



MIXED-SPECIES EXHIBITS WITH CARNIVORANS V.

Mixed-species exhibits with Dogs (*Canidae*)

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Cover photo © Anita Mazács



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INTRODUCTION

Within the narrower meaning of the mixed-species exhibits this document deals with 18 species of canids.

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

Dogs, *Canidae*

Grey Wolf, *Canis lupus* Linnaeus, 1758
African Golden Wolf, *Canis anthus* F. Cuvier, 1820
Golden Jackal, *Canis aureus* Linnaeus, 1758
Black-backed Jackal, *Canis mesomelas* Schreber, 1775
Dhole, *Cuon alpinus* Pallas, 1811
African Wild Dog, *Lycaon pictus* Temminck, 1820
Maned Wolf, *Chrysocyon brachyurus* Illiger, 1815
Bush Dog, *Speothos venaticus* Lund, 1842
Raccoon Dog, *Nyctereutes procyonoides* Gray, 1834
Crab-eating Fox, *Cerdocyon thous* Linnaeus, 1766
Grey Fox, *Urocyon cinereoargenteus* Schreber, 1775
Island Fox, *Urocyon littoralis* Baird, 1857
Bat-eared Fox, *Otocyon megalotis* Desmarest, 1822
Arctic Fox, *Alopex lagopus* Linnaeus, 1758
Swift Fox, *Vulpes velox* Say, 1823
Red Fox, *Vulpes vulpes* Linnaeus, 1758
Corsac Fox, *Vulpes corsac* Linnaeus, 1768
Fennec Fox, *Vulpes zerda* Zimmermann, 1780

Before discussing the main topic – it is worth to mention the socialization with pets as a dog (*Canis familiaris*).



Dog as companion

Despite being large predators who are able to move at seriously exceedingly speeds, Cheetahs are actually surprisingly shy. These cats are often so nervous and anxious in captivity which reduces the breeding success designed to the species in zoos. That's where dogs come in. Across the United States, zoos including the San Diego Zoo Safari Park, Columbus Zoo, Dallas Zoo and Wildlife Safari have been pairing Cheetahs with their own canine companions in favour of mental and physical wellbeing of the cats which seems to work. When Cheetah cubs are a few months old, they first get to meet their new best friends through a fence, then on leashes if they get along well. Once keepers are confident that they will be fine together, the Cheetah and dog are often brought to a shared living space inside the zoo where they can play off-leash and reach full running speeds chasing each other around. These exercise sessions provide the cats with the opportunity to thrive by expressing natural behaviors like sprinting and chasing. This is also an opportunity to help build the muscles and fitness, which will allow them to reach their running potential.



Cheetah and labrador
San Diego Zoo Safari Park, California, United States of America
Photos © Andy Stardust

Furthermore, in Buffalo Zoo there is a mixed exhibit with Greater One-horned Rhinoceros (*Rhinoceros unicornis*), Gaurs (*Bos gaurus*) and Axis Deer (*Axis axis*); it was reported that at one point there was a barn dog with the big herbivores (AZA 2017).



LIST OF SPECIES COMBINATIONS - *CANIDAE*

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



Grey Wolf, *Canis lupus* (Photo © Anita Mazács)

American Beaver, *Castor canadensis*
African Wild Dog, *Lycaon pictus*
Brown Bear, *Ursus arctos*
American Black Bear, *Ursus americanus*
Asiatic Black Bear, *Ursus thibetanus*
Black-tailed Prairie Dog, *Cynomys ludovicianus*
Moose, *Alces americanus*
Wapiti, *Cervus canadensis*
White-tailed Deer, *Odocoileus virginianus*
Reindeer, *Rangifer tarandus*
Muskox, *Ovibos moschatus*
Mountain Goat, *Oreamnos americanus*
Bighorn Sheep, *Ovis canadensis*
American Bison, *Bison bison*



African Golden Wolf, *Canis anthus* (Photo © Cécile Bloch)

Sloth Bear, *Melursus ursinus*



Golden Jackal, *Canis aureus* (Photo © Anita Mazács)

Raccoon Dog, *Nyctereutes procyonoides*

Brown Bear, *Ursus arctos*

Sloth Bear, *Melursus ursinus*



Black-backed Jackal, *Canis mesomelas* (Photo © Anita Mazács)

Blue Monkey, *Cercopithecus mitis*
Chimpanzee, *Pan troglodytes*
Lion, *Panthera leo*
Plains Zebra, *Equus quagga*
White Rhinoceros, *Ceratotherium simum*
Dromedary, *Camelus dromedarius*
Roan Antelope, *Hippotragus equinus*
Griffon Vulture, *Gyps fulvus*



Dhole, *Cuon alpinus* (Photo © Tamás Veress)

Binturong, *Arctictis binturong*
Sun Bear, *Helarctos malayanus*



African Wild Dog, *Lycaon pictus* (Photo © Krisztián Svábik)

Grey Wolf, *Canis lupus*

White Rhinoceros, *Ceratotherium simum*



Maned Wolf, *Chrysocyon brachyurus* (Photo © Anita Mazács)

Giant Anteater, *Myrmecophaga tridactyla*

Tufted Capuchin, *Sapajus apella*

Black Howler Monkey, *Alouatta caraya*

Capybara, *Hydrochoerus hydrochaeris*

South American Tapir, *Tapirus terrestris*

African Spurred Tortoise, *Centrochelys sulcata*

Galápagos Tortoise, *Chelonoidis nigra*



Bush Dog, *Speothos venaticus* (Photo © Krisztián Svábik)

Spectacled Bear, *Tremarctos ornatus*

South American Coati, *Nasua nasua*

White-nosed Coati, *Nasua narica*

Crab-eating Raccoon, *Procyon cancrivorus*



Raccoon Dog, *Nyctereutes procyonoides* (Photo © Tamás Boros)

Golden Jackal, *Canis aureus*
Northern Raccoon, *Procyon lotor*
American Mink, *Neovison vison*



Crab-eating Fox, *Cerdocyon thous* (Photo © Cláudio Dias Timm)

Andean Condor, *Vultur gryphus*



Grey Fox, *Urocyon cinereoargenteus* (Photo © Wilber Ruíz)

Red Fox, *Vulpes vulpes*
American Black Bear, *Ursus americanus*
Northern Raccoon, *Procyon lotor*



Island Fox, *Urocyon littoralis* (Photo © Shanthanu Bhardwaj)

North American Porcupine, *Erethizon dorsatum*



Bat-eared Fox, *Otocyon megalotis* (Photo © Krisztián Svábik)

Aardvark, *Orycteropus afer*
Mona Monkey, *Cercopithecus mona*
Vervet Monkey, *Chlorocebus pygerythrus*
Cape Porcupine, *Hystrix africaeaustralis*
Meerkat, *Suricata suricatta*
Yellow Mongoose, *Cynictis penicillata*
Common Dwarf Mongoose, *Helogale parvula*
Common Warthog, *Phacochoerus africanus*
Red River Hog, *Potamochoerus porcus*
Bongo, *Tragelaphus eurycerus isaaci*
Yellow-backed Duiker, *Cephalophus silvicultor*
Barbary Sheep, *Ammotragus lervia*
Ostrich, *Struthio camelus*
Egyptian Goose, *Alopochen aegyptiaca*
Grey Crowned Crane, *Balearica regulorum*
Eastern Yellow-billed Hornbill, *Tockus flavirostris*
Helmeted Guineafowl, *Numida meleagris*
Leopard Tortoise, *Stigmochelys pardalis*



Arctic Fox, *Alopex lagopus* (Photo © Krisztián Svábik)

Red Fox, *Vulpes vulpes*
Brown Bear, *Ursus arctos*
American Black Bear, *Ursus americanus*
Polar Bear, *Ursus maritimus*
Harbor Seal, *Phoca vitulina*
Grey Seal, *Halichoerus grypus*
Northern Raccoon, *Procyon lotor*
Reindeer, *Rangifer tarandus*
Muskox, *Ovibos moschatus*
Mountain Goat, *Oreamnos americanus*
Snowy Owl, *Bubo scandiacus*
Ural Owl, *Strix uralensis*
Common Raven, *Corvus corax*



Swift Fox, *Vulpes velox* (Photo © Krisztián Svábik)

Red Fox, *Vulpes vulpes*



Red Fox, *Vulpes vulpes* (Photo © Krisztián Svábik)

Arctic Fox, *Alopex lagopus*
American Beaver, *Castor canadensis*
Grey Fox, *Urocyon cinereoargenteus*
Swift Fox, *Vulpes velox*
Brown Bear, *Ursus arctos*
Polar Bear x Brown Bear hybrid, *Ursus maritimus x Ursus arctos*
American Black Bear, *Ursus americanus*
Asiatic Black Bear, *Ursus thibetanus*
Northern Raccoon, *Procyon lotor*
Eurasian Otter, *Lutra lutra*
Eurasian Badger, *Meles meles*
Striped Skunk, *Mephitis mephitis*
Wild Boar, *Sus scrofa*



Corsac Fox, *Vulpes corsac* (Photo © Krisztián Svábik)

Crested Porcupine, *Hystrix cristata*

Brown Bear, *Ursus arctos*

Asiatic Black Bear, *Ursus thibetanus*

Sloth Bear, *Melursus ursinus*

Asian Small-clawed Otter, *Aonyx cinereus*



Fennec Fox, *Vulpes zerda* (Photo © Krisztián Svábik)

Aardvark, *Orycteropus afer*
Rock Hyrax, *Procavia capensis*
Hairy Armadillo, *Chaetophractus* sp.
Southern Tamandua, *Tamandua tetradactyla*
Ring-tailed Lemur, *Lemur catta*
Red-bellied Tamarin, *Saguinus labiatus*
Golden-handed Tamarin, *Saguinus midas*
South African Ground Squirrel, *Xerus inauris*
Spring Hare, *Pedetes capensis*
Cape Porcupine, *Hystrix africaeaustralis*
Meerkat, *Suricata suricatta*
Yellow Mongoose, *Cynictis penicillata*
Klipspringer, *Oreotragus oreotragus*
Trumpeter Hornbill, *Bycanistes bucinator*



LIST OF MIXED-SPECIES EXHIBITS WITH LOCATIONS - *CANIDAE*

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



Grey Wolf, *Canis lupus*

Combined species:

- Grey Wolf, *Canis lupus*
- American Beaver, *Castor canadensis*
- turtles and fish

Institution(s): Cleveland Metroparks Zoo (Ohio, United States of America)

Combined species:

- Grey Wolf, *Canis lupus*
- African Wild Dog, *Lycaon pictus*

Institution(s): Shanghai Zoo (China)

Combined species:

- Grey Wolf, *Canis lupus*
- Brown Bear, *Ursus arctos*

Institution(s): Dierenrijk (Nuenen, the Netherlands), Ouwehands Dierenpark (Rhenen, the Netherlands), Olmense Zoo (Olmen, Belgium), Pairi Daiza (Brugelette, Belgium), Yaroslavl Zoo (Russia), Alternativer Bärenpark Worbis (Leinefelde-Worbis, Germany), Zoologischer Garten Eberswalde (Germany), Zoologischer Garten Berlin (Germany), Tiergarten Bernburg (Germany), Wildpark Lüneburger Heide (Nindorf-Hanstedt, Germany), Wildpark Poing (Germany), Wisentgehege Springe (Germany), Zoologischer Garten Schwerin (Germany), Juraparc (Le Pont-Vallorbe, Switzerland), Natur- und Tierpark Goldau (Switzerland), Kolmårdens Djurpark (Sweden), Orsa Grönklitt Björnpark (Sweden), Zoo Tábor (Czech Republic), ZOO Ljubljana (Slovenia), Kittenberger Kálmán Növény- és Vadaspark (Veszprém, Hungary), Budakeszi Vadaspark (Hungary), Szegedi Vadaspark (Hungary), Medveotthon (Veresegyház, Hungary), Jászberényi Állat- és Növénykert (Hungary), Grouse Mountain Wildlife Refuge (Vancouver, Canada)



Grey Wolf (*Canis lupus*) and Brown Bear (*Ursus arctos*)
Medveotthon, Veresegyház, Hungary
Photo © Anita Mazács



Grey Wolves (*Canis lupus*) and Brown Bear (*Ursus arctos*)
Ouwehands Dierenpark, Rhenen, the Netherlands
Photo © Ouwehands Dierenpark



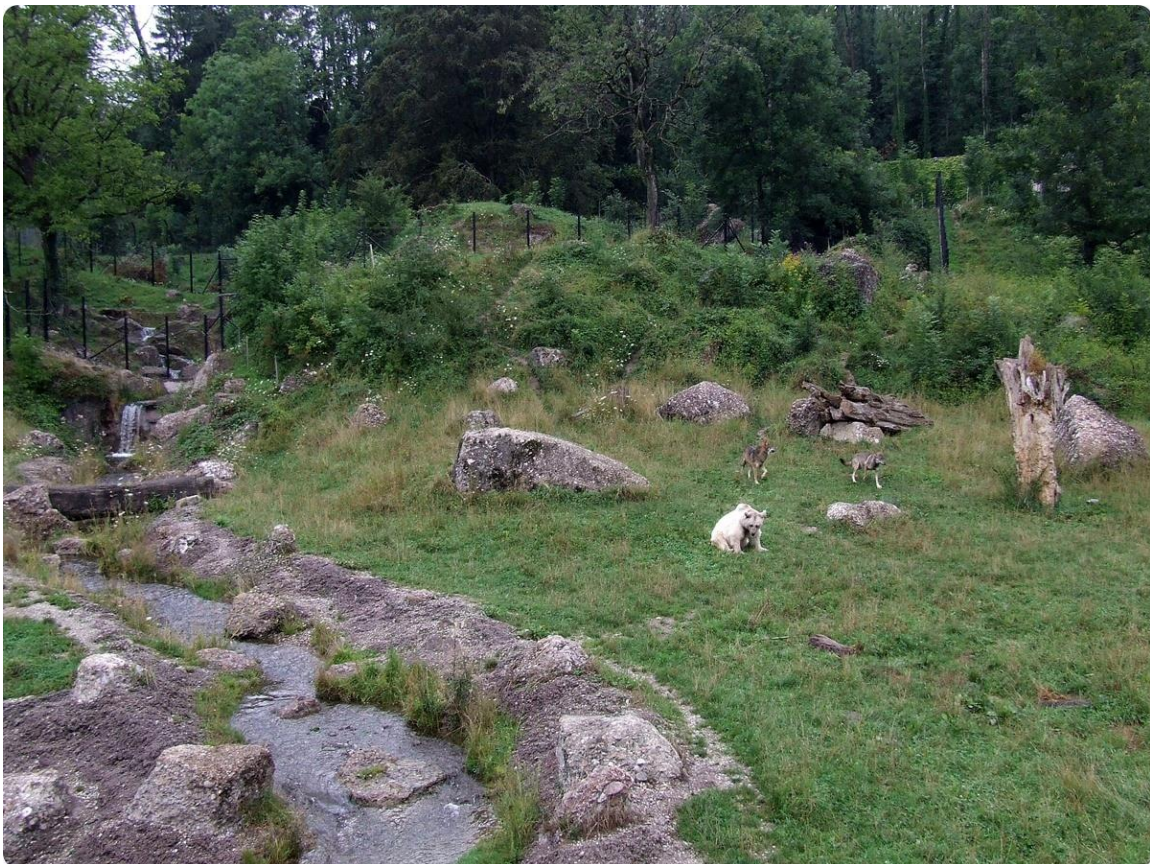
Grey Wolf (*Canis lupus*) and Brown Bear (*Ursus arctos*)
Juraparc, Vallorbe, Switzerland
Photo © Klaus Robin



Grey Wolf (*Canis lupus*) and Brown Bear (*Ursus arctos*)
Juraparc, Vallorbe, Switzerland
Photo © Juraparc



Grey Wolf (*Canis lupus*) and Brown Bear (*Ursus arctos*)
Juraparc, Vallorbe, Switzerland
Photo © Juraparc



Grey Wolf (*Canis lupus*) and Syrian Brown Bear (*Ursus arctos syriacus*) mixed exhibit
Natur- und Tierpark Goldau, Switzerland
Photo © Krisztián Svábik



Grey Wolves (*Canis lupus*) and Syrian Brown Bear (*Ursus arctos syriacus*)
Natur- und Tierpark Goldau, Switzerland
Photo © Krisztián Svábik

Combined species:

- Grey Wolf, *Canis lupus*
- American Black Bear, *Ursus americanus*

Institution(s): Ree Park – Ebeltoft Safari (Denmark) (Arctic Wolf, *Canis l. arctos*), Woburn Safari Park (Milton Keynes, United Kingdom), ZOO Olomouc (Czech Republic) (Arctic Wolf, *Canis l. arctos*), Zoo Tábor (Czech Republic), Olympic Game Farm (Sequim, United States of America), Greater Vancouver Zoo (Aldergrove, Canada)



Arctic Wolves (*Canis lupus arctos*) and American Black Bears (*Ursus americanus*)
Ree Park – Ebeltoft Safari, Denmark
Photo © Kare Jensen

Combined species:

- Grey Wolf, *Canis lupus*
- Asiatic Black Bear, *Ursus thibetanus*

Institution(s): Safari Park Gelendzhik (Russia)

Combined species:

- Grey Wolf, *Canis lupus*
- American Black Bear, *Ursus americanus*
- Puma, *Puma concolor*

Institution(s): Out of Africa Wildlife Park (Camp Verde, United States of America)



Combined species:

- Grey Wolf, *Canis lupus*
- American Black Bear, *Ursus americanus*
- Black-tailed Prairie Dog, *Cynomys ludovicianus*
- Moose, *Alces americanus*
- Wapiti, *Cervus canadensis*
- White-tailed Deer, *Odocoileus virginianus*
- Reindeer, *Rangifer tarandus*
- Muskox, *Ovibos moschatus*
- Mountain Goat, *Oreamnos americanus*
- Bighorn Sheep, *Ovis canadensis*
- American Bison, *Bison bison*

Institution(s): Zoo sauvage de Saint-Félicien (Quebec, Canada)

Combined species:

- Grey Wolf, *Canis lupus*
- American Bison, *Bison bison*

Institution(s): Parc Animalier du Hérisson (Doucier, France), Wolf Park (Battle Ground, Indiana, United States of America)



Grey Wolf (*Canis lupus*) and American Bison (*Bison bison*)
Wolf Park, Battle Ground, Indiana, United States of America
Photo © Monty Sloan



Grey Wolf (*Canis lupus*) and American Bison (*Bison bison*)
Wolf Park, Battle Ground, Indiana, United States of America
Photos © Monty Sloan



Grey Wolves (*Canis lupus*) and American Bison (*Bison bison*)
Wolf Park, Battle Ground, Indiana, United States of America
Photos © Monty Sloan



Grey Wolf (*Canis lupus*) and American Bison (*Bison bison*)
Wolf Park, Battle Ground, Indiana, United States of America
Photos © Monty Sloan



Grey Wolf (*Canis lupus*) and American Bison (*Bison bison*)
Wolf Park, Battle Ground, Indiana, United States of America
Photos © Monty Sloan



Grey Wolves (*Canis lupus*) and American Bison (*Bison bison*)
Wolf Park, Battle Ground, Indiana, United States of America
Photos © Monty Sloan



African Golden Wolf, *Canis anthus*

Combined species:

- Two subspecies of the African Golden Wolf, *Canis anthus*: Egyptian Wolf, *Canis a. lupaster* and Somali Wolf, *Canis a. riparius*
- Sloth Bear, *Melursus ursinus ursinus*

Institution(s): NaturZoo Rheine (Germany)



Golden Jackal, *Canis aureus*

Combined species:

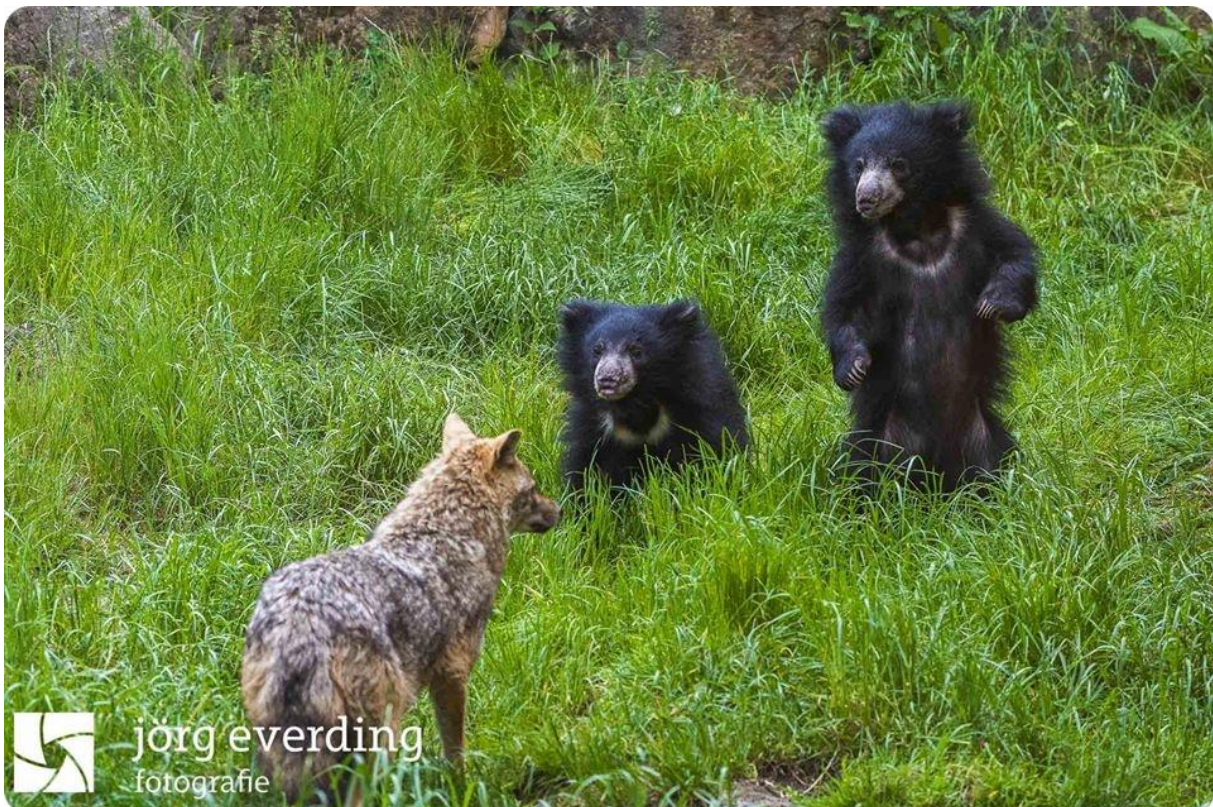
- Golden Jackal, *Canis aureus moreotica*
- Sloth Bear, *Melursus ursinus ursinus*

