



# Survival Blueprint *Chacoan peccary,* *Catagonus wagneri*



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**About the Survival Blueprint:** This document summarizes the existing knowledge of the Chacoan peccary (*Catagonus wagneri*), threats to its conservation, and identification of key stakeholders. It is adapted from the more comprehensive IUCN Action Plan that we generated for this species in 2016, after a specialists workshop in Paraguay (Altrichter et al. 2016; Supplementary Material I).

The Survival Blueprint provides prioritised scientifically-based recommendations designed for key players. It is intended to form a key reference and baseline record for future work on the species, provide a focus for interested stakeholders, and help aid in fundraising.

## INDEX

1. STATUS REVIEW .....	2
1.1 Taxonomy: .....	2
1.2 Distribution and population status: .....	2
1.2.1 Global distribution: .....	2
1.2.2 Local distribution: .....	3
1.3 Protection status: .....	5
1.4 Habitat and resource assessment: .....	5
1.5 Biology and ecology: .....	5
1.6 Threat analysis: .....	6
1.7 Stakeholder analysis: .....	7
1.8 Factors influencing success of survival blueprint implementation: .....	9
2. ACTION PROGRAMME .....	13
3. REFERENCES .....	28
4. SUPPLEMENTARY MATERIAL .....	29

# 1. STATUS REVIEW

This section highlights the currently known species information and is used as the basis on which the suggested action programme is built. For more detailed information about taxonomy see Parisi et al. (2016).

## 1.1 Taxonomy:

Class: *Mammalia*

Order: *Artiodactyla*

Family: *Tayassudae*

Genus: *Catagonus*

Species: *C. wagneri*

Common Names:

- English: Chacoan peccary
- Spanish (Argentina): Quimilero
- Spanish (Paraguay): Taguá
- Spanish (Bolivia): Solitario
- Others: Pecarí chaqueño (Spanish), Rosillo (Spanish) Curé-taguá (Guaraní), Nokkayk (Qom/Toba), Cuichajua (Ayoreo), Amutaj (Wichí).

## 1.2 Distribution and population status:

### 1.2.1 Global distribution:

The Chacoan peccary is associated to warm climate and arid to semi-arid environments (Ferraz et al. 2016). In the past, these conditions were present in areas that today have very different characteristics. Therefore, there are fossil records of the species far away from its present distribution, e.g. Uruguay (Gasparini et al. 2013). Currently, the species is endemic to the Dry Chaco region in Argentina, Bolivia and Paraguay (Altrichter et al. 2016).

Information about the distribution of the Chacoan peccary is insufficient (Camino 2016), in 2016, based on interviews and skulls, Torres et al. (2016) determined that the species is present in Cordoba Province, Argentina, in an area over 650 km South from its known southern limit distribution. In a workshop of experts held in Paraguay in 2016, we used the maximum entropy algorithm to generate a predictive distribution model based on independent records of the species and environmental variables (Figure 1, adapted from Ferraz et al. 2016). The map shows areas that could be inhabited by the Chacoan peccary (Figure 1). Although there are areas where the presence of the species was confirmed (Table 1) it is recommended field work to determine other areas where the species could be present.

Country	Population estimate (plus references)	Distribution	Population trend (plus references)	Notes
Argentina	No information	Dry Chaco; portions of the Provinces of Santiago del Estero,	No information but highly	

		Salta, Chaco, Formosa and Córdoba	probable decreasing	
Paraguay	No information	Dry Chaco; West and North area of the Country	No information but highly probable decreasing	
Bolivia	No information	Dry Chaco, inside and in the areas surrounding the National Park Kaa Iyá	No information	

Table 1. Areas where the presence of Chacoan peccary (*Catagonus wagneri*) was confirmed. The species could be present in other areas and further research is recommended.

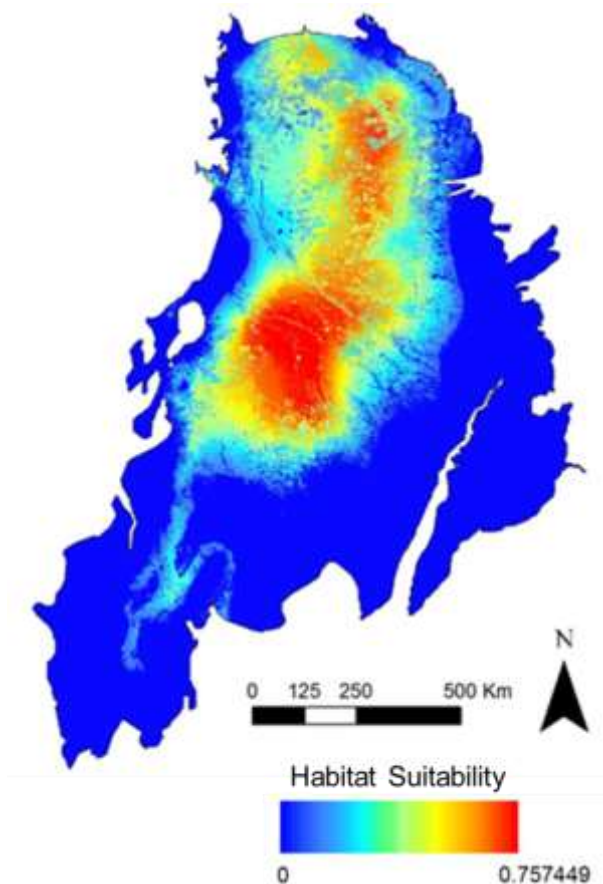


Figure 1. Predictive distribution model of the Chacoan peccary (*Catagonus wagneri*) in the Chaco ecoregion, based on habitat suitability. The model was built during an expert workshop in 2016 (adapted from Ferraz et al. 2016).

### 1.2.2 Local distribution:

Information about the species' distribution is scarce and there is urgent need of field research to determine the Chacoan peccary's distribution. In Argentina the Chacoan peccary is present in Chaco, Salta, Formosa and Córdoba Provinces. In Bolivia it is present in the Departments of Santa Cruz, Chuquisaca and Tarija. In Paraguay the species occupies the Departments of Alto Paraguay, Boqueron and Presidente Hayes (Table 2).

There are no estimates of the population size of the Chacoan peccary in any area (Leus et al. 2016).

