destruição de seu hábitat.

Infelizmente, a burocracia da legislação vigente tem desestimulado inúmeros produtores para a criação de animais silvestres, sendo necessário o estabelecimento de políticas governamentais que favoreçam e estimulem esta atividade como previsto na própria legislação de proteção (Lei de Proteção à Fauna Silvestre). A implantação de matadouros-frigoríficos especializados ou adaptados ao abate de animais silvestres, o estabelecimento de curtumes e fábricas de artefatos de couro, o estímulo às exportações, a redução de impostos, bem como os incentivos à criação de Associações e Cooperativas de Criadores são alguns exemplos das ações necessárias para o desenvolvimento da atividade.

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ANNEXE 8 – PROJECT DATA SHEET 2004

ANNEXE 8

Contract number : IC.-CT- 2001-10045

Year : 2004

Data sheet

for annual report

(to be completed by the co-ordinator at 12-monthly intervals from start of contract. Figures to be up-dated cumulatively throughout project lifetime)

1. Dissemination activities

Totals (cumulative)

Number of communications in conferences (published)	37
Number of communications in other media (internet, video, ...)	4
Number of publications in refereed journals (published)	3
Number of articles/books (published)	
Number of other publications	2

2. Training

Number of PhDs	3
Number of MScs	6
Number of visiting scientists	7
Number of exchanges of scientists (stays longer than 3 months)	7

3. Achieved results

Number of patent applications	
Number of patents granted	
Number of companies created	
Number of new prototypes/products developed	1
Number of new tests/methods developed	8
Number of new norms/standards developed	
Number of new softwares/codes developed	
Number of production processes	

4. Industrial aspects

Industrial contacts	yes	X	no	<input type="checkbox"/>
Financial contribution by industry	yes	<input type="checkbox"/>	no	<input type="checkbox"/>
Industrial partners : - Large	yes	<input type="checkbox"/>	no	<input type="checkbox"/>
- SME ¹	yes	X	no	<input type="checkbox"/>

5. Comments

Other achievements (use separate page if necessary)

¹ Less than 500 employees.