Institution(s): NaturZoo Rheine (Germany)



European Jackal (*Canis aureus moreotica*) and Indian Sloth Bear (*Melursus ursinus ursinus*)

**NaturZoo Rheine, Germany
Photo © NaturZoo Rheine**



European Jackal (*Canis aureus moreotica*) and Indian Sloth Bear (*Melursus ursinus ursinus*)

**NaturZoo Rheine, Germany
Photos ©Jörg Everding**



Combined species:

- Golden Jackal, *Canis aureus moreotica*
- Brown Bear, *Ursus arctos*

Institution(s): Szegedi Vadaspark (Hungary)

Combined species:

- Golden Jackal, *Canis aureus*
- Raccoon Dog, *Nyctereutes procyonoides*

Institution(s): Parco Faunistico La Torbiera (Agrate Conturbia, Italy)



Black-backed Jackal, *Canis mesomelas*

Combined species:

- Black-backed Jackal, *Canis mesomelas*
- Blue Monkey, *Cercopithecus mitis stuhlmanni*

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

Combined species:

- Black-backed Jackal, *Canis mesomelas*
- Chimpanzee, *Pan troglodytes*

Institution(s): Taronga Zoo (Sydney, Australia)



**Black-backed Jackal (*Canis mesomelas*) and Chimpanzee (*Pan troglodytes*), 1982
Taronga Zoo, Sydney, Australia
Photo © www.zoochat.com**



Combined species:

- Black-backed Jackal, *Canis mesomelas*
- Lion, *Panthera leo bleyenberghi*

Institution(s): Zoo Leipzig (Germany)

Combined species:

- Black-backed Jackal, *Canis mesomelas*
- White Rhinoceros, *Ceratotherium simum simum*

Institution(s): Allwetterzoo Münster (Germany)

Combined species:

- Black-backed Jackal, *Canis mesomelas*
- Dromedary, *Camelus dromedarius*

Institution(s): Tiergarten Schönbrunn (Vienna, Austria)

Combined species:

- Black-backed Jackal, *Canis mesomelas*
- Plains Zebra, *Equus quagga*
- Roan Antelope, *Hippotragus equinus*

Institution(s): Tiergarten Schönbrunn (Vienna, Austria)

Combined species:

- Black-backed Jackal, *Canis mesomelas*
- Griffon Vulture, *Gyps fulvus fulvus*

Institution(s): Dierenpark Amersfoort (the Netherlands)



Dhole, *Cuon alpinus*

Combined species:

- Dhole, *Cuon alpinus*
- Binturong, *Arctictis binturong*

Institution(s): Zoo Taiping & Night Safari (Malaysia)

Combined species:

- Dhole, *Cuon alpinus*
- Sun Bear, *Helarctos malayanus*

Institution(s): ZooParc de Trégomeur (France)



African Wild Dog, *Lycaon pictus*

Combined species:

- African Wild Dog, *Lycaon pictus*
- Grey Wolf, *Canis lupus*

Institution(s): Shanghai Zoo (China)

Combined species:

- African Wild Dog, *Lycaon pictus*
- White Rhinoceros, *Ceratotherium simum*

Institution(s): CERZA Parc Zoologique Lisieux (France)



Maned Wolf, *Chrysocyon brachyurus*

Combined species:

- Maned Wolf, *Chrysocyon brachyurus*
- Giant Anteater, *Myrmecophaga tridactyla*

Institution(s): RZSS Edinburgh Zoo (United Kingdom), Zoo Leipzig (Germany), Zoo Osnabrück (Germany), Phoenix Zoo (Arizona, United States of America), Houston Zoo (Texas, United States of America), San Diego Zoo (Kalifornia, United States of America), Sunset Zoo (Manhattan, Kansas, United States of America), Montgomery Zoo & Mann Wildlife Learning Museum (Alabama, United States of America), Zoo Boise (Idaho, United States of America), Audubon Zoo (New Orleans, Louisiana, United States of America), Greensboro Science Center (North Carolina, United States of America), Turtle Back Zoo (West Orange, New Jersey, United States of America)



Maned Wolf (*Chrysocyon brachyurus*) and Giant Anteater (*Myrmecophaga tridactyla*)
Phoenix Zoo, Arizona, United States of America
Photo © Rebecca Benham



**Maned Wolf (*Chrysocyon brachyurus*) and Giant Anteater (*Myrmecophaga tridactyla*)
Greensboro Science Center, North Carolina, United States of America
Photos © Greensboro Science Center**



Combined species:

- Maned Wolf, *Chrysocyon brachyurus*
- Black Howler Monkey, *Alouatta caraya*

Institution(s): Zoo Opole (Poland)

Combined species:

- Maned Wolf, *Chrysocyon brachyurus*
- Capybara, *Hydrochoerus hydrochaeris*

Institution(s): Houston Zoo (Texas, United States of America), Rolling Hills Zoo (Salina, Kansas, United States of America), Wildlife Safari (Winston, Oregon, United States of America)

Combined species:

- Maned Wolf, *Chrysocyon brachyurus*
- South American Tapir, *Tapirus terrestris*

Institution(s): South Lakes Safari Zoo (Lindal in Furness, United Kingdom), Audubon Zoo (New Orleans, Louisiana, United States of America), Houston Zoo (Texas, United States of America)

Combined species:

- Maned Wolf, *Chrysocyon brachyurus*
- Capybara, *Hydrochoerus hydrochaeris*
- South American Tapir, *Tapirus terrestris*

Institution(s): Zoo de Lille (France)



**Maned Wolf (*Chrysocyon brachyurus*) and South American Tapir (*Tapirus terrestris*)
mixed exhibit
Zoo de Lille, France
Photos © Alex Kantorovich**



Maned Wolf (*Chrysocyon brachyurus*) and South American Tapir (*Tapirus terrestris*)
Zoo de Lille, France
Photos © Alex Kantorovich



Combined species:

- Maned Wolf, *Chrysocyon brachyurus*
- Tufted Capuchin, *Sapajus apella*
- Capybara, *Hydrochoerus hydrochaeris*
- South American Tapir, *Tapirus terrestris*

Institution(s): CERZA Parc Zoologique Lisieux (France)

Combined species:

- Maned Wolf, *Chrysocyon brachyurus*
- African Spurred Tortoise, *Centrochelys sulcata*
- Galápagos Tortoise, *Chelonoidis nigra*

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



Bush Dog, *Speothos venaticus*

Combined species:

- Bush Dog, *Speothos venaticus*
- Spectacled Bear, *Tremarctos ornatus*

Institution(s): Zoo Frankfurt (Germany)

Combined species:

- Bush Dog, *Speothos venaticus*
- South American Coati, *Nasua nasua*

Institution(s): Twycross Zoo (United Kingdom), Parc Zoologique de Paris (France)



Bush Dog (*Speothos venaticus*) and South American Coatis (*Nasua nasua*)
Twycross Zoo, United Kingdom
Photo © Ben Gilbert



Combined species:

- Bush Dog, *Speothos venaticus*
- White-nosed Coati, *Nasua narica*
- Crab-eating Raccoon, *Procyon cancrivorus*

Institution(s): ZooParc Overloon (the Netherlands)



Bush Dog (*Speothos venaticus*), White-nosed Coati (*Nasua narica*) and Crab-eating Raccoon (*Procyon cancrivorus*)
ZooParc Overloon, the Netherlands
Photo © Steven van den Heuvel



Raccoon Dog, *Nyctereutes procyonoides*

Combined species:

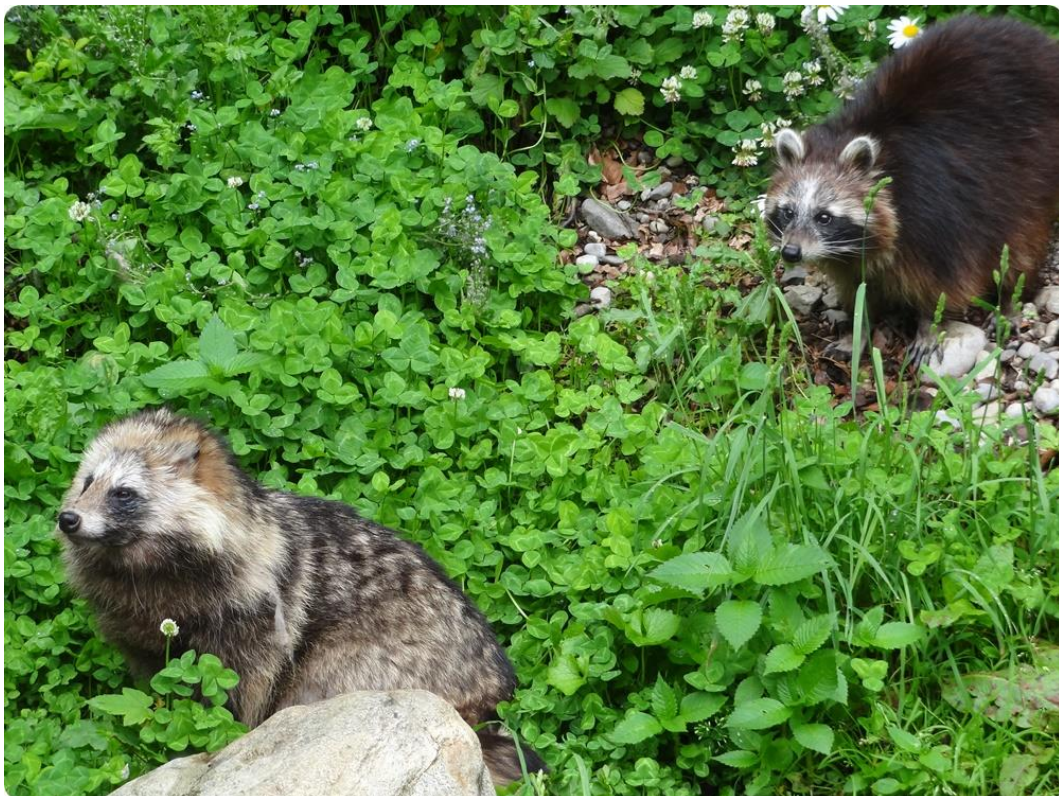
- Raccoon Dog, *Nyctereutes procyonoides*
- Golden Jackal, *Canis aureus*