Country	Region / province	Site	Level of Protection	References	Notes
Argentina					
	Santiago del Estero (North)				
		Parque Nacional Copo and surrounding areas	National Park	Quiroga 2013	
		Parque Provincial Copo	Provincial Protected Area	Camino 2016 b	
		Particular properties	None		
		Provincial Properties occupied by small scale ranchers	None	Brassiolo M, pers. com.	Information provided by Redaf (www.redaf.org)
	Córdoba				
		Northwest		Torres et al. 2016	
	Chaco (Northwest)				
		Parque Provincial Loro Hablador	Provincial Protected Area	Camino 2016 b	
		Particular properties	None	Camino 2016 b	
		Provincial Properties occupied by small scale ranchers and indigenous people	None	Camino 2016 b	
		Indigenous properties	None	Camino 2016 b	
	Formosa (West)				
		Particular properties	None	Camino 2016 b	
		Provincial Properties occupied by small scale ranchers and indigenous people	None	Camino 2016 b	
		Indigenous properties	None	Camino 2016 b	
Bolivia					Information about the Chacoan

					peccary in Bolivia is scarce
	Kaa Iyá	National Park	Protected Area	Altrichter et al. 2016	
		Indigenous properties	None	Altrichter et al. 2016	
Paraguay					
	Defensores del Chaco	National Park	Protected Area	Saldivar-Ballesai 2016	
	Private areas Paraguay (North West)	Particular Properties	None	Altrichter et al. 2016; Saldivar-Ballesai 2016	

Table 2. Distribution of the Chacoan peccary by site, country, region.

### 1.3 Protection status:

Hunting the Chacoan peccary is forbidden in Argentina (National Laws 24,375 and 25,841; Resolutions N°91/03 and 793/87) and Paraguay (National Law 96/92). In Bolivia, hunting is allowed with particular permits (National Law 12301) but never allowed in protected areas. In the three countries hunting by indigenous people is allowed outside protected areas. This is because the three countries ratified Convention Number 169 for the Indigenous and Tribal peoples, of the International Labour Organization.

The three countries approved the International Convention on Biodiversity (CBD) and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) that classifies the species in Appendix I.

### 1.4 Habitat and resource assessment:

The species' habitats have low rainfall and high temperature and its key habitats are xerophytic thorny forest. These forests are dominated by different species including *Schinopsis lorentzii* and *Aspidosperma quebracho-blanco*. A dense shrub layer can be present and the ground is usually covered by bromeliads and cacti. The species selects forests of  $\leq 7m$  high at a home range scale because it is probably adapted to natural edge forests that limit with natural grasslands. Cacti are essential for Chacoan peccary's diet although it also consumes other items. Tolerance to hunting is low.

Sources: Altrichter and Boaglio 2004, Altrichter et al. 2016, Camino 2016b, Ferraz et al. 2016.

### 1.5 Biology and ecology:

There is scarce information about the biology of the species in nature. Chacoan peccaries' group size ranges between 1 and 9 individuals (Mayer and Brandt 1982, SOWLS 1997). It is believed that there is only one reproductive male in the groups (Campos pers.com.). Females have one litter a year and litter sizes - in Paraguay, in semi-captivity- vary between 1-4 (Mayer and Brandt 1982). Litter size for wild populations in Paraguay was estimated in 1.7 (Taber et al. 1993) but local inhabitants of the Dry Chaco in Argentina indicate that each female only raises 1 cub (*pers.obs.*).

## 1.6 Threat analysis:

Status of the species according to the IUCN Red List of Threatened Species: ENDANGERED

Gaps in existing knowledge of the species are huge and this situation creates a challenge for the implementation of conservation actions. Basic information about the species is scarce. We lack reproductive and mortality parameters in the wild, and information about litter size, reproductive ages, number of females per male and other parameters that are essential for modelling population viability (Leus et al. 2016). Also, new records of the species showed that the distribution of the species was not known and we lack information about metapopulations and landscape connectivity (Altrichter et al. 2016).

Threats:

Critical	Habitat loss due deforestation for intensive agricultural and cattle production	Ultimate threat
High	Habitat loss and degradation due habitat loss and degradation performed by local inhabitants (peasants and indigenous communities): tree extraction, extensive cattle production, etc.	Ultimate threat
High	Subsistence Hunting	Proximate threat
High	Dogs that belong to local inhabitants but are not fed or looked for	Proximate threat
Medium	Commercial hunting	Proximate threat
Low	Diseases	Further research is required
Low	Poisoned by products used in intensive productions	Ultimate threat

## 1.7 Stakeholder analysis:

People or groups of people who directly or indirectly affect the species positively or negatively, or are affected by it and its conservation. The assessment is done by considering peoples' interest, their activities, how their activities impact on the species (positive or negative), the intensity of the impact (Table 3).

Country	Stakeholder	Interest	Current activities	Impact	Intensity	Proposed activities
Argentina, Paraguay and incipient in Bolivia	Companies and people that intensively produce crops or meat	Making money	Production of soy and other agricultural goods or of cattle. The forest and grasslands are completely transformed for these productions to be implemented	Negative	critical	Negotiate a landscape design in productive lands that maintain natural environments and their connectivity. Forbid hunting in their lands.
Argentina, Paraguay and Bolivia	Companies that extract trees	Making money	Tree extraction (legally or illegally and usually with no justice in the payment to local inhabitants)	Negative	critical	Fare trade would give local people the same money for less trees so fare trade + educational and awareness programmes on the importance of these trees for local ecosystems and their own livelihoods would be useful.
Argentina, Paraguay and Bolivia	People from towns and cities	Hunting	Hunting the species either commercially (particularly in Paraguay), for fun or to eat it (although	Negative	high	- More control; - CEPA for people of towns and cities on the importance of the species (adults and children);

			they have access to other meat sources)			- CEPA for rural inhabitants for the to protect the species in their lands and not allow foreigners to hunt
Argentina and Bolivia	Indigenous groups and small scale ranchers	Hunting	Subsistence hunting of the species	Negative	medium	- CEPA for them to understand the importance and uniqueness of the species and may be they could replace the Chacoan peccary's meat with other wild animals.
Argentina, Paraguay and Bolivia	Conservation NGOs and independent groups	Conservation	Creation of Protected Areas, Research, Working with local communities	Positive	high	Proyecto Quimilero is part of these initiatives and interacts with other groups to enhance positive results
Argentina, Paraguay and Bolivia	Pro-indigenous NGOs and religious groups	Support to indigenous needs and rights	Working with local indigenous communities and interacting with government, media, etc.	Positive	low	Interaction between conservation and social initiatives to enhance positive results
Argentina, Paraguay and Bolivia	Government Offices	Unclear	Not much presence. Implementation of some social programmes; association with large companies that intensively produce	Negative	high	Interact with decision makers in the cities that could be interested in the sustainable development of the area, bring them ideas and support for



			crops and meat or that extract trees.			implementation of programmes and actions to conserve the Chacoan peccary and the region
Argentina, Paraguay and Bolivia	Protected Areas (National Parks Office)	Conservation	Not much presence or invest in the Chacoan peccary's distribution range but there are protected areas in the territory	Positive	critical	Meeting with representatives of institutions of protected areas to incentive investment in existing protected areas and to propose new protected areas and wildlife corridors

**Table 3.** Stakeholder analysis showing people or groups of people who directly or indirectly affect the species, or are affected by it and its conservation.

