



## **Mixed-species exhibits with Peccaries (*Tayassuidae*)**

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## INTRODUCTION

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As in already completed mixed exhibit documents, I would like to start with a brief introductory summary of the topic to be discussed.

Mixed-species exhibits with different mammals in the last few decades became a major trend. The success of a mixed-species exhibit depends on how we can take general animal husbandry criteria into account in more complex ways in comparison with a single-species exhibit. Those general rules that are important in animal exhibitry are still valid to a greater extent when presenting a multi-species captive environment. As many articles and other publications deal with the subject of general advantages and disadvantages of the mixed-species exhibits, instead of this, here I will assemble a detailed list of mixed exhibits involving at least one member of the family *Tayassuidae*. The main aim of these documents is to summarize data and experiences about this exhibitry type with the hope that these manuals will be a useful supplement for the husbandry guidelines of different species.

The most important aspects of a successful mixed exhibit are the purposeful use of space and enclosure furnishings, the appropriate feeding techniques, decision-making of which species we want to breed and the right choice of species and individuals.

### Use of space and enclosure furnishings

Generally speaking, one of the most critical factors is the size of the area: the larger the enclosure, the fewer the problems. Expanding the size of the whole captive habitat we can greatly increase the chances that the specimens of the different species are able to get out of each other's way. Although this quantitative factor is also important, however, the quality of the given enclosure is much more crucial, since these agents can ensure the stress-free socialization of the combined species. It is extremely important to provide a secure outdoor and indoor space for the subdominant specimens whether belonging to the same species or not. The outdoor exhibit should be well-structured with many kinds of enclosure furnishing elements like small mounds, logs, rock formations and heavily planted areas so that the animals can get out of visual contact with others sharing the same enclosure and provide several escape routes in case of an aggressive contact between the different species. The best option is if the subdominant species have their own areas both outdoors and indoors.

### Feeding

In terms of the daily routine tasks using the appropriate feeding techniques is one of the key factors of success. The experiences show that in several cases the associated species can be easily competitors of each other in reference to nutrition. Therefore it is necessary to feed the smaller species separately or provide as many feeding stations



as possible throughout the whole enclosure and keep the competition to a minimum level, because most of the injuries and fatal accidents are the results of food-related aggression. In general, feeding the different species separately is an important factor in managing the mixed-species exhibit successfully, but on the other hand this makes it difficult to apply certain food-related environmental enrichment methods in comparison with a single-species enclosure.

## **Breeding**

One of the most important questions is to decide whether we would like to breed the species involved in a multi-species exhibit, or which species we want to breed. The practice of zoos keeping peccaries in a mixed exhibit shows that the presence of these omnivorous animals means potential danger for the other species when they are dominant in the given coexistence. In this case providing the above-mentioned own areas or total separation can be the solution during the time of rearing the young. Furthermore, the behavioural changes of the adult animals during the breeding season must also be borne in mind which may easily lead to fatal injuries. Therefore it is really important to emphasize the possibility of proper separation. Generally speaking it seems to be true that the proper management of breeding in a mixed-species enclosure is more difficult – or sometimes impossible – than in a single-species exhibit. As a result, there is no aim to breed (all) the animals in this type of exhibitry in many cases, so sterilisation and single-sex grouping are also applied techniques in managing. If any of the species has an important breeding programme like SSP or EEP, it is worth to look over and analyse all the mentioned disadvantages before putting the given animals into a mixed enclosure.

## **Choice of species and individuals**

According to the criteria of species selection, most of the known examples show that zoos exhibit animals together from the same geographic region for educational purposes. In the case of combining species that occupy similar ecological niches in nature the level of competition can be very high, therefore a large difference in body size between the combined species may be part of the solution. Choosing animals with different lifestyles – for example terrestrial-arboreal or diurnal-nocturnal – might be a good option as well. Although considering the theoretical approaches of the appropriate selection of species are also very important, we have to take into account that the success of the combination depends mostly on the individual level, simply because of the diverse individual characteristics of the animals in terms of behaviour. Correct introduction of the different species is a very sensitive issue which depends principally on the method of socialization and age of the animals. Introducing the smaller and subdominant species to the exhibit can be efficient due to exploring the whole area. During socialization the principle of gradience should be followed, so visual and olfactory stimuli have to be the first before the possibility of physical contact of the animals. In general younger animals can be combined easier, but the experiences have shown us that many adult peccaries have successfully been mixed with several other taxa.