Institution(s): Parco Faunistico La Torbiera (Agrate Conturbia, Italy)

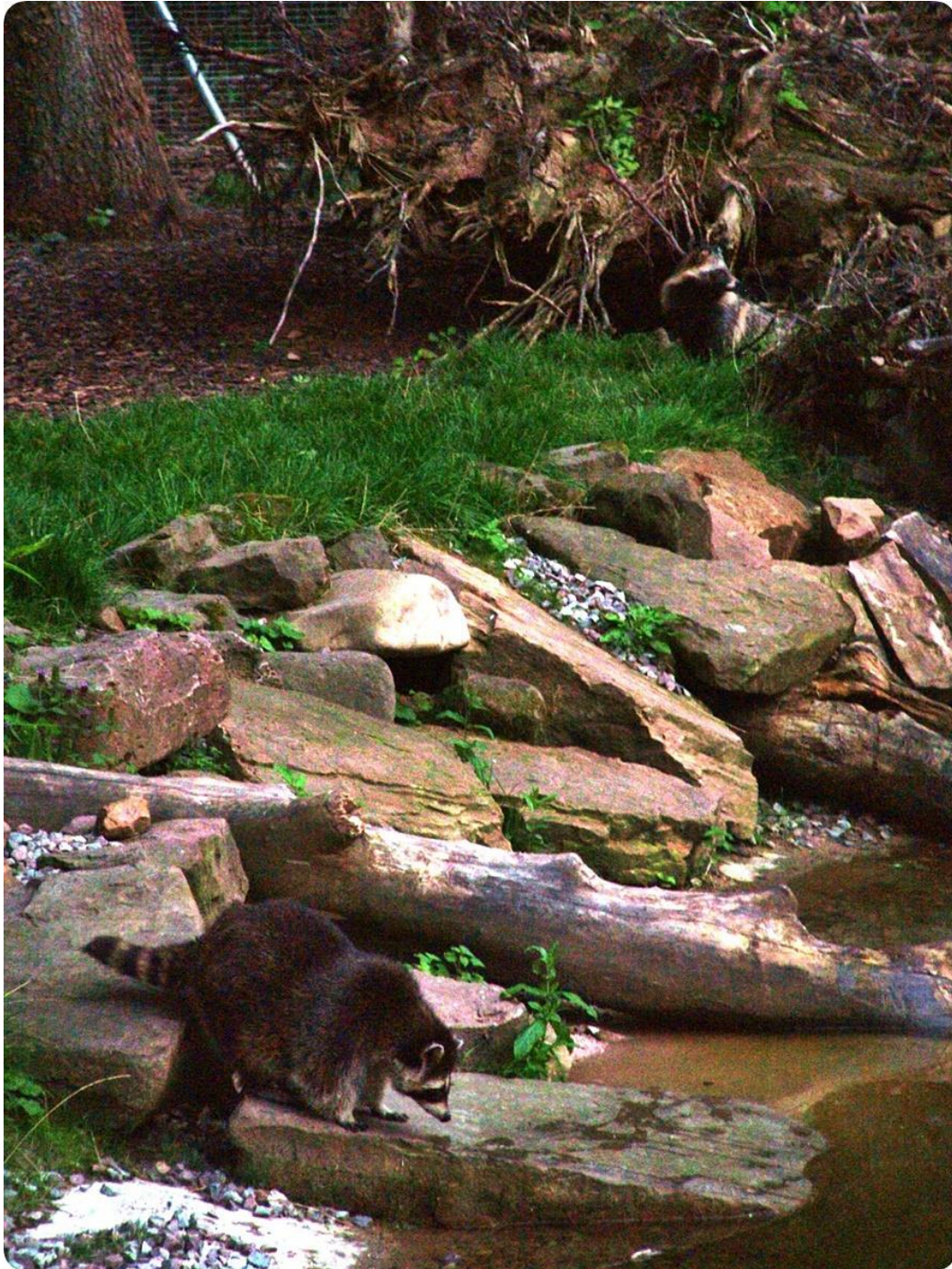
Combined species:

- Raccoon Dog, *Nyctereutes procyonoides*
- Northern Raccoon, *Procyon lotor*

Institution(s): Kecskeméti Vadaskert (Hungary), Solinger Vogel- und Tierpark (Germany), Greifvogelstation & Wildfreigehege Hellenthal (Germany), Wildpark Pforzheim (Germany), Tierpark Bern - Dählhölzli (Switzerland), Moscow Zoo (Russia)



Raccoon Dog (*Nyctereutes procyonoides*) and Northern Raccoon (*Procyon lotor*)
Tierpark Bern - Dählhölzli, Switzerland
Photo © dr. Marc Rosset



Raccoon Dog (*Nyctereutes procyonoides*) and Northern Raccoon (*Procyon lotor*)
Wildpark Pforzheim, Germany
Photo © Ben Gilbert

Combined species:

- Raccoon Dog, *Nyctereutes procyonoides*
- Northern Raccoon, *Procyon lotor*
- American Mink, *Neovison vison*

Institution(s): Wildpark Mölln (Germany)



Crab-eating Fox, *Cerdocyon thous*

Combined species:

- Crab-eating Fox, *Cerdocyon thous*
- Andean Condor, *Vultur gryphus*

Institution(s): Los Angeles Zoo (California, United States of America)



Grey Fox, *Urocyon cinereoargenteus*

Combined species:

- Grey Fox, *Urocyon cinereoargenteus*
- Red Fox, *Vulpes vulpes*
- Northern Raccoon, *Procyon lotor*

Institution(s): Charles Towne Landing State Historic Site (South Carolina, United States of America)

Combined species:

- Grey Fox, *Urocyon cinereoargenteus*
- American Black Bear, *Ursus americanus*

Institution(s): Arizona-Sonora Desert Museum (Tucson, Arizona, United States of America)

Combined species:

- Grey Fox, *Urocyon cinereoargenteus*
- Northern Raccoon, *Procyon lotor*

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



Grey Fox (*Urocyon cinereoargenteus*) and Northern Raccoon (*Procyon lotor*)
The Texas Zoo, Victoria, Texas, United States of America
Photo © www.deviantart.com

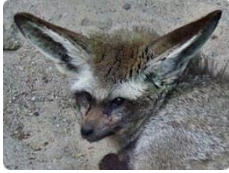


Island Fox, *Urocyon littoralis*

Combined species:

- Island Fox, *Urocyon littoralis*
- North American Porcupine, *Erethizon dorsatum*

Institution(s): CuriOdyssey (San Mateo, California, United States of America)



Bat-eared Fox, *Otocyon megalotis*

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Aardvark, *Orycteropus afer*

Institution(s): Bioparc València (Spain)

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Mona Monkey, *Cercopithecus mona*
- Vervet Monkey, *Chlorocebus pygerythrus*
- Barbary Sheep, *Ammotragus lervia*

Institution(s): Los Angeles Zoo (California, United States of America)

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Cape Porcupine, *Hystrix africaeaustralis*

Institution(s): Zoo Miami (Florida, United States of America)

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Meerkat, *Suricata suricatta*

Institution(s): Reaseheath Zoo (Nantwich, United Kingdom), Combe Martin Wildlife & Dinosaur Park (Ilfracombe, United Kingdom), San Diego Zoo (California, United States of America), World of Birds Wildlife Sanctuary and Monkey Park (Cape Town, Republic of South Africa)



Bat-eared Fox (*Otocyon megalotis*) and Meerkat (*Suricata suricatta*)
World of Birds Wildlife Sanctuary and Monkey Park, Cape Town, South African Republic
Photo © www.pixdaus.com

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Common Dwarf Mongoose, *Helogale parvula*

Institution(s): Zoo des Sables d'Olonne (France)

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Yellow Mongoose, *Cynictis penicillata*

Institution(s): ZOO Antwerpen (Belgium)



Bat-eared Fox (*Otocyon megalotis*) and Yellow Mongoose (*Cynictis penicillata*)
ZOO Antwerpen, Belgium
Photo © Tom Van Deuren

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Bongo, *Tragelaphus eurycerus isaaci*
- Yellow-backed Duiker, *Cephalophus sylvicultor*

Institution(s): Los Angeles Zoo (California, United States of America)

Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Common Warthog, *Phacochoerus africanus sundevallii*
- earlier Ground Hornbill, *Bucorvus* sp.