### 1.8 Factors influencing success of survival blueprint implementation:

	Description	Threats	Opportunities
<b>Socio-cultural effects</b>			
	The culture of the local people of the Dry Chaco (small scale ranchers and indigenous groups) is unique, endemic of this region, closely related to local ecosystems. These cultures are threatened by extinction.		Coincidences between local cultures and the species' characteristics allow the local use of the Chacoan peccary as a flagship species.
	Large producers that are associated with deforestation and intensive production of soy and meat usually come from other areas. Their culture is usually not associated to local ecosystems	Their culture is not associated to local wildlife and the extinction of the Chacoan peccary could be an unimportant event for them and more a natural consequence of "development"	

	It is probable that the Chacoan peccary, as the other peccary species, spreads the seeds of certain native plants. These plants may be fodder for cattle extensively raised by small scale ranchers		If the Chacoan peccary helps in maintaining fodder for cattle of small scale ranchers, then they will want to conserve the species
	Chacoan peccary is a prey for Pumas		Pumas eat goats and cows that are extensively raised by small scale ranchers. The presence of the Chacoan peccary could decrease attacks because there would be another prey available. If so, conserving the species can be positive for small scale ranchers.
<b>Economic implications</b>			
	The hide of the Chacoan peccary can have some economic value	This increases the probability of people hunting on the Chacoan peccary	
<b>Existing conservation measures</b>			
	<i>Proyecto Quimilero</i> is currently working in Chaco Province, Argentina, to protect and study the species. Main activities include: CEPA, strengthening of local capacities and research among others.	<i>Proyecto Quimilero</i> is a small independent group. Sustainability of actions depend on small scale funding and on members of the group keeping their jobs in an unstable economic and political situation	Actions so far are having a good reception locally and also outside the study area. As <i>Proyecto Quimilero</i> focuses on conservation while strengthening local capacities, actions may last even if the project members leave the area. Additionally, <i>Proyecto Quimilero</i> interacts with other projects and this gives the initiative more resilience.
	Proyecto Taguá CCCI, in Paraguay carries out research on Chacoan peccary and supporting conservation measures	The location of the CCCI is isolated and this may difficult interaction with other stakeholders. Funding is limited.	The CCCI has been functioning since 1985. It has collected important information about the species and has been breeding individuals for future reintroduction programmes.

	National Parks (Kaa Iyá, Defensores de Chaco, Impenetrable, Copo, Formosa, etc.)	These areas are becoming islands in the middle of a deforestation matrix	National Parks protect territory of the species and there are initiatives to create wildlife corridors and unite these areas by working in conservation with local people
	In Cordoba, Argentina, a group directed by Ph.D. Torres is studying the species	The risk is that information provided may not be applied if no further efforts other than research	Provides information necessary to conserve the species
	Guyrá Paraguay is working for the conservation of the Chaco ecoregion and its biodiversity		This NGO develops different conservation and research actions and interacts with government, researchers and NGOs of Paraguay and Argentina promoting conservation.
	There are other small scale research initiatives	May not last in time	May provide information that is necessary for conserving the species.
	Large scale research initiatives (e.g. Berlin University, INTA, etc)		Will provide usefull information for conserving the species. More visibility and investment on research on ints habitats
<b>Administrative/political set-up</b>			
	In Argentina and Paraguay laws are clear about the prohibition of hunting the species.	Control and law enforcement is insufficient to protect the species	
	Habitat destruction	Legal and illegal habitat destruction is supported by present administrative and political set up	
	Intensive production of crops and cattle are more important for decision makers	Most decision makers cannot understand the importance of conserving wildlife or a region. Their knowledge about ecology and sustainability is insufficient and their interest for short-term economic benefits drives most local decisions.	

	Corruption	Enforcement of any measure is very difficult because the territory is isolated and decision makers are corrupt	
<b>Local expertise and interest</b>			
	Between 2015 and 2017 <i>Proyecto Quimilero</i> has been working with local species promoters: these are local people that are interested in protecting the species		The species' promoters could: (1) inspire the conservation of the Chacoan peccary; (2) Continue with conservation actions for the species; (3) disseminate information about the species to other areas, (4) train other species promoters
<b>Appeal of species</b>			
	Locally, the species is appealing because it is a source of food and because of similarities with local cultures		These characteristics increase the opportunities of conserving the species
	Outside the study area, the species is almost unknown		This decreases the conservation opportunities and investments on the species
<b>Resources</b>			
	Through <i>Proyecto Quimilero</i> , there is funding for implementing conservation measures (EDGE-ZSL; MBZ; Rufford foundation)	<i>Proyecto Quimilero</i> is a small independent group. Sustainability of actions depend on small scale funding and on members of the group keeping their jobs in an unstable economic and political situation	As the initiatives of this group were already funded and accomplished successfully the objectives, future funding is probable.
	There are some government initiatives (in Argentina) for poverty alleviation		These initiatives could decrease hunting pressure and habitat destruction

**Table 4.** Factors influencing success of survival blueprint implementation.

## 2. ACTION PROGRAMME

This section of the survival blueprint is based on the results of the international workshop for the conservation of the Chacoan peccary held by experts during 2016 in Paraguay (Altrichter et al. 2016)

**Vision (30-50 year timescale)** Ensure viable populations of *Catagonus wagneri* in the Chaco ecoregion, maintaining ecological integrity and environmental connectivity throughout its distribution, within a framework of sustainable development that addresses the needs and visions of local communities, valuing the species as emblem.

**Goals (5 -1 0 year timescale):**

1. Natural habitat of the species will be conserved and it will be connected for populations to interchange individuals;
2. Existing populations are conserved.