## List of mixed-species exhibits involving Tayassuids

This document purposefully focuses on creating a list of current and historic mixed-species exhibits with family *Tayassuidae*; many of the listed coexistences are still ongoing at present, many of them are not anymore. Only a short summary of the general experiences is given here, therefore for further and detailed information it is worth contacting the institutions mentioned below.

Within the narrower meaning of the mixed-species exhibits this document deals with three species of Peccaries.

In the list below you can see which species have been kept in mixed exhibits in captivity:

### **Peccaries, *Tayassuidae***

**Chacoan Peccary**, *Catagonus wagneri* Rusconi, 1930

**Collared Peccary**, *Pecari tajacu* Linnaeus, 1758

**White-lipped Peccary**, *Tayassu pecari* Link, 1795



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## **LIST OF SPECIES COMBINATIONS - *TAYASSUIDAE***

**The list shows examples of species combinations with at least one peccary species combined with the taxa below**

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**Chacoan Peccary, *Catagonus wagneri*** (Photo © Krisztián Svábik)

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Bearded Capuchin, *Sapajus libidinosus*

South American Coati, *Nasua nasua*

White-nosed Coati, *Nasua narica*

Greater Rhea, *Rhea americana*





**Collared Peccary, *Pecari tajacu*** (Photo © Krisztián Svábik)

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Giant Anteater, *Myrmecophaga tridactyla*  
Capuchin, *Sapajus sp.*  
Bearded Capuchin, *Sapajus libidinosus*  
Central American Agouti, *Dasyprocta punctata*  
Patagonian Mara, *Dolichotis patagonum*  
Capybara, *Hydrochoerus hydrochaeris*  
Mexican Grey Wolf, *Canis lupus baileyi*  
Coyote, *Canis latrans*  
American Black Bear, *Ursus americanus*  
South American Coati, *Nasua nasua*  
White-nosed Coati, *Nasua narica*  
South American Tapir, *Tapirus terrestris*  
Shetland Pony, *Equus ferus f. caballus*  
Guanaco, *Lama guanicoe*  
Llama, *Lama guanicoe f. glama*  
Alpaca, *Vicugna vicugna f. pacos*  
Tule Elk, *Cervus canadensis nannodes*  
White-tailed Deer, *Odocoileus virginianus*  
Sinaloa White-tailed Deer, *Odocoileus virginianus sinaloae*  
Fallow Deer, *Dama dama*  
Southern Pudu, *Pudu puda*  
American Bison, *Bison bison*  
Wood Bison, *Bison bison athabasca*  
Bighorn Sheep, *Ovis canadensis*  
Greater Rhea, *Rhea americana*  
Lesser Rhea, *Rhea pennata*  
American White Pelican, *Pelecanus erythrorhynchos*  
Great White Pelican, *Pelecanus onocrotalus*  
Black-necked Swan, *Cygnus melanocoryphus*  
Canada Goose, *Branta canadensis*  
Orinoco Goose, *Neochen jubata*  
Andean Goose, *Chloephaga melanoptera*  
Ruddy-headed Goose, *Chloephaga rubidiceps*  
White-cheeked Pintail, *Anas bahamensis*  
Mallard, *Anas platyrhynchos*  
Mexican Duck, *Anas diazi*  
Yellow-billed Teal, *Anas flavirostris oxyptera*  
Chiloe Wigeon, *Mareca sibilatrix*  
Rosy-billed Pochard, *Netta peposaca*  
Black-bellied Whistling-duck, *Dendrocygna autumnalis*  
White-faced Whistling-duck, *Dendrocygna viduata*  
Coot, *Fulica sp.*  
American Coot, *Fulica americana*





Wild Turkey, *Meleagris gallopavo*

Jabiru, *Jabiru mycteria*

Red-legged Seriema, *Cariama cristata*

Northern Screamer, *Chauna chavaria*

Southern Screamer, *Chauna torquata*

Red-eared Slider, *Trachemys scripta elegans*



**White-lipped Peccary, *Tayassu pecari*** (Photo © Anita Mazács)

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South American Coati, *Nasua nasua*



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## LIST OF MIXED-SPECIES EXHIBITS WITH LOCATIONS - *TAYASSUIDAE*

**The list shows specific examples of current and historic mixed-species exhibits involving at least one peccary species combined with the taxa below, with indication of the institution(s) where they have been tried out**

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**Chacoan Peccary, *Catagonus wagneri***

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Combined species:

- Chacoan Peccary, *Catagonus wagneri*
- Bearded Capuchin, *Sapajus libidinosus*
- South American Coati, *Nasua nasua*

Institution(s): Zoologischer Garten Schwerin (Germany)

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Combined species:

- Chacoan Peccary, *Catagonus wagneri*
- White-nosed Coati, *Nasua narica*

Institution(s): Zoo Leipzig (Germany)



**Chacoan Peccaries (*Catagonus wagneri*) and White-nosed Coati (*Nasua narica*)**  
**Zoo Leipzig, Germany**  
**Photo © Florian Rimpler**





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Combined species:

- Chacoan Peccary, *Catagonus wagneri*
- White-nosed Coati, *Nasua narica*
- South American Coati, *Nasua nasua*

Institution(s): ZOO Planckendael (Mechelen, Belgium)



**Chacoan Peccaries (*Catagonus wagneri*) and White-nosed Coati (*Nasua narica*)**  
**ZOO Planckendael, Mechelen, Belgium**  
**Photo © Kevin B.**

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Combined species:

- Chacoan Peccary, *Catagonus wagneri*
- Greater Rhea, *Rhea americana*

Institution(s): Sequoia Park Zoo (Eureka, California, United States of America)



### **Collared Peccary, *Pecari tajacu***

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Giant Anteater, *Myrmecophaga tridactyla*
- Capybara, *Hydrochoerus hydrochaeris*
- South American Tapir, *Tapirus terrestris*
- Southern Pudu, *Pudu puda*
- Andean Goose, *Chloephaga melanoptera*
- Wild Turkey, *Meleagris gallopavo*
- Jabiru, *Jabiru mycteria*
- Northern Screamer, *Chauna chavaria*
- Southern Screamer, *Chauna torquata*

Institution(s): Zoo Dortmund (Germany)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Giant Anteater, *Myrmecophaga tridactyla*
- Patagonian Mara, *Dolichotis patagonum*
- Capybara, *Hydrochoerus hydrochaeris*
- South American Tapir, *Tapirus terrestris*
- Southern Pudu, *Pudu puda*
- Greater Rhea, *Rhea americana*
- Southern Screamer, *Chauna torquata*

Institution(s): Zoo Dortmund (Germany)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Giant Anteater, *Myrmecophaga tridactyla*
- Patagonian Mara, *Dolichotis patagonum*
- Capybara, *Hydrochoerus hydrochaeris*
- Guanaco, *Lama guanicoe*

Institution(s): Wilhelma – Der Zoologische-Botanische Garten – Stuttgart (Germany)





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Combined species:

- Collared Peccary, *Pecari tajacu*
- Capuchin, *Sapajus sp.*
- South American Coati, *Nasua nasua*

Institution(s): Zoo Salzburg Hellbrunn (Austria)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Bearded Capuchin, *Sapajus libidinosus*
- South American Coati, *Nasua nasua*

Institution(s): Zoologischer Garten Schwerin (Germany)



**Collared Peccaries (*Pecari tajacu*), Bearded Capuchins (*Sapajus libidinosus*) and South American Coatis (*Nasua nasua*)**  
**Zoologischer Garten Schwerin, Germany**  
**Photo © Mario Berndtgen**





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Combined species:

- Collared Peccary, *Pecari tajacu*
- Central American Agouti, *Dasyprocta punctata*
- South American Coati, *Nasua nasua*

Institution(s): Spaycific Zoo (Spay, France)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Patagonian Mara, *Dolichotis patagonum*
- Llama, *Lama guanicoe f. glama*

Institution(s): Kecskeméti Vadaskert (Hungary)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Capybara, *Hydrochoerus hydrochaeris*

Institution(s): Szegedi Vadaspark (Hungary)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Capybara, *Hydrochoerus hydrochaeris*
- South American Tapir, *Tapirus terrestris*

Institution(s): Zoologischer Garten Schwerin (Germany)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Capybara, *Hydrochoerus hydrochaeris*
- South American Tapir, *Tapirus terrestris*
- Guanaco, *Lama guanicoe*
- Lesser Rhea, *Rhea pennata*
- Black-necked Swan, *Cygnus melanocoryphus*
- Orinoco Goose, *Neochen jubata*
- Ruddy-headed Goose, *Chloephaga rubidiceps*
- White-cheeked Pintail, *Anas bahamensis*
- Yellow-billed Teal, *Anas flavirostris oxyptera*
- Chiloe Wigeon, *Mareca sibilatrix*
- Rosy-billed Pochard, *Netta peposaca*
- Black-bellied Whistling-duck, *Dendrocygna autumnalis*
- White-faced Whistling-duck, *Dendrocygna viduata*
- Red-legged Seriema, *Cariama cristata*
- Southern Screamer, *Chauna torquata*