Institution(s): San Diego Zoo Safari Park (California, United States of America)



Bat-eared Fox (*Otocyon megalotis*) and Southern Warthog (*Phacochoerus africanus* *sundevallii*)

San Diego Zoo Safari Park, California, United States of America

Photo © San Diego Zoo Safari Park



Bat-eared Fox (*Otocyon megalotis*) and Southern Warthog (*Phacochoerus africanus* *sundevallii*)

San Diego Zoo Safari Park, California, United States of America

Photo © MaryAnn Fuller



Bat-eared Foxes (*Otocyon megalotis*) and Southern Warthogs (*Phacochoerus africanus sundevallii*)
San Diego Zoo Safari Park, California, United States of America
Photo © Curby Simerson



Bat-eared Foxes (*Otocyon megalotis*) and Southern Warthogs (*Phacochoerus africanus sundevallii*)
San Diego Zoo Safari Park, California, United States of America
Photo © Scott Richardson



Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Red River Hog, *Potamochoerus porcus*
- Egyptian Goose, *Alopochen aegyptiaca*

Institution(s): Saint Louis Zoo (Missouri, United States of America)



Bat-eared Foxes (*Otocyon megalotis*) and Red River Hogs (*Potamochoerus porcus*)
Saint Louis Zoo, Missouri, United States of America
Photo © David Freely



Bat-eared Foxes (*Otocyon megalotis*) and Red River Hog (*Potamochoerus porcus*)
Saint Louis Zoo, Missouri, United States of America
Photo © Saint Louis Zoo



Bat-eared Fox (*Otocyon megalotis*) and Red River Hog (*Potamochoerus porcus*)
Saint Louis Zoo, Missouri, United States of America
Photo © Thomas Bauer



Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Ostrich, *Struthio camelus australis*

Institution(s): Opel-Zoo (Kronberg, Germany)



Bat-eared Fox (*Otocyon megalotis*) and South African Ostrich (*Struthio camelus australis*)

**Opel-Zoo, Kronberg, Germany
Photo © Dr. Thomas Kauffels**

Combined species:

- Bat-eard Fox, *Otocyon megalotis*
- Grey Crowned Crane, *Balearica regulorum gibbericeps*
- Eastern Yellow-billed Hornbill, *Tockus flavirostris*
- Helmeted Guineafowl, *Numida meleagris*

Institution(s): Indianapolis Zoo (Indiana, United States of America)



Combined species:

- Bat-eared Fox, *Otocyon megalotis*
- Leopard Tortoise, *Stigmochelys pardalis*

Institution(s): The Living Desert (Palm Desert, California, United States of America)



Arctic Fox, *Alopex lagopus*

Combined species:

- Arctic Fox, *Alopex lagopus*
- Red Fox, *Vulpes vulpes*

Institution(s): Staten Island Zoo (New York, United States of America), RepZOOTic (Erdősmecske, Hungary)

Combined species:

- Arctic Fox, *Alopex lagopus*
- Brown Bear, *Ursus arctos*

Institution(s): Skansen (Stockholm, Sweden), Kittenberger Kálmán Növény- és Vadaspark (Veszprém, Hungary), ZOOM Erlebniswelt Gelsenkirchen (Germany) (Kodiak Bear, *Ursus a. middendorffi*, later Kamchatka Brown Bear, *Ursus a. beringei*)

Combined species:

- Arctic Fox, *Alopex lagopus*
- Polar Bear, *Ursus maritimus*

Institution(s): Omaha's Henry Doorly Zoo (Nebraska, United States of America), Zoo Duisburg (Germany)

Combined species:

- Arctic Fox, *Alopex lagopus*
- American Black Bear, *Ursus americanus*

Institution(s): Dierenpark Zie-ZOO (Volkel, the Netherlands)



Combined species:

- Arctic Fox, *Alopex lagopus*
- Harbor Seal, *Phoca vitulina*

Institution(s): Central Park Zoo (New York, New York, United States of America)

Combined species:

- Arctic Fox, *Alopex lagopus*
- Grey Seal, *Halichoerus grypus*

Institution(s): New York Aquarium (Brooklyn, New York, United States of America)

Combined species:

- Arctic Fox, *Alopex lagopus*
- Northern Raccoon, *Procyon lotor*

unknown insitution

Combined species:

- Arctic Fox, *Alopex lagopus*
- Reindeer, *Rangifer tarandus*

unknown institution

Combined species:

- Arctic Fox, *Alopex lagopus*
- Muskox, *Ovibos moschatus wardi*

Institution(s): Korkeasaari Zoo (Helsinki, Finland)



Combined species:

- Arctic Fox, *Alopex lagopus*
- Mountain Goat, *Oreamnos americanus*

Institution(s): Woodland Park Zoo (Seattle, Washington, United States of America)

Combined species:

- Arctic Fox, *Alopex lagopus*
- Snowy Owl, *Bubo scandiacus*

Institution(s): Opel-Zoo (Kronberg, Germany), Zoo Dresden (Germany), Zoo Duisburg (Germany), RZSS Highland Wildlife Park (Kingussie, United Kingdom), København Zoo (Denmark)

Combined species:

- Arctic Fox, *Alopex lagopus*
- Ural Owl, *Strix uralensis*

Institution(s): Opel-Zoo (Kronberg, Germany)

Combined species:

- Arctic Fox, *Alopex lagopus*
- Common Raven, *Corvus corax*

Institution(s): Opel-Zoo (Kronberg, Germany)



Swift Fox, *Vulpes velox*

Combined species:

- Swift Fox, *Vulpes velox*
- Red Fox, *Vulpes vulpes*

Institution(s): Bearizona (Williams, Arizona, United States of America)



Red Fox, *Vulpes vulpes*

Combined species:

- Red Fox, *Vulpes vulpes*
- American Beaver, *Castor canadensis*

Institution(s): Wildpark Bad Mergentheim (Germany)

Combined species:

- Red Fox, *Vulpes vulpes*
- Arctic Fox, *Alopex lagopus*

Institution(s): Staten Island Zoo (New York, United States of America), RepZOOTic (Erdősmecske, Hungary)

Combined species:

- Red Fox, *Vulpes vulpes*
- Swift Fox, *Vulpes velox*

Institution(s): Bearizona (Williams, Arizona, United States of America)

Combined species:

- Red Fox, *Vulpes vulpes*
- Grey Fox, *Urocyon cinereoargenteus*
- Northern Raccoon, *Procyon lotor*

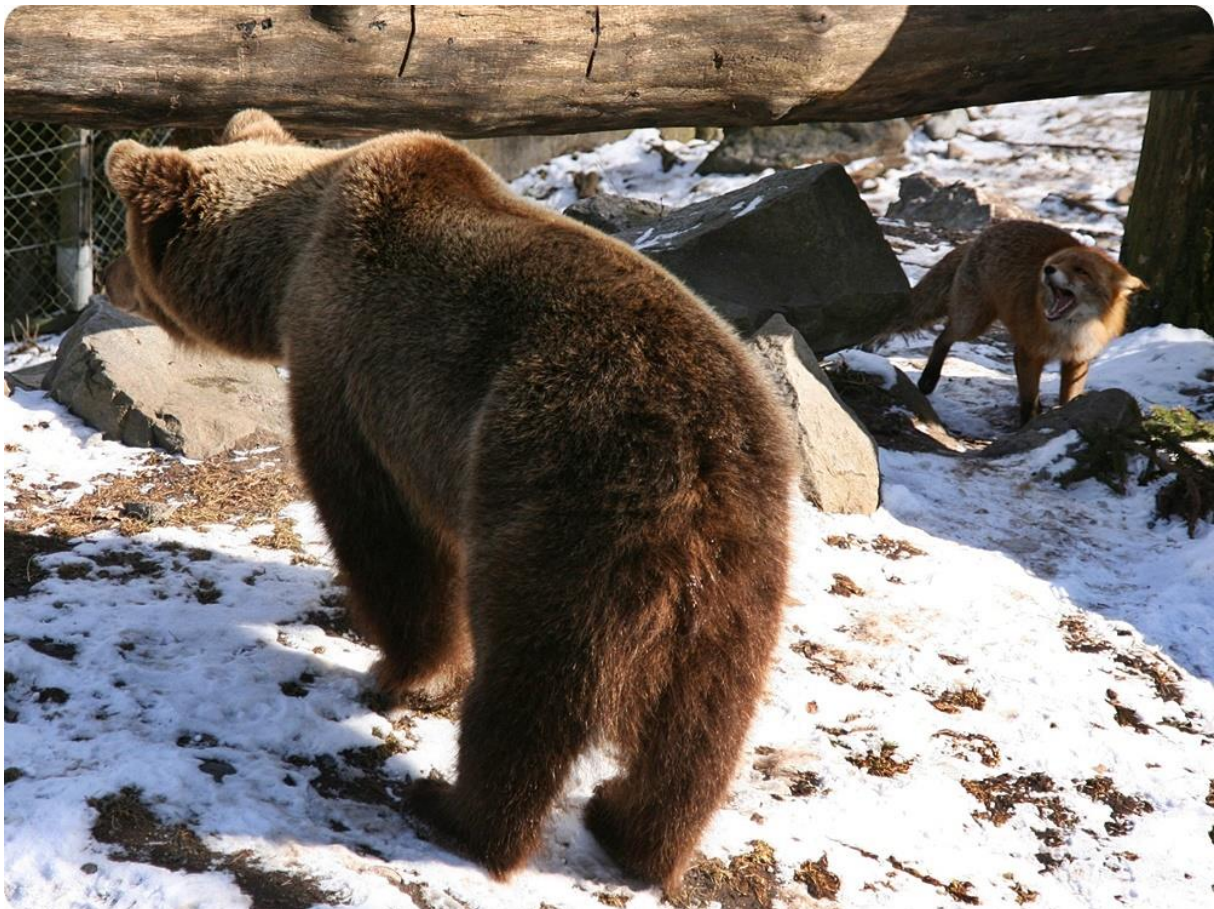
Institution(s): Charles Towne Landing State Historic Site (South Carolina, United States of America)



Combined species:

- Red Fox, *Vulpes vulpes*
- Brown Bear, *Ursus arctos*

Institution(s): Skansen (Stockholm, Sweden), ZOO Ljubljana (Slovenia), Alpenzoo Innsbruck (Austria), Wildpark Bad Mergentheim (Germany), Heimat-Tierpark Olderdissen (Bielefeld, Germany), Dartmoor Zoo (Sparkwell, United Kingdom), Omaha's Henry Doorly Zoo & Aquarium (Nebraska, United States of America) (Grizzly, *Ursus a. horribilis*)



Red Fox (*Vulpes vulpes*) and Brown Bear (*Ursus arctos*)
Skansen, Stockholm, Sweden
Photo © Skansen

Combined species:

- Red Fox, *Vulpes vulpes japonica*
- Brown Bear, *Ursus arctos lasiotus*
- Asiatic Black Bear, *Ursus thibetanus japonicus*