**Objectives** are listed in the Table 5 and are the result of the specialists meeting held in Paraguay in March 2016 (Altrichter et al. 2016).

<b>(I) Habitat Conservation</b>		
Objective		Priority
1	Give proper value to the Chaco ecosystems, ecosystem services and resources	Critical
2	Relevant stakeholders interact and can reach consensus (government, researchers, NGOs, producers and private companies, local communities)	High
3	The existing legal regulations are improved, regionally appropriate and applicable. There are no legal gaps and the countries the occupy the Chaco region are interested and involved in the sustainable development of the region	Critical
4	There are new declared protected areas and the existing protected areas are consolidated throughout the Chacoan peccary's distribution range (Bolivia, Paraguay and Argentina)	Critical
5	Facilitate land tenure rights of lands inhabited by traditional people in areas suitable for the species	Critical
<b>(II) Hunting</b>		
Objective		Priority
1	Entities responsible for oversight and control fulfil their obligations in an efficient and coordinated manner	Critical
2	The species is considered an emblem of the Chaco	High
3	Local communities care for the species and its habitat	Critical
4	The species is declared under the highest level of protection (eg National Monument)	Critical
5	The guidelines provided in this document and in the Action Plan (Altrichter et al. 2016) are adopted as a	High

	guideline for the conservation of the species in each country by Law	
6	The number of dogs per family has been reduced to the minimum necessary. There are no wild dogs	High
7	There is an updated record of individuals of Chacoan peccary in captivity with adequate control and inspection actions	High
8	Eradication of illegal hunting of the Chacoan peccary	High
9	There is no Chacoan peccary mortality associated with accidents or trampling	High
<b>(III) Information on the Chacoan peccary</b>		
Objective		Priority
1	There is biological information on the species from captive breeding programs	High
2	There is a standardized system of monitoring the species and studies of habitat selection and occupation	High
3	There is a database of publications of about the Chacoan peccary	High
4	There is information about distribution of Chacoan peccary's populations, habitat selection and requirements and landscape functional connectivity for the species	Critical
5	There is information available on the socio-economic value of the species and the different perceptions of different cultures on it	High
6	There is a pilot education and public awareness programme focused on the species, which functions effectively and is accessible to key local actors to conserve the species	Critical
7	There is a standardized protocol for telemetry studies	High
8	There is information about ecological and biological parameters of the species	Critical
9	Research on the topics listed above (1-8) appears on the agendas of National Research Institutions (CONICET, CONACIT, Universities, government agencies of science, etc.)	High

**Table 5.** Objectives and their importance to achieve the vision and goals of conserving the Chacoan peccary (*Catagonus wagneri*). Based on the specialists workshop held in Paraguay in March 2016 (Altrichter et al. 2016).

**Actions** are the activities which need to be performed in order to achieve the Objectives, which will achieve the Goals, and, ultimately, the Vision. Actions are typically short-term (usually 1–5 years). Proposed actions are listed in the activity table (Table 6), which details each Action, including information on the relative priority of each activity to the conservation of the species, countries where specific projects are of high priority, agencies responsible for undertaking them, cost, time scale, indicators for monitoring, risks and opportunities, and activity type. The list of actions was also generated during the meeting of specialists (Altrichter et al. 2016).

Activities	Country / region	Priority	Associated Cost (US\$)	Time scale	Responsible stakeholders	Indicators	Opportunities and threats	Activity type
<b>Objective title: (I) Habitat Conservation – (1) Give proper value to the Chaco ecosystems, ecosystem services and resources</b>								
(1) Environmental education through generation and dissemination of informative graphic material	Argentina, Paraguay, Bolivia	Critical	20,000	July 2016 / July 2019	S.P.E.C.I.E.S. (Anthony Giordano)	- Generation of descriptive graphic material (manual, triptych and poster) (1000 copies)  - Distribution of this material (1000 copies)	Opportunities: there are funds for these initiatives: Threats: Correct distribution of this material in isolated areas	Education & Awareness
(2) Environmental education through informative talks / workshops aimed at the children and youth of local communities	Argentina	Critical	6,000	April 2016/ April 2021	Proyecto Quimilero (Hugo H. Correa / Micaela Camino)	- Talks (30/year), presentations (20/year), activities (20/year) and workshops (20/year) for students of schools of the Chaco Province, Argentina.	Opportunities: Proyecto Quimilero already started with these activities Threats: Unstable political and economic conditions threaten continuity of activities and funding	Education & Awareness
(3) Environmental education through species local promoters	Argentina	Critical	6,000	April 2016/ April 2021	Proyecto Quimilero (Micaela Camino)	- By January 2019 there will be 5 trained local species promoters - By April 2021 There will be 20 local species promoters - By April 2021 local species promoters will have provided public presentations in different areas important for the conservation of the species (200 total public presentations) - Distribution of printed material focused on the conservation of the species and its habitats	Opportunities: Proyecto Quimilero already started with these activities Threats: Unstable political and economic conditions threaten continuity of activities and funding	Education & Awareness + Capacity Building
(4) Include in the official educational curricula the themes: (i)	Departments of Güemes and	Critical	300	April 2017/ April 2018	Proyecto Quimilero (Hugo H. Correa / Micaela Camino)	- These themes are officially included in the educational curricula through proper institutions ( <i>regional educativa</i> )	Opportunities: Proyecto Quimilero already started with this initiative.	Education & Awareness

Chacoan peccary theme and (ii) habitat loss	Almirante Brown of Chaco Province, Argentina							
(5) Publish information about Chacoan peccary in public media	Paraguay, Argentina	Critical	300	July 2016/ July 2018	S.P.E.C.I.E.S. & Proyecto Quimilero (Anthony Giordano / Micaela Camino)	- 3 articles published in Paraguay and -2 articles published in Argentina	Threats: No interest from the media	Education & Awareness
(6) Generate information about effects of land use change on Chacoan peccary and other mammal species	Argentina, Paraguay, Bolivia	Critical	60,000	May 2016/ March 2021	Universidad Nacional de Córdoba & INTA & Proyecto Quimilero (Ricardo Torres / Julieta Decarre / Micaela Camino)	- 3 scientific articles published in per reviewed journals -2 reports for decision makers	Opportunities: Research groups interested and already working on this Threats: Not getting enough funds	Improving Knowledge
(7) Collect and provide access to scientific information on ethno-botany, ethnozoological and sustainable production in Chaco ecosystems	Argentina, Paraguay, Bolivia	High	Not estimated	May 2016/ March 2018	Proyecto Quimilero (Micaela Camino)	Information available in a web site		Improving Knowledge
(8) Define, detect and determine Areas of Importance for Conservation (AIC) of the Chacoan peccary	Argentina, Paraguay, Bolivia	Critical	300	May 2016/ December 2019	INTA (Julieta Decarre)	Map available in the web and published in a scientific article	Opportunities: We will use available information	Improving Knowledge
<b>Objective title: (1) Habitat Conservation – (2) Relevant stakeholders interact and can reach consensus (government, researchers, NGOs, producers and private companies, local communities)</b>								
(9) Encourage the exchange of opinions and	Córdoba Province, Argentina	High	900	May 2016/ December 2017	Universidad Nacional de Córdoba (Ricardo Torres)	- 2 Meetings between the Environmental Office of Córdoba Province and the University;	Threats: Lack of interest from one or more parties	Law & policy