Institution(s): Audubon Zoo (New Orleans, Louisiana, United States of America)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Mexican Grey Wolf, *Canis lupus baileyi*
- Coyote, *Canis latrans*
- American Black Bear, *Ursus americanus*
- Sinaloa White-tailed Deer, *Odocoileus virginianus sinaloae*
- Canada Goose, *Branta canadensis*
- Mexican Duck, *Anas diazi*
- American Coot, *Fulica americana*
- Wild Turkey, *Meleagris gallopavo*
- Red-eared Slider, *Trachemys scripta elegans*

Institution(s): Africam Safari (Puebla, Mexico)





**Collared Peccaries (*Pecari tajacu*) and American Black Bears (*Ursus americanus*)**  
**Africam Safari, Puebla, Mexico**  
**Photos © Frank Carlos Camacho**





**Collared Peccaries (*Pecari tajacu*) and American Black Bears (*Ursus americanus*)**  
**Africam Safari, Puebla, Mexico**  
**Photo © Frank Carlos Camacho**

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Combined species:

- Collared Peccary, *Pecari tajacu*
- American Black Bear, *Ursus americanus*
- Sinaloa White-tailed Deer, *Odocoileus virginianus sinaloae*
- American White Pelican, *Pelecanus erythrorhynchos*
- Canada Goose, *Branta canadensis*
- Mallard, *Anas platyrhynchos*
- Mexican Duck, *Anas diazi*
- Coot, *Fulica sp.*
- Wild Turkey, *Meleagris gallopavo*

Institution(s): Africam Safari (Puebla, Mexico)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- South American Coati, *Nasua nasua*

Institution(s): Zoologická a botanická zahrada města Plzně (Czech Republic), Zoologická zahrada Liberec (Czech Republic), ZOO a zámek Zlín-Lešná (Czech Republic), Zoologischer Garten Schwerin (Germany), Tier- und Freizeitpark Eichholz Gemendorf (Germany), Spaycific Zoo (Spay, France), Miskolci Állatkert és Kultúrpark (Hungary)





**Collared Peccaries (*Pecari tajacu*) and South American Coati (*Nasua nasua*)**  
**Miskolci Állatkert és Kultúrpark, Hungary**  
**Photo © Antal Nagy**



**Collared Peccary (*Pecari tajacu*) and South American Coati (*Nasua nasua*)**  
**Zoologická zahrada Liberec, Czech Republic**  
**Photo © Alex Kantorovich**





**Collared Peccaries (*Pecari tajacu*) and South American Coatis (*Nasua nasua*)**  
**Zoologická zahrada Liberec, Czech Republic**  
**Photo © Alex Kantorovich**



**Collared Peccaries (*Pecari tajacu*) and South American Coatis (*Nasua nasua*)**  
**Zoologická zahrada Liberec, Czech Republic**  
**Photo © www.zoochat.com**





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Combined species:

- Collared Peccary, *Pecari tajacu*
- White-nosed Coati, *Nasua narica*

Institution(s): Papiliorama (Kerzers, Switzerland)



**Collared Peccary (*Pecari tajacu*) and White-nosed Coati (*Nasua narica*)**  
**Papiliorama, Kerzers, Switzerland**  
**Photo © Krisztián Svábik**

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Shetland Pony, *Equus ferus f. caballus*
- Llama, *Lama guanicoe f. glama*

Institution(s): Zoo vrt Osijek (Croatia)





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Combined species:

- Collared Peccary, *Pecari tajacu*
- South American Tapir, *Tapirus terrestris*

Institution(s): Dallas Zoo (Texas, United States of America), Zoo Santo Inácio (Avintes, Portugal), Szegedi Vadaspark (Hungary), Nagyerdei Kultúrpark (Debrecen, Hungary)



**Collared Peccaries (*Pecari tajacu*) and South American Tapir (*Tapirus terrestris*)**  
**Zoo Santo Inácio, Avintes, Portugal**  
**Photo © Nayer Youakim**

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Combined species:

- Collared Peccary, *Pecari tajacu*
- South American Tapir, *Tapirus terrestris*
- Alpaca, *Vicugna vicugna f. pacos*