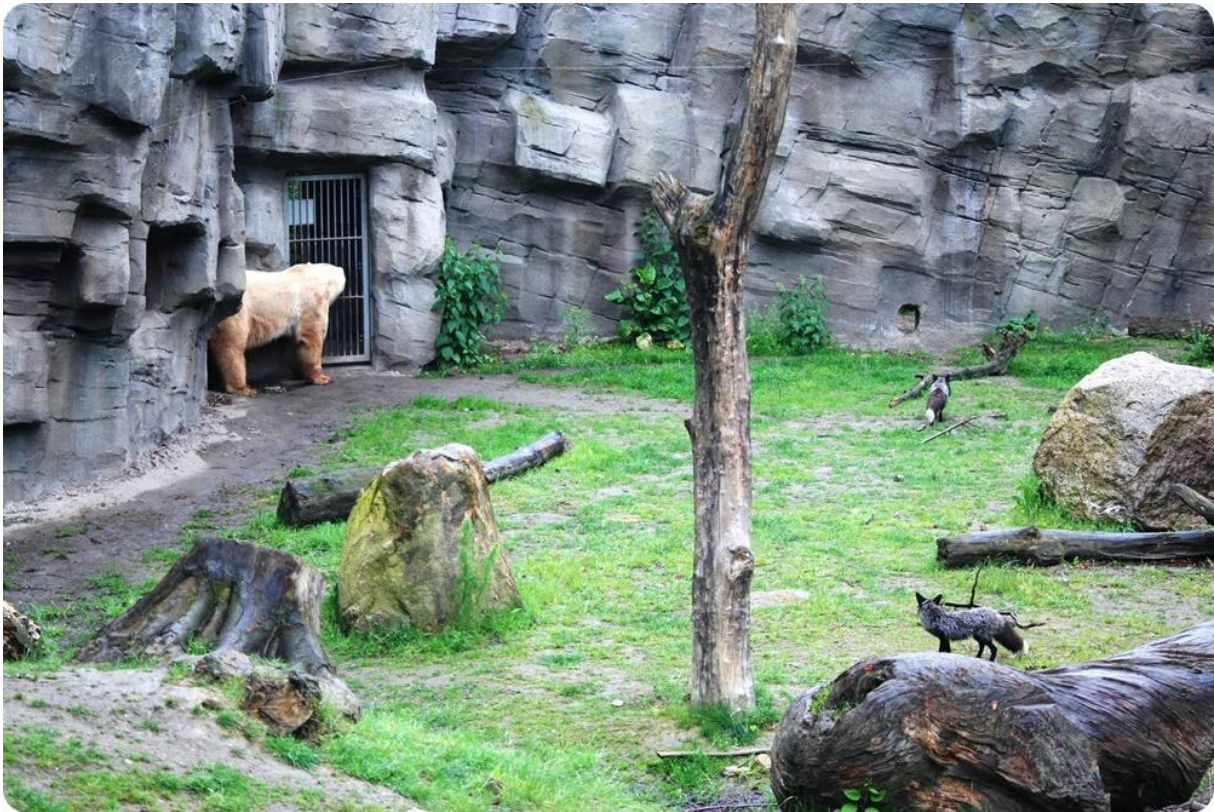
Institution(s): Tama Zoological Park (Tokyo, Japan)



Combined species:

- Red Fox, *Vulpes vulpes* var. *argentata*
- *Ursus maritimus* x *Ursus arctos* (Polar Bear x Brown Bear hybrid)

Institution(s): Zoo Osnabrück (Germany)



Silver Foxes (*Vulpes vulpes* var. *argentata*) and Polar Bear x Brown Bear hybrid (*Ursus maritimus* x *Ursus arctos*)
Zoo Osnabrück, Germany
Photo © Ben Gilbert

Combined species:

- Red Fox, *Vulpes vulpes*
- American Black Bear, *Ursus americanus*

Institution(s): Topeka Zoo (Kansas, United States of America), Turtle Back Zoo (West Orange, New Jersey, United States of America), California Living Museum (Bakersfield, California, United States of America), Oklahoma City Zoo (Oklahoma, United States of America)



Combined species:

- Red Fox, *Vulpes vulpes*
- Northern Raccoon, *Procyon lotor*

Institution(s): Minnesota Zoo (Minnesota, United States of America)

Combined species:

- Red Fox, *Vulpes vulpes*
- Northern Raccoon, *Procyon lotor*
- Eurasian Otter, *Lutra lutra*
- Striped Skunk, *Mephitis mephitis*

Institution(s): Zoo sauvage de Saint-Félicien (Quebec, Canada)

Combined species:

- Red Fox, *Vulpes vulpes*
- Eurasian Badger, *Meles meles*

Institution(s): Natur- und Tierpark Goldau (Switzerland), Zoo am Meer Bremerhaven (Germany)

Combined species:

- Red Fox, *Vulpes vulpes*
- Wild Boar, *Sus scrofa scrofa*

Institution(s): Tierpark Lange Erlen (Basel, Switzerland)



Corsac Fox, *Vulpes corsac*

Combined species:

- Corsac Fox, *Vulpes corsac*
- Brown Bear, *Ursus arctos*

Institution(s): DierenPark Amersfoort (the Netherlands), Zoo Heidelberg (Germany)
(Syrian Brown Bear, *Ursus a. syriacus*)



Corsac Fox (*Vulpes corsac*) and Syrian Brown Bear (*Ursus a. syriacus*)
Zoo Heidelberg, Germany
Photo © Allan Galway



Corsac Fox (*Vulpes corsac*) and Syrian Brown Bear (*Ursus a. syriacus*)
Zoo Heidelberg, Germany
Photo © Allan Galway



Corsac Fox (*Vulpes corsac*) and Syrian Brown Bear (*Ursus a. syriacus*)
Zoo Heidelberg, Germany
Photo © Zoo Heidelberg



Combined species:

- Corsac Fox, *Vulpes corsac*
- Asiatic Black Bear, *Ursus thibetanus*

Institution(s): Dierenrijk (Nuenen, the Netherlands)

Combined species:

- Corsac Fox, *Vulpes corsac*
- Asiatic Black Bear, *Ursus thibetanus*
- Crested Porcupine, *Hystrix cristata*

Institution(s): DierenPark Amersfoort (the Netherlands)



Corsac Foxes (*Vulpes corsac*) and Asiatic Black Bears (*Ursus thibetanus*)
DierenPark Amersfoort, the Netherlands
Photo © DierenPark Amersfoort

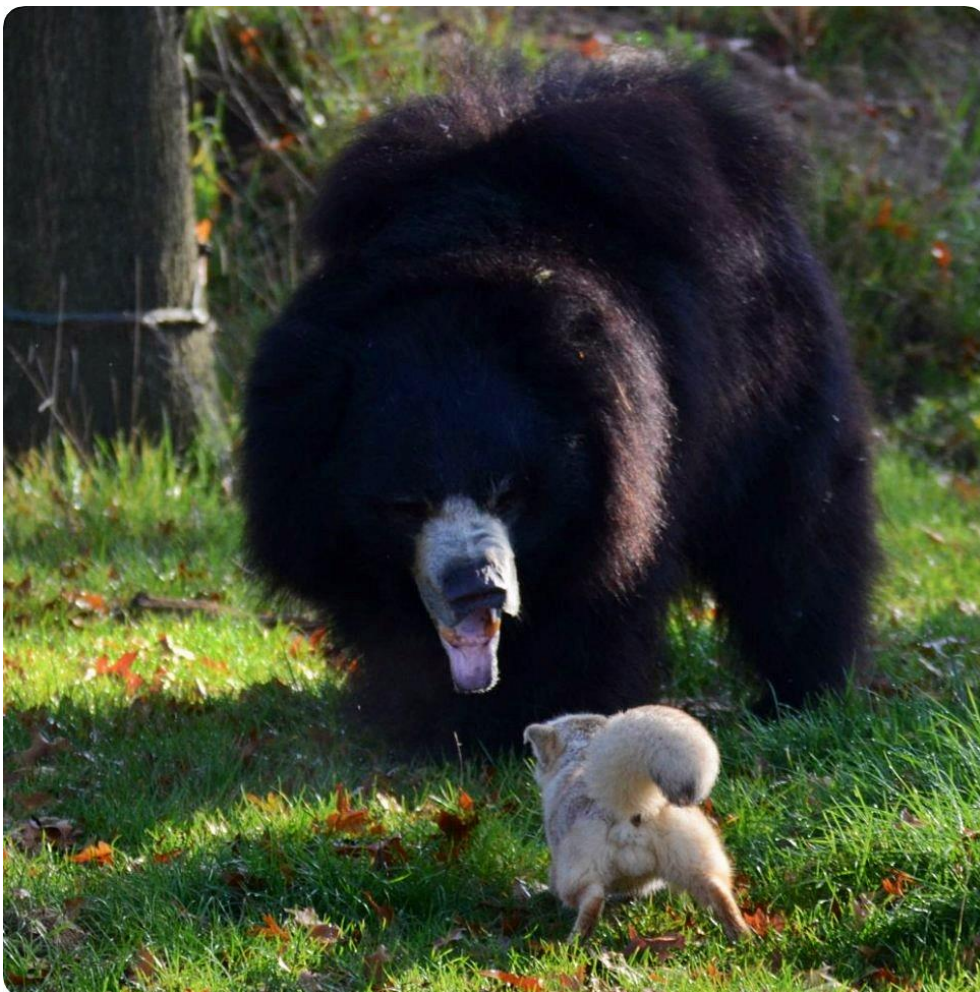
Combined species:

- Corsac Fox, *Vulpes corsac*
- Sloth Bear, *Melursus ursinus*
- Asian Small-clawed Otter, *Aonyx cinereus*

Institution(s): Safaripark Beekse Bergen (Hilvarenbeek, the Netherlands)



Corsac Foxes (*Vulpes corsac*) and Indian Sloth Bears (*Melursus ursinus ursinus*)
Safaripark Beekse Bergen, Hilvarenbeek, the Netherlands
Photo © Örs Görög



Corsac Fox (*Vulpes corsac*) and Indian Sloth Bear (*Melursus ursinus ursinus*)
Safaripark Beekse Bergen, Hilvarenbeek, the Netherlands
Photo © Neil Ingram



Fennec Fox, *Vulpes zerda*

Combined species:

- Fennec Fox, *Vulpes zerda*
- Aardvark, *Orycteropus afer*

Institution(s): Sacramento Zoo (California, United States of America), Pittsburgh Zoo & PPG Aquarium (Pennsylvania, United States of America)

Combined species:

- Fennec Fox, *Vulpes zerda*
- Rock Hyrax, *Procapra capensis*

Institution(s): ZOO Dvůr Králové (Czech Republic), Brookfield Zoo (Illinois, United States of America)

Combined species:

- Fennec Fox, *Vulpes zerda*
- Hairy Armadillo, *Chaetophractus sp.*
- Southern Tamandua, *Tamandua tetradactyla*
- Ring-tailed Lemur, *Lemur catta*

Institution(s): Sunshine Aquarium (Tokyo, Japan)

Combined species:

- Fennec Fox, *Vulpes zerda*
- Red-bellied Tamarin, *Saguinus labiatus*

Institution(s): Skærup Zoo (Børkop, Denmark)



Combined species:

- Fennec Fox, *Vulpes zerda*
- Golden-handed Tamarin, *Saguinus midas*

Institution(s): Skærup Zoo (Børkop, Denmark)

Combined species:

- Fennec Fox, *Vulpes zerda*
- Cape Porcupine, *Hystrix africaeaustralis*

Institution(s): Brookfield Zoo (Illinois, United States of America), Peoria Zoo (Illinois, United States of America)

Combined species:

- Fennec Fox, *Vulpes zerda*
- Spring Hare, *Pedetes capensis*

Institution(s): Brookfield Zoo (Illinois, United States of America)

Combined species:

- Fennec Fox, *Vulpes zerda*
- Meerkat, *Suricata suricatta*
- Yellow Mongoose, *Cynictis penicillata*
- South African Ground Squirrel, *Xerus inauris*

unknown institution

Combined species:

- Fennec Fox, *Vulpes zerda*
- Common Dwarf Mongoose, *Helogale parvula*

Institution(s): Zoo de Lille (France)



Combined species:

- Fennec Fox, *Vulpes zerda*
- Klipspringer, *Oreotragus oreotragus*

Institution(s): Memphis Zoo (Tennessee, United States of America)

Combined species:

- Fennec Fox, *Vulpes zerda*
- Trumpeter Hornbill, *Bycanistes bucinator*

Institution(s): Zoo Augsburg (Germany)



SUMMARIZE THE EXPERIENCES

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

The most frequent association is the **Grey Wolf** & Brown Bear coexistence which have been tried in many institutions. Some accidents have also been reported: in one occasion a bear cub was killed by full-grown wolves as it was strolled to a bear-proof area, furthermore, another time it happened that a lonely bear was attacked by a pack of wolves. On the contrary Alaskan Tundra Wolf pups were killed by Kodiak Bears in a 3400 m² exhibit in Wildpark Lüneburger Heide (HAMMER 2002, LARSSON 1995).