knowledge between productive and academic areas						- A final document of agreement and understanding on sustainable production for the Chaco is developed		
(10) Workshops to highlight the importance of conserving the Chacoan peccary and its habitats. Focused on Personal of Protected Areas, Environmental offices, among others	Argentina, Salta, Formosa, Chaco, Santiago del Estero and Cordoba Provinces	High	4500	Deadline: July 2018	National Parks (Julio Monguillot)	One meeting per Province	Threat: Lack of interest of invited participants Opportunities: Institutional support from Protected Areas and Environmental Offices	Education & Awareness
(11) Talks on sustainable management of livestock for producers	Area of Misión Nueva Pompeya, Chaco, Argentina	High	3500	Deadline: July 2017	Mesa 10 de Marzo (Daniel Jaimes)	One presentation in the meeting of leaders of different productive groups for them to disseminate the information	Opportunities: Daniel is the president of the federation of producers of this area	Education & Awareness
(12) Educational activities focused on Menonite communities	Paraguay	High	1000	Deadline: December 2017	Neuland Colony (Rosalia Goerzen and Kathe Walbtunner)	- Publish monthly an article in German focused on the Chacoan peccary and the importance of its conservation, and on conserving its habitats. State the importance of the coexistence of the species with the livestock. Publication will be done in the monthly information bulletins of the three cooperatives of the Paraguayan Chaco; - Presentations and activities in menonite schools (8)	Opportunities: responsables are members of the monite communities	Education & Awareness

<b>Objective title: (I) Habitat Conservation – (3) The existing legal regulations are improved, regionally appropriate and applicable. There are no legal gaps and the countries that occupy the Chaco region are interested and involved in the sustainable development of the region</b>								
(13) Improve existing laws for sustainable development of the Chaco ecoregion	Paraguay	Critical	200	Deadline: June 2017	Neulando Colony (Rosalía Goerzen)	- Inclusion of new ecosystems in the protective normative (e.g. espartillar)	Opportunities: responsible people are members of the monite communities	Law&Policy
<b>Objective title: (I) Habitat Conservation – (4) There are new declared protected areas and the existing protected areas are consolidated throughout the Chacoan peccary's distribution range (Bolivia, Paraguay and Argentina)</b>								
(14) Encourage the creation of new protected areas	Argentina	Critical	200	Deadline: June 2021	Proyecto Quimilero & National Parks	- Creation of one National Park; - Creation of private protected areas (3)	Opportunities: This is an initiative important for many different stakeholders	Law&Policy
(15) Collect information on the degree of implementation of protection on existing Protected Areas	Argentina	□□	100	Deadline: July 2018	National Parks (Julio Monguillot, Andres Bosso)	- A written and printed report with the information		Improving Knowledge
(16) Encourage monitoring of the species inside the Protected Areas occupied by Chacoan peccary	Argentina, Paraguay, Bolivia	High	15,000	Deadline: December 2018	National Parks (Julio Monguillot, Andres Bosso)	- A monitoring programme implemented in each protected area and protocols are consistent so we can compare data	Threats: Funds may be insufficient	Improving Knowledge
<b>Objective title: (I) Habitat Conservation – (5) Facilitate land tenure rights of lands inhabited by traditional people in areas suitable for the species</b>								
(17) Identify "owners" who intend / need to get the title of their lands and manage funds to carry out the necessary procedures in the Chacoan peccary's	Argentina	High	Not estimated	Deadline: December 2020	Proyecto Quimilero (Micaela Camino)	- People that occupy areas that are important for conserving the species get their land titles and act to conserve the species	Threats: there are important economic interests that do not want these people to get these land tenure titles	Law&Policy

areas important for conservation.								
<b>Objective title: (II) Hunting – (1) Entities responsible for oversight and control fulfil their obligations in an efficient and coordinated manner</b>								
(18) Develop coordinated and joint hunting control actions through an inter-institutional control schedule.	Argentina, Paraguay and Bolivia	Critical	300	Deadline: December 2018	Proderi, Fundación Kaa Iyá, Environmental Office, Wildlife Department, Paraguay (Ivana Ghione, Rosa L. Cuellar, Diego Giménez)	- An Inter-institutional control schedule is elaborated and signed by all responsible organisms of control and hunt regulation	-	Law & Policy
(20) Training courses for government entities and security forces in the Chaco Region on the status, regulations and threats of the species.	Argentina, Paraguay and Bolivia	Critical	Not estimated	Deadline: March 2019	National Parks Argentina, Fundación Kaa Iyá, Universidad Nacional de Asunción (Julio Mongillot, Rosa L. Cuellar, Nora Neris)	- 3 workshops per year per country focused on people from security, control and inspection forces (Police, Gendarmerie, those with responsibility for Environmentat governmental level and related Ministries, etc.). - Develop and disseminate educational materials and educational books that include information on the importance of the species and its habitat (see actions above). - Meetings with association of neighbours to develop control activities to protect the Chacoan peccary (8 meetings per country)	Threats: Lack of interest of participants; Opportunities: Institutions are probably interested	Education & Awareness
<b>Objective title: (II) Hunting – (2) The species is considered an emblem of the Chaco</b>								
(21) Formal (school programmes) and informal education campaigns (talks, conferences, courses, dissemination of written material).	Argentina, Paraguay and Bolivia	High	See Activities 1-5 Above in this Table					