Institution(s): Nyíregyházi Állatpark (Hungary)



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Combined species:

- Collared Peccary, *Pecari tajacu*
- Guanaco, *Lama guanicoe*

Institution(s): Detroit Zoo (Michigan, United States of America), Miskolci Állatkert és Kultúrpark (Hungary)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Guanaco, *Lama guanicoe*
- Fallow Deer, *Dama dama*
- Southern Screamer, *Chauna torquata*

Institution(s): Detroit Zoo (Michigan, United States of America)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Tule Elk, *Cervus canadensis nannodes*

Institution(s): Audubon Zoo (New Orleans, Louisiana, United States of America)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Tule Elk, *Cervus canadensis nannodes*
- White-tailed Deer, *Odocoileus virginianus*
- Wild Turkey, *Meleagris gallopavo*

Institution(s): Audubon Zoo (New Orleans, Louisiana, United States of America)

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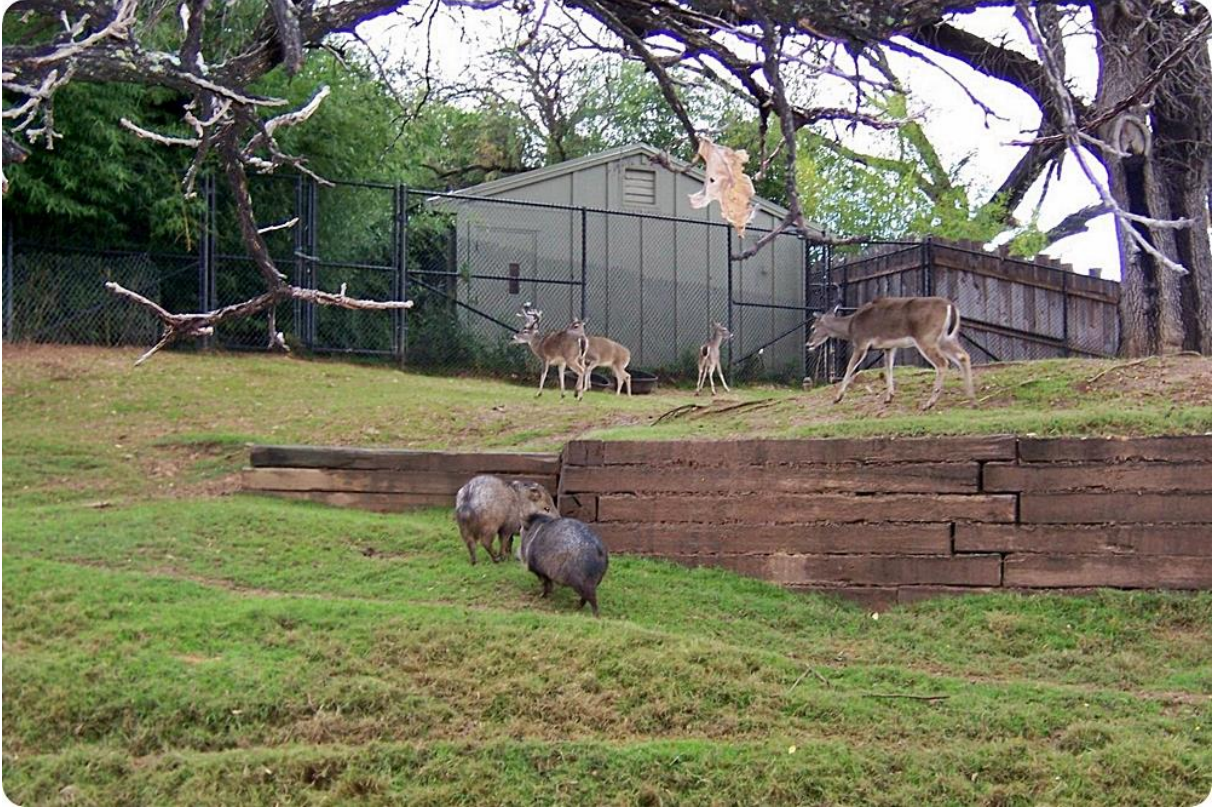
Combined species:

- Collared Peccary, *Pecari tajacu*
- White-tailed Deer, *Odocoileus virginianus*
- Wild Turkey, *Meleagris gallopavo*

Institution(s): Cameron Park Zoo (Waco, Texas, United States of America)