In one coexistence sometimes bites of wolves against juvenile bears was occurred but the aggressions had not been that intensive that the species had to be separated again and the female bear quickly learnt to look after her young. Heavy aggression primarily occurred intraspecifically, conflicts between the different species were much more milder. In a wolf & bear community it was reported that one wolf diverted the bear while the others grab the food so the observation of the group-work was a notable part of the behaviour (HAMMER 2002).

In the Bear Forest in Rhenen the Grey Wolf & Brown Bear community has been existing since 1994. In the 2 hectare size exhibit there is no breeding due to sterilized animals. The wolf-bear interactions seemed to be mostly playful, sometimes agonistic. Especially young bears were more often than others victims of wolf harassment and were sometimes seriously bitten. There was a problem during feeding: there should have been found some food items which preferred by the wolves but not really by the bears. The problem was solved fed the wolves with rat and muskrat (EIJK 1995).

The mixed exhibits with a wolf & bear association are mostly large, for example the animals have 1,8 hectare in Kolmården and 8 hectare in Orsa Björnpark. It is worth mentioning that Kolmården is one of the first attempts to combine these two carnivorans since 1970. The relatively smaller mixed exhibits – like the 3200 m² size enclosure in Schwerin – usually has an adjoining enclosure for the wolves on their own with access to the bears (HAMMER 2002). In Zoo Schwerin the initial group structure was three female Brown Bears and two male Grey Wolves. The species were habituated to each other for one week, separated by wire mesh. Subsequent association caused no problems. Interspecific interactions occurred during feeding sessions: when a female Brown Bear climbed down a tree trunk, a wolf can be observed to pinch her fur (ZIEGLER 2002).

We can read a detailed article about a Grey Wolf & Syrian Brown Bear mixed exhibit in Natur- und Tierpark Goldau in the journal *Der Zoologische Garten* 80(3): Pp. 93-105. (BAUMANN, A. & WEHRLE, M. 2011).

One of the most complex multi-species exhibit in point of size of the area and number of species is taken place in Zoo sauvage de Saint-Félicien in Quebec, Canada. Their „Natural Trail Park” area is about 185 hectares in there the institution has Grey Wolf,



American Black Bear, Wapiti, Reindeer, Moose, White-tailed Deer, Muskox, American Bison, Black-tailed Prairie Dog and birds (GAGNON 2012, pers. comm.). According to a former reference (LUBIW-HAZARD 2000) another species, like Bighorn Sheep and Mountain Goat were also exhibited in this area which was about 325 hectares. It has been working since 1972. The animals in the park are well adapted, they breed and behave naturally. In spring bears prey upon White-tailed Deer fawns which helps keeping the herd stable. The institution usually brings the female deer in enclosures for birthing but it is impossible to catch all of them (GAGNON 2012, pers. comm.).

In Out of Africa Wildlife Park two female American Black Bears lived with the female Cougars for about 17 years with no serious incidents. The bears spent most of their time together, separate from the Cougars. The pack of four wolves, two males and two females, lived harmoniously for about one year. But as the wolves matured, they became somewhat assertive over one of the Cougars, so the wolves were removed to another habitat (HARRISON, POWELL 2012, pers. comm.).

The Wolf Park in Indiana has had a not really ordinary cohabitation in reference to the management of a mixed exhibit. Their Grey Wolves and American Bison did not live together all the time, the institution put them together once a week from May through November, weather permitting, for most of the period from 1980 to 2011. In the beginning it was only on special occasions. These „wolf-bison demonstrations” were held in the afternoon to allow visitors to watch. Typically the wolves and bison were together for approximately an hour at time in a 6,9 hectares pasture under continuous supervision and control. This was specifically to allow the wolves to go through the first stages of a hunt during which they observe the prey for vulnerable individuals. One of the main aims of these demonstrations was to study the behaviour of the animals and also to let the public see that wolves have to work hard for a living. It has been considered these demonstrations to be for research, for public education and for environmental enrichment for both wolves and bison. The Park also assessed the wolves' health before taking them into the bison habitat. Elderly wolves, wolves with injuries and one wolf who was just not a very fast runner, were not used for wolf-bison demonstrations. The wolves – were leash trained anyway – were always attracted to little calves, but the mother cows usually did an excellent job of protecting the calves if the wolves got close. All in all many different types of behaviour were documented during these demonstrations. The institution never had any bison killed or seriously injured (GOODMANN 2018, pers. comm.).

NaturZoo Rheine in Germany has a **Golden Jackal** & Sloth Bear mixed exhibit, however, beforehand an **African Golden Wolf** was kept together with the bears. The relatively big exhibit is about 5300 m² and it was built in 2009. We can read a detailed article about this cohabitation in the journal *Der Zoologische Garten* 80 (2011) Pp. 1-28. (JOHANN 2011). The Italian Parco Faunistico La Torbiera kept their female Golden Jackals together with Raccoon Dogs in a 2200 m² mixed exhibit, but as the enclosure was not suitable for breeding had to be given up (ROCCA 2018, pers. comm.).

Keeping together **Black-backed Jackals** and Lions at Zoo Leipzig was not successful. The initial group structure was 1.1 Black-backed Jackals (both juveniles) and 2.1 Lion (genders were kept separately), later on changed to 2.0 Lions. The 1100 m² sized mixed exhibit was covered with grass and artificial kopje-like cliffs and surrounded by dry ditch and water moat, enclosure was partly equipped with hot wires. Association was only outdoor. Jackals were given sufficient time to explore the outdoor enclosure, so habituation happened in absence of Lions. Planted areas between the dry ditch and jackals indoor area exclusively accessible for the jackals



(protected against Lions through hot wires). During the first weeks jackals preferred to use the outdoor enclosure during the night. They did not try to dig burrows and accepted sleeping boxes indoors. Since January 2001 jackals showed more diurnal activities in the outdoor enclosure, together with Lions. In February 2001, the female jackal incautiously ignored the distance to the next shelter and was cornered by the male Lions. During this encounter the jackal was lethally injured and subsequently euthanased. To reduce the risk of further jackal – lion encounters, artificial tubes were integrated into the ground of the outdoor enclosure, but they were not used by the remaining male jackal. About six weeks after the loss of the female, the male jackal was found with multiple bone fractures on the ground of the dry ditch (5 m deep). This lethal accident occurred in the absence of Lions during the night. The curiosity and playful behaviours of the relatively young (approx. 2.5 years of age) male Lions towards new stimuli might be one reason for the failure of this association. Another reason can be seen in the wet and loamy soil of the outdoor enclosure, preventing the jackals to dig a system of protective burrows (ZIEGLER 2002).

Surprisingly the combination of **Dholes** and Sun Bears has also been tried in ZooParc de Trégomeur in France, where the canids had their enclosure of their own. Nowadays **Maned Wolves** kept together with Giant Anteaters in several North-American zoos. The Greensboro Science Center in North-Carolina keeps its breeding pair of Maned Wolves together with a male Giant Anteater in a mixed exhibit is about 2700 m². The institution does leave the wolves with full exhibit access in the evening, the anteater is closed in at night. The park also uses the indoor holding units to separate wolves when needed and did so when they had pups. The female wolf was indoors in the largest run with den box while the male had middle run and exhibit during day with anteater. Later when pups went on exhibit, anteater was held in for a few days until intros to pups were started. When pups were introduced, they did wait till they were pretty good size and had a good feel for the exhibit and were mobile. Later on introduction were done first and then staff observed the behaviour of the animals. For several years the two species really tend to ignore one another and there has never been any aggression observed from either species towards each other. When introduction were first done, there was some curiosity behaviors, primarily from wolves to anteater but really pretty uneventful. The park has since raised several more sets of pups in this exhibit in recent past though they move the anteater out of the space when pups are young. They also have since introduced a new female wolf to this exhibit and it did initially sustain one injury from the anteater when she became too curious with him and his personal space. He swatted her across the neck and created several large lacerations which the veterinarian needed to suture. However, they did not let this deter them from this set-up and this female clearly learned from this interaction and no further issues have occurred (HOFFMAN-BALDER 2018, pers. comm.).

Zoo Boise also has experience with this combination: when the institution first opened its exhibit they had a mixed exhibit and the male anteater and the male Maned Wolf they received had lived together at their previous institution in Sunset Zoo, Manhattan. The animals lived together happily until the park received females and the staff began to see aggression. At that time zoo management decided it was best to separate the species and make two exhibits, so they have lived next door to each other for several years now and the institution has had viable offspring from both species (RUFFNER 2018, pers. comm.).

Houston Zoo has had Maned Wolves and Giant Anteaters together for many years with no issues (HODGE 2018, pers. comm.), and the Phoenix Zoo has the same



combination at present and it is successful (TRESZ 2018, pers. comm.). Currently one female wolf and one older male anteater live together in Phoenix: the two species primarily avoid each other and the park has separate night houses for each species (SCHILLING 2018, pers. comm.).

Audubon Zoo has previously had a mixed exhibit containing two male Maned Wolves and one female Giant Anteater. All three individuals shared the exhibit yard during daytime hours and were separated in the evenings. The Giant anteater had access to her holding den and the exhibit during over night hours and the wolves share a holding area together overnight. The exhibit was designed for breeding just Maned Wolves. Some key interactions between these species were as follows: Maned Wolves are able to house with one another overnight and share food/bedding area(s) with minimal aggression at times. Wolves and anteater while on exhibit took turns interacting with enrichment provided to them. They both had an understanding of appropriate space regulation between one another. If come to close they exhibited warning signs before for altercation will arise. Also plenty of space was provided to where each animal on exhibit can get away from one another. Maned wolf males if separated too long or anesthetized for physicals will have to reestablish dominance which can result in biting, scratching and pinning of one another. Between anteater and wolves the anteater will swipe claws at wolves if come to close but normally did not make contact (ANDERSON 2015, pers. comm.).