(22) Public awareness programme to disseminate information on the species and legal normative for its protection	Argentina, Paraguay and Bolivia	Critical	Not estimated	Deadline: March 2018	Proderi, Fundación Kaa Iyá, Itaipú Binacional, Environmental Office, Paraguay (Ivana Ghione, Rosa L. Cuellar, Silvia Saldivar Bellassai, Diego Gimenez)	- 1 radio spot per country played in different programmes for at least three months - 1 TV spot per country that appears at least for three months in different tv programmes of each country - A graphic campaign in each capital city.	Threats: It may be too expensive	Education & Awareness
(23) Arrange the adoption of the species as a symbol -of local governments	Argentina, Paraguay and Bolivia	Critical	400	Deadline: December 2020	Proderi, Fundación Kaa Iyá, Universidad Nacional de Asunción, Environmental Office, Paraguay (Ivana Ghione, Rosa L. Cuellar, Nora Neris, Diego Gimenez)	- The species is adopted as an emblem by each country	-	Law & Policy
<b>Objective title: (II) Hunting – (3) Local communities care for the species and its habitat</b>								
(24) Environmental Education	Argentina, Paraguay and Bolivia	High	See Activities 1-5 Above in this Table					
(25) Locally Based Monitoring and Research on the species	Argentina, Paraguay and Bolivia	Critical	78,000	Deadline: December 2019	Proderi, Fundación Kaa Iyá, Universidad Nacional de Asunción, Proyecto Quimilero, Guyrá Paraguay) Ivana Ghione, Rosa L. Cuellar, Nora Neris, Micaela Camino, Hugo Correa, Jeffrey Thompson, Marianela Velilla	- In August 2018 there will be a monitoring protocol to collect data on subsistence hunting and bio-ecological information. This protocol will be jointly developed between communities, researchers and government authorities. - By January 2019, there will have been 5 training and sensitization workshops on the species and its habitat for local communities of each country. - In March 2019 the monitoring system will be functioning in the	Opportunities: There are groups working already on this in Argentina and that have worked with communities in Bolivia. Threats: Getting enough funding, interest of local people	Improving Knowledge + Building Local Capacities

						three countries with the same protocol		
<b>Objective title: (II) Hunting – (4) The species is declared under the highest level of protection (eg National Monument)</b>								
(26) Negotiate and manage the declaration of the Chacoan peccay under the maximum category of protection under National, Regional, Provincial, Departmental and Local authorities	Argentina, Paraguay and Bolivia	Critical	1,000	Deadline: March 2019	Environmental Office of Argentinean Provinces and of Paraguay (Ivana Ghione, Micaela Camino, Diego Giménez)	- By March 2019 the species will have the maximum category of protection in all mentioned levels	-	Law & Policy
<b>Objective title: (II) Hunting – (5) The guidelines provided in this document and in the Action Plan (Altrichter et al. 2016) are adopted as a guideline for the conservation of the species in each country by Law</b>								
(27) Disseminate and validate the Action Plan (Altrichter et al. 2016) with public and private institutions and social organizations	Argentina, Paraguay and Bolivia	Critical	2,000	Deadline: March 2019	Fundación Kaa Iyá & Environmental Office, Paraguay (Rosa L. Cuellar, Diego Giménez).	- By March 2019 meetings (18) for the presentation and dissemination of the Action Plan with legislative, administrative, institutional and civil organizations will have To manage the official adoption of the Plan of Action as a guideline for the conservation of the species	Threats: Lack of interest of institutions. Opportunities: The Action Plan has large institutional support	Law & Policy
(28) To manage the official adoption of the Plan of Action (Altrichter et al. 2016) as a guideline for the conservation of the species	Argentina, Paraguay and Bolivia	Critical	1,000	Deadline: March 2019	National Parks, Fundación Kaa Iyá, Environmental Office (Pablo Perovic, Rosa L. Cuellar, Diego Giménez).	- By March 2019 there will be at least one official document per country that states that the Action Plan is to be used as a guideline for the conservation of the species	Threats: Lack of interest of institutions. Opportunities: The Action Plan has large institutional support	Law & Policy
<b>Objective title: (II) Hunting – (6) The number of dogs per family has been reduced to the minimum necessary. There are no wild dogs</b>								

(29) Education and Awareness Programme to spread information for responsible dog ownership and on the impact of feral dogs in the forest	Argentina, Paraguay and Bolivia	Critical	3,000	Not established	Proderi, Fundación Kaa Iyá, Universidad Nacional de Asunción (Ivana Ghione, Rosa L. Cuellar, Nora Neris)	<ul style="list-style-type: none"> <li>- Meetings at the local level within the range of the species to inform the impact of the presence of dogs for the Chacoan peccary (at least 5 per country).</li> <li>- A report informing the results of the survey on the dog population.</li> <li>- Design and print information posters about conflicts between dogs and wildlife and ways to prevent them (posters will be distributed in meetings).</li> </ul>	Opportunities: Local people can see the negative effect of their dogs for wildlife.	Education & Awareness
(30) Health service and sterilization of dogs	Argentina, Paraguay and Bolivia	□□	Not estimated	Not established	Proderi, Fundación Kaa Iyá, Universidad Nacional de Asunción (Ivana Ghione, Rosa L. Cuellar, Nora Neris)	<ul style="list-style-type: none"> <li>- Organize campaigns of sanitation and sterilization of dogs in communities and rural areas (2 health campaigns per year per country).</li> <li>- Report every year the results of a monitoring of the canine population and their health status. - Follow up on educational and health campaigns</li> </ul>	Opportunities: Local people can see the negative effect of their dogs for wildlife. Threats: there is no health system for humans in most of the Chacoan peccary's distribution range and, therefore, it will be hard to get funding for a dog health service. And providing health service for dogs before humans may have a negative impact on people's perception of the initiative.	Other
(31) Control of the population of dogs in protected areas	Argentina, Paraguay and Bolivia	High	Not estimated	Not established	Proderi, Fundación Kaa Iyá, Universidad Nacional de Asunción	- Control of dogs in Protected Areas	Threats: (1) funding, (2) animal protection associations may	Other