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**Collared Peccaries (*Pecari tajacu*) and White-tailed Deer (*Odocoileus virginianus*)**  
**Cameron Park Zoo, Waco, Texas, United States of America**  
**Photo © [www.zoochat.com](http://www.zoochat.com)**



**Collared Peccary (*Pecari tajacu*) and American Bison (*Bison bison*)**  
**Ueno Zoological Gardens, Tokyo, Japan**  
**Photo © Yasuki Ichishima**





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Combined species:

- Collared Peccary, *Pecari tajacu*
- American Bison, *Bison bison*

Institution(s): Detroit Zoo (Michigan, United States of America), Ueno Zoological Gardens (Tokyo, Japan)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Wood Bison, *Bison bison athabasca*

Institution(s): Tierpark Nordhorn (Germany)



**Collared Peccary (*Pecari tajacu*) and Wood Bison (*Bison bison athabasca*)**  
Tierpark Nordhorn, Germany  
Photo © Jörg Everding





**Collared Peccaries (*Pecari tajacu*) and Wood Bison (*Bison bison athabasca*)**  
**Tierpark Nordhorn, Germany**  
**Photo © Alex Kantorovich**



**Collared Peccary (*Pecari tajacu*) and Wood Bison (*Bison bison athabasca*) mixed exhibit**  
**Tierpark Nordhorn, Germany**  
**Photo © Alex Kantorovich**



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Combined species:

- Collared Peccary, *Pecari tajacu*
- Bighorn Sheep, *Ovis canadensis*

Institution(s): Dallas Zoo (Texas, United States of America)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Greater Rhea, *Rhea americana*

Institution(s): Botanical and Zoological Garden Nahariya (Israel)

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Combined species:

- Collared Peccary, *Pecari tajacu*
- Great White Pelican, *Pelecanus onocrotalus*

Institution(s): Szegedi Vadaspark (Hungary)

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### **White-lipped Peccary, *Tayassu pecari***

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Combined species:

- White-lipped Peccary, *Tayassu pecari*
- South American Coati, *Nasua nasua*

Institution(s): ZOO Planckendael (Mechelen, Belgium)

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## SUMMARIZE THE EXPERIENCES

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The study lists species combinations and mixed exhibits with three species of *Tayassuidae*. Altogether 43 mixed exhibits with peccaries have been collected from 28 zoological institutions worldwide until June 2021.

The results show that the most popular „participant“ is the Collared Peccary which has been listed in 38 mixed exhibits. The Chacoan Peccary has been listed in four, while the White-lipped Peccary in only one mixed exhibit.

In regard to species combination Collared Peccary is the most frequently associated member of the family which has been socialized with 46 different species. Chacoan Peccary listed with four and White-lipped Peccary only with one other taxon.

Peccaries, like suids, can be characterized by their poor vision, good hearing and outstanding olfactory abilities. These medium-sized mammals – morphologically similar to suids as well – are highly social and interact frequently during the day through mutual scent marking, grooming and scratching. Chacoan Peccaries are diurnal, seldom active at night except during hot weather conditions. Collared and White-lipped Peccaries can be active during the day or night depending on weather – primarily temperature – conditions and hunting pressures. All the three species live in herds of various sizes, differing from the typically solitary or small group living lifestyle of most forest ungulate species (TABER et al. 2011).

Peccaries are very defensive animals and for a long time it was thought that they are unsuitable for associations with other species (PUSCHMANN 1983). Peccaries – females also – can behave very aggressively against other species. Special care in this connection should be taken especially during the period of rearing young (HAMMER 2002).

In Sequoia Park Zoo a male group of **Chacoan Peccaries** (5.0) has been successfully mixed with male Greater Rheas (0.2) since 2010. Firstly only two elderly peccaries – approximately 15 years old – were introduced for a breeding pair of rhea. In 2014 three other peccaries – approximately one year old specimens – joined the group, meanwhile the rhea group has also changed from 1.1 to 2.3 to 2.0. The exhibit is 3000 m<sup>2</sup> and has several pen areas, where creeps were installed to allow peccaries access but excluding the birds. The night stall for the peccaries is not accessible for the rheas as well. The exhibit is divided into two parts with gates open between them. When tensions run high the staff can separate the species. The rhea are aggressive to the peccaries: from time to time one of the male rheas chases the peccaries but no aggression has been observed from peccary to bird, but when peccaries are backed into a corner they can defend themselves. Previously rhea breeding has contributed to some tension when the male rheas are territorial (AZA Ungulate TAGs 2017).