In San Diego Zoo most of the time the Maned Wolves moved away from the Giant Anteater. Only one time did the wolf nip at the tail of the anteater. Further interestin experinece was that at times one of the wolves would sleep with the anteater (SAN DIEGO ZOO 2015, pers. comm.).

Keeping together Maned Wolves and Giant Anteaters has already started in the 1980s in Zoo Osnabrück, Germany in a relatively small, 350 m² exhibit. The species were separated over night and during feeding. Most of the time the species were ignored each other, but sometimes juvenile wolves performed playful attacks and the anteater showed threat display on their hindlegs (DRÜWA 1986).

Houston Zoo has also had their Maned Wolves together with a Capybara for a few months with no apparent issues. The institution has also tried the Maned Wolf with a South American Tapir, however there was aggression from the tapir towards the wolf so it lasted less than a week (HODGE 2018, pers. comm.).

In Europe Parc Zoologique CERZA has had experinece keeping the Maned Wolves together with South American Tapirs, Capybaras and Black-capped Capuchins. According to the observations the carnivores tried to catch the monkeys.

Some mixed-species exhibits with **Bush Dogs** also have to be known. A cohabitation with Andean Bears was reported from Zoo Frankfurt (BRÜNING 2018, pers. comm.). In Twycross Zoo one South American Coati was killed by a group of Bush Dogs containing with even more individuals (LIPTOVSKY 2018, pers. comm.). One of the most unique and interesting combination is found in ZooParc Overloon in the Netherlands where three species of carnivorans – Bush Dog, Crab-eating Raccoon and White-nosed Coati – exhibited together. This goes quite well also and creates a lot of interactive behaviour between the species (HEUVEL 2018, pers. comm.).

Keeping **Raccoon Dogs** and Northern Raccoons is an old story in Tierpark Bern, it has worked now for many years, maybe also due to the large enclosure (ROSSET 2018, pers. comm.). As aforesaid the combination with Golden Jackals in Parco Faunistico La Torbiera was not suitable for breeding so had to be given up (ROCCA 2018, pers. comm.).

The **Bat-eared Fox** and Yellow Mongoose combination in ZOO Antwerpen did not work out well. The animals – a pair of foxes and just a few mongooses – were first got



along well, but as soon as the mongoose group got bigger they were aggressive towards the foxes. The foxes stayed underground the whole day and only came out during the night which was maybe not such a big problem regarding welfare for a primarily nocturnal species. After all, both species had quite different activity periods. However, for visitors it was not a success and the institution stopped this combination (PAPIES 2018, pers. comm.).

Saint Louis Zoo has positive experience keeping together male group of Bat-eared Foxes, a breeding pair of Red River Hogs and Egyptian Geese. All animals were adults when introduced to each other. The female Red River Hog is separated to give birth. The foxes have a portion of the habitat that only they can access (AZA 2017).

In San Diego Zoo Safari Park Bat-eared Foxes and Common Warthogs live together since 2005. Foxes have dens and holes to separate themselves when desired (AZA 2017).

A Bat-eared Fox and South African Ostrich cohabitation in Opel-Zoo in Kronberg, Germany is also successful (BECKMANN 2018, pers. comm.).

Arctic Foxes and Polar Bears have been combined in Omaha's Henry Doorly Zoo and Aquarium in Nebraska. Initially foxes were chased by the bears and as long as the bears were young and quick a danger existed that one of the fox was caught by them. The foxes had areas for retreat where they slept and did not seem nervous and also reared young. They habituated quickly the presence of the bears and finally slept in the enclosure part of the bears. Later on one fox was killed as it slept in the non bear-proof area of the exhibit (THOMAS 1968, HAMMER 2002). Exhibit size is 348 m². A former guide from Zoo Duisburg was also mentioning the same combination.

ZOOM Erlebniswelt in Gelsenkirchen stopped the coexistence of Arctic Fox and Kodiak Bear a few years ago. The park had to learn that it depends very much from the individual specimens: as long as they had an old male bear, the foxes were more or less undisturbed. This male was too slow and not interested in chasing them, and the foxes understood this situation very well. They did not hesitate to approach the bear, stole food just in front of his head and bred successfully several times. When the old male died the institution got two young male of Kamchatka Brown Bears and the situation was totally different. Still the foxes were faster than the bears, but the bears tried to get them, tried to dig them out of the ground and eventually managed to catch one or two. Obviously the foxes were totally stressed, they never bred again and even tried to escape of the enclosure in any way. In the end the institution decided to stop it and leave the bears alone (GÜRTLER 2012, pers. comm.). A Hungarian zoo in Veszprém and the Swedish Skansen also have experiences keeping Arctic Foxes and Brown Bears together.

The Arctic Fox and Muskox combination was one of the most successful mixed exhibit in Helsinki Zoo since 1992, the exhibit size was 1400 m² (HAMMER 2002).

Woodland Park Zoo in Seattle was only successful in mixing its Arctic Foxes and Rocky Mountain Goats for a very short period – when they had only one geriatric goat with mobility limitations who chose not to be on exhibit most of the time. The institution has not been successful exhibiting younger, more active goats with foxes (WOODLAND PARK ZOO 2018, pers. comm.).

The Arctic Fox and Snowy Owl combination has been tried out in several institutions. According to the experiences in Opel-Zoo this did not work. The foxes were too active and the owls never came to the ground. The institution has also tried to mix their Arctic Foxes with Ravens and Ural Owls as well. In both cases the foxes killed one of the birds (BECKMANN 2018, pers. comm.).

The Skansen in Stockholm keeps **Red Foxes** together with Brown Bears and it works very well. The only accident which was reported when fox cubs were young and just



started to go out from the den the institution has had a few accidents. The park has been keeping the species together for a long time, since the early 1980. The total outdoor area is 3065 m² and indoor for the bears is 113 m². The foxes get an outside area for their own at 44 m² with a “indoor cave”. The bears are able to find something to eat at all time of the day as keepers works a lot with feeding enrichment. The foxes eat a lot of the bears food but they got their own food when the bears are inside the indoor building every night. During the winter their bears are hibernating. More cubs survive inside the bear enclosure comparing to a litter in the nature (ASKELUND 2012, pers. comm.).

An other type of interaction – interspecific play between the juveniles – was also reported, like in Sweden where juvenile bears played with foxes under the supervision of the female bear. The foxes even became that cheeky, that they playfully bit the ears of the adult bears, which took it calmly (CURRY-LINDAHL 1958).

The Alpenzoo Innsbruck in Austria kept their Red Foxes together with Brown Bears in a relatively small, 400 m² exhibit. Foxes became active over night and hid in the tunnels between indoor and outdoor enclosure. Outdoors the young bears inspected the hiding places and the ends of the tunnels, so species were separated again (HAMMER 2002).

In Omaha’s Henry Doorly Zoo and Aquarium foxes had to be taken out again from the Grizzly Bear enclosure as they always escaped (HAMMER 2002).

Worth to mention that Zoo Osnabrück keeps their Polar Bear x Brown Bear hybrids together with Silver Foxes.

On the Minnesota (North American Native species) Trail of the Minnesota Zoological Gardens the park also currently has a Red Fox and Northern Raccoon mixed. These two animals were wild orphan animals that were confiscated from a private holder; both animals were raised in the person's house with domestic dogs/cats as well as a North American River Otter. This has worked well for them as the fox frequently plays with the raccoon, but it is not known that they would repeat this again given the unique background of these two animals being raised in a human environment and very imprinted (NESS 2018, pers. comm.).

The 3500 m² mixed exhibit in Saint-Félicien with four species of carnivores – Red Fox, Northern Raccoon, Eurasian Otter and Striped Skunk – was also noticeable which had been worked without problems since 1995 (HAMMER 2002).

Zoo Heidelberg in Germany keeps their **Corsac Foxes** and Syrian Brown Bears together and this coexistence is still working very well for a long time. The first introduction was done in 1981. Initially foxes were habituated to the enclosure without bears being present. Male juvenile foxes often steal food items from bears at close range. Bears subsequently chase foxes over short distances. This challenging behaviour was rarely observed in female foxes. Loss of some infant/juvenile foxes caused by the bears was reported from the early years of this association. Nowadays newborn foxes and parents are kept in the indoor enclosure for approximately 3-4 months. Then they get access to the outdoor enclosure during the nights. Finally they have exclusive access to the outdoor enclosure for one day before the group is (re)associated with the bears. This procedure prevented further losses of young foxes until now (REICHLER-DANIELOWSKI 2012, pers. comm., ZIEGLER 2002).

In the past Dierenpark Amersfoort in the Netherlands had a combination where three species – Corsac Fox, Asiatic Black Bear and Crested Porcupine – were cohabitated one enclosure. This coexistence worked quite well without any major problems. The Foxes had the opportunity to choose between two enclosures with two different species of bears, e.a. through a tunnel system they could go to the enclosure with Asiatic Black Bears and to the enclosure with Brown Bears. During the day in 99% of



the case they spend their time in the enclosure with the Asiatic Black Bear and Crested Porcupines. The Brown Bears were more active hunters on them than the black bear, so they choose during the day for the most peaceful option. At night when the Brown Bears were locked up in the resting enclosures, the foxes did not have fear to go to brown's enclosure. Their Corsac Foxes and Asiatic Black Bears went to over an other zoo to Dierenrijk in 2009 and they also have this mixed exhibit after that (DIJKGRAAF 2012, pers. comm.). So, the fox and bear coexistence was continued in Dierenrijk, although not without a „learning curve”. The fox from Amersfoort knew (how) to stay away from the bears, because he kept his distance from the breeding pair of bear they had already soon lost interest in the fox. However the newly arrived group of foxes (1.3 specimen) from Hamerton never learnt how to live with bears. The foxes were far too curious and approached the bears without any fear. A female fox was killed after three days of introduction. The foxes did learn from this, they keep away from the bears. About two months later the park found another fox killed in the inside enclosure. It was killed because it tried to steal food from the bears inside, since the inside enclosure only has one entrance and access point the fox could not get away in time. After this the staff adjusted the entrance, they added a rubber flap in front of the entrance, heavy enough to make it impossible for the foxes to lift it, but the bears can easily lift the flap to get in (JANSEN 2012, pers. comm.).

In the recent past Safaripark Beekse Bergen in Hilvarenbeek introduced Corsac Foxes and Asian Small-clawed Otters into the new enclosure of their Sloth Bears. The exhibit is not for breeding purposes so male groups were created from each species (VERSTEEGE 2018, pers. comm.).



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