					(Ivana Ghione, Rosa L. Cuellar, Nora Neris)		see this action as negative		
<b>Objective title: (II) Hunting – (7) There is an updated record of individuals of Chacoan peccary in captivity with adequate control and inspection actions</b>									
(32) Organization and registration of public and private collections of live animals	Argentina, Paraguay and Bolivia	High	Not estimated	Deadline: March 2019	National Parks, Kaa Iyá, Environmental Office (Pablo Perovic, Rosa L. Cuellar, Diego Giménez)	- By March 2019 all individuals in public and private collections will be identified and recorded in an inventory that will be available online.	Opportunities: there are not so many institutions that have live collections of Chacoan peccaries	Species Management	
<b>Objective title: (II) Hunting – (8) Eradication of illegal hunting of the Chacoan peccary</b>									
(33) Educational and Awareness programme focused on the species and on current regulations and sanctions, aimed at hunting clubs and tour operators.	Argentina, Paraguay and Bolivia	□□	Not estimated	Deadline: March 2020	National Parks, Kaa Iyá, Environmental Office (Pablo Perovic, Rosa L. Cuellar, Diego Giménez)	- 20 hunting clubs will receive printed material informing on the importance of the species, current regulations and applicable sanctions		Education & Awareness	
(34) Promote ecotourism	Argentina, Paraguay and Bolivia	□□	Not estimated	Deadline: March 2020	National Parks, Kaa Iyá, Environmental Office (Pablo Perovic, Rosa L. Cuellar, Diego Giménez)	- By March 2019, potential sites to encourage tourism in the Chaco region will be identified. - In these areas sustainable economic alternatives for ecotourism will be promoted in meetings with local people (20) and with investors (4). - By March 2020 there will be a ecotourism plan for the Chaco region.	Opportunities: the region is unique, beautiful and the second largest after Amazonia in South America. Threats: Deforestation is accelerated and makes the region less appealing for tourists	Livelihood, Economic & Other Incentives	
(35) Environmental Education	Argentina, Paraguay and Bolivia	High	See Activities 1-5 Above in this Table						Education & Awareness

<b>Objective title: (II) Hunting – (9) There is no Chacoan peccary mortality associated with accidents or trampling</b>								
(36) Put signs on the routes indicating speeds and presence of wildlife	Argentina, Paraguay and Bolivia	Medium	Not estimated	Deadline: March 2020	National Parks, Kaa Iyá, Environmental Office (Pablo Perovic, Rosa L. Cuellar, Diego Giménez)	- Meetings with road authorities (3). - By March 2019 critical areas within the range of the species will be identified. - By March 2020 there will be signs and control on the roads.	-	Other
<b>Objective title: (III) Information on the Chacoan peccary – (1) There is biological information on the species from captive breeding programs</b>								
(37) Compile and Analyse existing information about Chacoan peccary in South America	Argentina, Paraguay and Bolivia	Critical	0	Deadline: March 2019	Centro chaqueño para la conservación y la investigación (Juan Campos Krauer)	- An article with the information will be published in the bulletin of the peccary specialist group or in the journal edited by Guyra Paraguay.	Opportunities: the information already exists and there is no associated cost for this activity because the person in charge can be a researcher with salary and resources from its own institution	Improving Knowledge
(38) Compile and Analyse existing information about Chacoan peccary in US and Europe	Argentina, Paraguay and Bolivia	Critical	0	Deadline: March 2019	IUCN (Kristin Leus)	- An article published in a journal with compiled information	Opportunities: the information already exists and there is no associated cost for this activity	Improving Knowledge
<b>Objective title: (III) Information on the Chacoan peccary – (2) There is a standardized system of monitoring the species and studies of habitat selection and occupation</b>								
(39) Design a monitoring programme to determine the distribution of the species taking into account detectability and false presences (Activity associated to Activity N°25 but	Argentina, Paraguay and Bolivia	Critical	Considered in Activity N°25	Deadline: August 2018	Proderi, Kaa Iyá, Universidad Nacional de Asunción, Proyecto Quimilero, Guyrá Paraguay (Ivana Ghione, Rosa L. Cuellar, Nora Neris, Micaela Camino, Hugo Correa, Jeffrey Thompson, Marianela Velilla)	- In August 2018 there will be a monitoring protocol for the species	Opportunities: There are groups working already on this in Argentina and Paraguay.	Improving Knowledge



more comprehensive)								
(40) Generate identification guide for species of peccaries	Argentina, Paraguay and Bolivia	High	2000	Deadline: March 2019	Proyecto Quimilero (Micaela Camino)	- In March 2019 a guide for differentiating the three peccary species will be: (i) printed and (ii) available online		Improving Knowledge
<b>Objective title: (III) Information on the Chacoan peccary – (3) There is a database of publications of about the Chacoan peccary</b>								
(41) Generate database	Argentina, Paraguay and Bolivia	High	0	Deadline: March 2019	IUCN (Mariana Altrichter)	- In March 2019 a database of publications on the Chacoan peccary will be available online	Opportunities: there is no cost associated to this activity	Improving Knowledge
<b>Objective title: (III) Information on the Chacoan peccary – (4) There is information about distribution of Chacoan peccary's populations, habitat selection and requirements and landscape functional connectivity for the species</b>								
(42) Apply monitoring programme and determine the distribution and habitat selection of the species taking into account detectability and false presences (in all its distribution range; Activity associated to Activities N°25 and N°39)	Argentina, Paraguay and Bolivia	Critical	Considered in Activity N°25	Deadline: - Implementation starting in March 2019; - Finishing in March 2023	Proderi, Kaa Iyá, Univesidad Nacional de Asunción, Proyecto Quimilero, Guyrá Paraguay (Ivana Ghione, Rosa L. Cuellar, Nora Neris, Micaela Camino, Hugo Correa, Jeffrey Thompson, Marianela Velilla)	- In August 2018 there will be a monitoring protocol for the species - By March 2019, the monitoring system will be functioning in the three countries with the same protocol	Opportunities: There are groups working already on this in Argentina and Paraguay. Threats: Getting enough funding to implement this measure simultaneously in the three countries	Improving Knowledge
(43) Design and application of genetic studies	Argentina, Paraguay and Bolivia	Critical	8,000	Deadline: December 2018	Centro chaqueño para la conservación y la investigación, Proyecto Quimilero (Juan Campos Krauer, Micaela Camino)	- By June 2017 the design of the collection of samples for genetic analysis will be ready. - By January 2019 there will be a scientific article published providing information about population genetics of wild Chacoan peccary populations	Threats: Getting funding and be able to reach isolated areas for survey	Improving Knowledge