Zoo Leipzig started to keep their Chacoan Peccaries together with White-nosed Coatis just a few months ago and according to their experiences the coexistence works well (HOLLAND 2021, pers. comm.).

Zoo Dortmund has had a 3000 m<sup>2</sup> sized South American mixed exhibit since the 1980s where **Collared Peccaries** (1.3), Giant Anteaters (1.3), Capybaras (1.3), South American Tapirs (1.2), Southern Pudus, Andean Geese (1.1), Wild Turkeys (0.0.4), Jabirus (1.1), Northern Screamers (0.0.2) and Southern Screamers (0.0.2) lived together. The species were separated during feeding and overnight (BARTMANN 1980 and HAMMER 2002). Anteaters and tapirs bred regularly; Capybaras, pudus



and peccaries also bred successfully. Peccaries had to be separated when Capybaras or pudus was rearing their young (ZIEGLER 2002).

Wilhelma in Stuttgart has had a multi-species South American exhibit since 1997. The associated species – Collared Peccary (1.4), Giant Anteater (1.1), Patagonian Mara (4.7), Capybara (1.1) and Guanaco (5.14) – were separated during feeding and over night, Guanacos during rearing of young as well. Peccaries perhaps tried to eat young Patagonian Maras. Enclosure size was 2500 m<sup>2</sup> (HAMMER 2002).

Africam Safari in Puebla, Mexico combined their American Black Bears with big herbivores and several species of birds. Originally only the bears settled down in the area, after that, Sinaloa White-tailed Deer were added in 1995, Collared Peccaries arrived in 1996 and several bird species, primarily waterfowl were introduced to the exhibit in 2002. The peccaries are penned separately at night, the bears are also placed in dormitories during the night. When a new bear is introduced, the peccaries and geese are kept in adjacent pens. One occasion an accident has also been reported: one introduced peccary was predated by the bears the second day after it was added to exhibit. No other animal has been predated (AZA Ungulate TAGs 2017). In reference to species combination later on two other carnivores, Mexican Grey Wolves and Coyotes were also added. Associated species and group compositions were the followings in 2017: Collared Peccary (3.4), Mexican Grey Wolf (1.1), Coyote (1.2), American Black Bear (1.5), Sinaloa White-tailed Deer (1.6), Canada Goose (2.2.4), Mexican Duck (3.2), American Coot (+0.0.10), Wild Turkey (1.5), Red-eared Slider (+0.0.22). The whole area is 12.700 m<sup>2</sup> big with a 850 m<sup>2</sup> lake with trout, catfish and carp. Peccaries, wolves and bears all have isolation yards, peccaries and wolves maternity ward and birthing den as well. The group of peccaries consists of juvenile specimens, deer live in a non-breeding group and Coyotes are geriatric (CAMACHO 2017). It is worth mentioning that peccaries' main predators – as documented in several studies – are the Puma and Jaguar. The Collared Peccary – given its smaller size and larger distribution area – has a greater range of natural predators which include Coyote and American Black Bear as well (TABER et al. 2011).

One of the most frequent associations is the Collared Peccary & South American Coati coexistence which has been tried in many institutions. In Zoo Salzburg Hellbrunn the coatis had their own enclosure but had access to the peccaries (HAMMER 2002).

In Miskolc Zoo this combination works perfectly well. The peccaries occupied the enclosure first: during the introduction period they approached the coatis aggressively but there were no problems or injuries. The coatis seems to be the dominant and they can chase the peccaries out of their stall. The latter ones are also protecting their food, but as the coatis are more agile they can easily steal some of their food items (VERESS 2021, pers.comm.).

The Papiliorama in Kerzers kept one male White-nosed Coati with a breeding group of Collared Peccary. The reason the institution tried this combination was that their coatis would be transferred to another zoo but they did not know how long it would take until the paperwork was finished to send them out. As the zoo did not want to keep any of their coati behind the scenes nor put it on birth control they decided to keep the male and female separately. The staff chose the peccary enclosure as it is next to the coati enclosure, only separated by wire mesh. This way the coatis could stay in contact with each other. On first sight things worked out well but probably it was more stressful for the peccaries then was obvious on first sight. The first offspring of the peccaries that was born after the coati was introduced was eaten by the coati. It is not clear if the newborn peccary was still-born or if the coati killed it. In any case the peccary did not get any offspring anymore until months after the coati was moved out again (RÜEGG 2018, pers. comm.).



A male Collared Peccary and a female South American Tapir lived together in Dallas Zoo between 2008-2015. Both animals were lonely after the death of their partner and both geriatric as well. The tapir had impaired eyesight from cataracts. The peccary nipped at the legs of the tapir when excited, causing the tapir to run around the exhibit and the peccary to run after her. Separation for a time out usually resolved the situation quickly. It was observed that the peccary entered the pool to be with the tapir but the tapir pushed him out of the pool. The animals were housed together until the natural death of the peccary (AZA Ungulate TAGs 2017).

In Zoologischer Garten Schwerin the Collared Peccaries attacked young South American Tapirs but the coexistence had to be given up due to other reasons (HAMMER 2002).

Detroit Zoo had an unsuccessful mixed exhibit with a male group of Collared Peccaries (5.0) and a big group of Guanacos (6.6). Neither group was a breeding group as all male specimens were castrated. All animals were geriatric – or nearly – at time of introductions. Species were separated overnight. The institution tried to house these species together over a period of several months, but peccaries chased the Guanacos and the latter ones never became comfortable with the peccaries. Peccaries were aggressive toward Guanacos: often divided up and chased the Guanacos as a group, approaching from many angles. Guanacos were always on alert and moved whenever the peccaries moved to maintain the greatest distance possible. Several individuals of the Guanaco group had arthritis and mobility issues that created an additional difficulty (AZA Ungulate TAGs 2017).

Cameron Park Zoo had a mix of female Collared Peccaries (0.2), a group of White-tailed Deer (2.3) and a pair of Wild Turkey (1.1). The first group the zoo had from 1993-2005 were hand-reared and did well; they even socialized with the deer. The last group the institution had from 2005-2008 were parent-reared and aggressive to all exhibit-mates (AZA Ungulate TAGs 2017).

In Tierpark Nordhorn the Collared Peccary and Wood Bison mixed exhibit opened in 2012. Inside the stables the peccaries have about 14 m<sup>2</sup> available and the bison's 80 m<sup>2</sup>. The separation enclosures measured 92 m<sup>2</sup> and 33 m<sup>2</sup> in size. The mixed-species exhibit is approximately 1600 m<sup>2</sup>, thereof 100 m<sup>2</sup> are retreat areas for the peccaries. On the opposite side of the main exhibit there is an additional space for the smaller species with a shelter. Wooden poles and electric fencing prevent the bison from entering this area. Keeping bison and peccaries together seems to be enriching for both species. Sometimes playful chasing behaviors have been observed between young bison and peccaries (HOMBURG, ZooLex 2019). The White-nosed Coatis are meant to have access to the peccary and bison mixed exhibit. A tunnel with slides to connect both areas was built under the visitor path. This cohabitation so far was not tested because it requires additional fencing in the mixed exhibit (HOMBURG, ZooLex 2020).

The Collared Peccary and American Bison mix has been tried out in other zoos as well, but this combination has been proved unsuccessful in Detroit Zoo. The coexistence was consisted of male group of Collared Peccaries (6.0) and a smaller group of American Bison (1.2). The peccaries were in their late teens, while the male bison was one year old and the females were one and eight years old at the time of introduction. Neither group was a breeding group as all male animals were castrated. The peccaries had a small protected area on exhibit surrounded by vertical posts that the bison could not enter. Multiple areas of deadfall in the mixed exhibit provided "hiding" opportunities for the peccaries. For exhibit servicing the peccaries and bison were locked in separate – but adjacent – stalls in the holding building. The gate to the holding building was modified to allow peccaries to enter while excluding bison.



Finally the coexistence was given up due to the bison were aggressive to peccary and the exhibit was relatively open so peccaries seemed to feel vulnerable moving around in it (AZA Ungulate TAGs 2017).

Dallas Zoo had another combination with their Collared Peccaries (0.2 or 1.1), when these animals lived together with a group of Bighorn Sheep (2.4) for 2-3 years. Species could be separated in separate yards and barns for feeding and as needed, f.e. Bighorn Sheep calves were separated from peccaries until 30 days old. Peccaries were aggressive towards Bighorn Sheep, biting their legs and horns, and chasing them at times. Bighorn Sheep occasionally butted peccaries during encounters which resulted in a broken ribs one instance. Species were separated after the peccaries killed a one month old Bighorn Sheep calf (AZA Ungulate TAGs 2017).

It is worth mentioning that the desert eco-display – Burgers' Desert – in Burgers' Zoo in Arnhem has several free-flying bird species which can enter the Collared Peccary exhibit inside the building.



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