<b>Objective title: (III) Information on the Chacoan peccary – (5) There is information available on the socio-economic value of the species and the different perceptions of different cultures on it</b>									
(44) Design and application of studies on the socio-economic value of the species and the perceptions on the Chacoan peccary of different cultures	Argentina, Paraguay and Bolivia	High	20,000	Deadline: March 2023	Proyecto Quimilero (Micaela Camino)	- By June 2018 the design of the studies will be ready; - By January 2021 there will be a scientific article published providing information about the perceptions of different cultures on the Chacoan peccary; - By the deadline there will be 3 articles published providing this information	Opportunities: there are groups already working on this in Argentina and that have worked on this in Bolivia	Improving Knowledge	
<b>Objective title: (III) Information on the Chacoan peccary – (6) There is a pilot education and public awareness programme focused on the species, which functions effectively and is accessible to key local actors to conserve the species</b>									
(45) To evaluate different ways of disseminating information on the importance of the species and its conservation in the local populations of the Argentine Chaco	Argentina	Critical	5,000	Deadline: March 2019	Proyecto Quimilero (Micaela Camino)	- By June 2019 the best ways to disseminate information on the Chacoan peccary will be available in a printed article and online	Opportunities: This initiative is almost completed	Improving Knowledge + Education & Awareness	
<b>Objective title: (III) Information on the Chacoan peccary – (7) There is a standardized protocol for telemetry studies</b>									
(46) Compile and analyse available information on telemetry and related studies that exist in CCCI, Itaipú and zoos in Europe and the United States	Argentina, Paraguay and Bolivia	Critical	Idem Activities 37 and 38 above in this Table						Improving Knowledge
(47) Perform tests of handling and	Paraguay	High	Not estimated	Deadline: March 2023	Centro chaqueño para la conservación y la	- Telemetry, methodologies for immobilization and physiological	Threats: No group working on this yet	Improving Knowledge	

manipulation of the species in captivity					investigación (Juan Campos Krauer)	tests will be done before March 2022. - Scientific article published by deadline		
<b>Objective title: (III) Information on the Chacoan peccary – (8) There is information about ecological and biological parameters of the species</b>								
See Activities 37 and 38								Improve knowledge
(48) Perform telemetry studies	Paraguay	High	Not estimated	Deadline: March 2023	Guyrá Paraguay (Jeffrey Thompson)	- Articles (3) published in scientific journals	Threats: No group working on this yet	Improving Knowledge
<b>Objective title: (III) Information on the Chacoan peccary – (9) Research on the topics listed above (1-8) appears on the agendas of National Research Institutions (CONICET, CONACIT, Universities, government agencies of science, etc.)</b>								
(49) Disseminate research priorities in the universities of the three countries	Argentina, Paraguay, Bolivia	Critical	500	Deadline: March 2020	IUCN (Mariana Altrichter)	- Information will be available online		Improving Knowledge

**Table 6** (Adapted from the Action Plan for the Conservation of the Species, Altrichter et al. 2016). Actions to be developed to accomplish Objectives for conserving the Chacoan peccary (*Catagonus wagneri*). The table also specifies in which countries the activity should be developed, stakeholders responsible for undertaking them, cost, time scale, indicators for monitoring, risks and opportunities, and activity type.

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#### 4. SUPPLEMENTARY MATERIAL

NAME	INSTITUTION	COUNTRY
Rocío Barreto	Environmental Office, Wildlife Department	Paraguay
Evelyn Brites	Guyra Paraguay	Paraguay
Daniel Brooks	Museum of Natural Sciences of Houston, Texas	USA
Micaela Camino	Grupo de Ecología de Paisaje y Medio Ambiente de la Universidad de Buenos Aires, Consejo Nacional de Investigaciones Científicas y Técnicas (GEPAMA, UBA, CONICET); Director of Proyecto Quimilero; EDGE of Existence Programme, Zoological Society of London (EDGE–ZSL)	Argentina
Juan Campos Krauer	Centro Chaqueño para la Conservación y la Investigación (CCCI)	Paraguay
Hugo Correa	Proyecto Quimilero	Argentina
Rosa L. Cuellar	Fundación Kaa-Iya	Bolivia
Julieta Decarre	Biodiversidad, Ecología y Gestión Ambiental en Agroecosistemas. Instituto de Recursos Biológicos, CIRN, INTA	Argentina
Arnaud Desbiez	UICN SSC CBSG Brasil, Royal Zoological Society of Scotland, RZSS	Brasil

Katia Ferraz	Laboratorio de Ecología, Manejo e Conservação de Fauna Silvestre (LEMaC), Departamento de Ciências Florestais, ESALQ, Universidad de San Pablo	Brasil
Ivana Ghione	PRODERI, Ministerio de la Producción, Chaco, sede Misión Nueva Pompeya	Argentina
Diego Giménez	Environmental Office, Wildlife Department	Paraguay
Anthony Giordano	SPECIES Director	USA
Rosalía Goerzen	Cooperativa Fernheim, Filadelfia	Paraguay
Daniel Jaimes	Representante mesa de organizaciones “10 de Marzo”, comunidad criolla del Impenetrable Chaqueño, Proyecto Quimilero	Argentina
Kristin Leus	Oficial del Programa Regional Europeo de UICN, IUCN SSC Conservation Breeding Specialist Group, IUCN SSC Wild Pig Specialist Group, Copenhagen Zoo	Bélgica
Julio Monguillot	National Protected Areas Administration, Director Northwest Area, Salta	Argentina
Timoteo Navarrete	Cacique Comunidad Wichí, Nueva Población, Chaco, Argentina	Argentina
Nora Neris	Secretaria del Ambiente, Universidad Nacional de Asunción	Paraguay
Edder Ortiz	Guyra Paraguay	Paraguay
Pablo Perovic	National Protected Areas Administration, Salta	Argentina
Viviana Rojas B.	Guyra Paraguay	Paraguay
Silvia Saldivar Bellassai	Itaipú Binacional	Paraguay

Licindo Tebez	Agricultor familiar; Proyecto Quimilero	Argentina
Jeffrey Thompson	Researcher - Guyra Paraguay	Paraguay
Ricardo Torres	Museo de Zoología, Facultad de Ciencias Exactas, Físicas y Naturales, Universidad Nacional de Córdoba	Argentina
Marianela Velilla	Manager of the Species Conservation Programme - Guyra Paraguay	Paraguay
Laura Villalba	Manager of the Species Conservation Programme - WCS Paraguay	Paraguay
Kathi Waldbrunner	Colonia Neuland	Paraguay
Andrea Weiller	Directora de la Carrera Biología, Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Asunción, Paraguay	Paraguay

**Table S1.** List of Participants of the International Workshop for the conservation of the Chacoan Peccary (*Catagonus wagneri*) held with specialists in Paraguay in March 2016 (Altrichter et al. 2016) .