

## Mixed species exhibits at the Los Angeles Zoo

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There is nothing particularly new in displaying more than one animal species in the same enclosure. A reptile house frequently contains mixed exhibits; many zoos have at least one bird aviary which is shared by a number of species, and large ground dwelling birds are often kept with antelope and other hoofed mammals. But at the Los Angeles Zoo we have, in addition, a number of exhibits with combinations which, to the best of our knowledge, have rarely, if ever before, been housed together.

There are several advantages in exhibiting more than one species within a single display.

First, the space may be used more efficiently; if, for example, an arboreal and one or more terrestrial species are housed together, each occupies its own niche in the enclosure. Secondly, a mixed exhibit can offer the visitor a more interesting and instructive display; as the layout of our zoo is primarily zoogeographic, animals which might be found in the same vicinity in the wild are grouped together. Thirdly, because it is often essential to limit the number of individuals of one species which can be kept together, we house the separate pairs, groups or extra  $\sigma\sigma$  with different species and

SPECIES HOUSED	ENCLOSURE	INTERACTION/BEHAVIOUR
<b>AQUATIC SECTION</b>		
American beaver <i>Castor canadensis</i> Trumpeter swan <i>C. cygnus buccinator</i>	pool: 8.24 × 12.81 × 1.07 m deep land: 9.15 × 5.19 m	little or no interaction: the nocturnal beavers are seldom active during the day and the birds add interest to a frequently static exhibit
Grey seal (0.3) <i>Halichoerus grypus</i> Canadian otter (2.2) <i>Lutra canadensis</i>	pool: 16.6 × 6.2 × 2.8 m deep land 9 × 16 m	otters at first reluctant to enter water with the seals but now swim freely among them
California sealion (1.2) <i>Zalophus californianus</i> Capybara (3 juv) <i>Hydrochoerus hydrochaeris</i>	pool: 17 × 8.6 × 2.5 m deep land: 16.8 × 10.8 m	no aggression by sealions towards capybara even when very young; animals have been seen swimming and basking together
<b>AUSTRALIAN SECTION</b>		
Grizzled tree kangaroo <i>Dendrolagus inustus</i> Lace monitor <i>Varanus varius</i>	8.3 × 5.8 × 4.6 m high wire-fronted enclosure with ample climbing facilities and natural earth floor	kangaroos removed at c. 1630 hours and kept in separate holding area at night
Common wombat <i>Vombatus ursinus</i> Brush-tailed rock wallaby <i>Petrogale pencillata</i> Kookaburra <i>Dacelo gigas</i> Black palm cockatoo <i>Probosciger aterrimus</i> Brush turkey <i>Alectura lathami</i>	8.3 × 5.3 × 4.6 m with earth-floor and well supplied with perches; ledges and caves in backwall made from broken concrete stained brown	ledges and caves regularly used by wallabies

SPECIES HOUSED	ENCLOSURE	INTERACTION/BEHAVIOUR
<b>NORTH AMERICAN SECTION</b>		
American bison <i>Bison b. bison</i>	51.7 × 25.8 m field pen	bison removed from pen during Pronghorn fawning season (late May to mid-June) and housed off-exhibit; originally 2 adult ♂ Pronghorns housed and separated only in rutting season (September) until horn-sheaths shed; one now removed because of injury sustained during night in holding area; water-fowl also introduced but unsuccessfully (see Table 2)
Pronghorn <i>Antilocapra a. americana</i>		
North American wild turkeys <i>Meleagris gallopavo</i>		
Striped skunk <i>Mephitis mephitis</i>	8.3 × 5.3 m	almost no interaction; porcupines mostly occupy branches of dead trees provided; skunks largely nocturnal and sleep in hollow log on ground during day
North American porcupine <i>Erithizon dorsatum</i>		
American badger <i>Taxidea taxus</i>	11.1 × 6.2 m with earth floor (for badgers to burrow) and hollow logs mounted off ground against back wall	raccoons spend most of day in the logs; badgers placed in holding area at night; one aggressive encounter between ♂♂ led to injuries but animals reintegrated after two separations without further incident
Raccoon <i>Procyon lotor</i>		
<b>AFRICAN SECTION</b>		
Bongo <i>Boaocerus euryceros isaaci</i>	38.5 × 9.2 m with large hollow logs	logs used by foxes; occasional aggression between ♂ Bongo and ♂ duiker but no serious injuries
Yellow-backed duiker <i>Cephalophus sylvicultor</i>		
Bat-eared fox <i>Otocyon megalotis</i>		
Kikuyu colobus <i>Colobus guereza kikuyuensis</i>	12.3 × 4.6 × 18.5 m with ledges and caves similar to wallaby exhibit	no interaction
Cape hyrax <i>Procavia capensis</i>		
African crested porcupine <i>Hystrix cristata</i>	6.2 × 4.6 × 12.3 m	no interaction; porcupines removed at night
African fish eagle <i>Haliaeetus vocifer</i>		
Red-flanked duiker <i>Cephalophus rufilatus</i>	12.3 × 4.6 × 18.5 m glass-fronted enclosure planted with trees	monkeys spend most of time in trees; duikers regularly rear young
Moustached guenon <i>Cercopithecus c. cephus</i>		
Schmidt's spot-nosed guenon <i>Cercopithecus ascanius schmidti</i>	12.3 × 4.6 × 18.5 m	both species have reared young; monkeys feed with and occasionally groom antelope; also show interest in antelope young but do not harm them
Suni antelope <i>Neotragus moschatus</i>		
Gelada baboon <i>Theropithecus gelada</i>	24.6 × 30.8 m moated enclosure	baboons lived for several years in reasonable state of compatibility with Chimpanzees <i>Pan troglodytes</i> . However, although the Chimpanzees reared several young, after the death of 2 young in 1977, the baboons ceased to breed; they are now separated from the apes and housed with ibex
Nubian ibex <i>Capra ibex nubiana</i>		
Angola giraffe (1.2) <i>Giraffa camelopardalis angolensis</i>	55.4 × 24.6 m	successful trial with 2 adult ♂ Springbok; it is intended to integrate remainder of herd
Springbok (2) <i>Antidorcas marsupialis</i>		

SPECIES HOUSED	ENCLOSURE	INTERACTION/BEHAVIOUR
Southern white rhinoceros <i>Ceratotherium s. simum</i> Damara zebra <i>Equus burchelli antiquorum</i>	33.8 × 15.4 m	at first rhinos chased zebra and exhibit was divided by telephone poles to give zebra escape route and force rhinos to wade through 1 m deep pool; later animals became accustomed to each other and fed in close proximity
EURASIAN SECTION		
Gaur <i>Bos gaurus</i> Blackbuck <i>Antelope cervicapra</i> Axis deer <i>Axis axis</i>	55.4 × 23.1 m	when first introduced the juvenile Gaur chased the Blackbuck severely for 40 minutes then both species settled to peaceful co-existence; Axis deer introduced without problems
Prevost's squirrel <i>Callosciurus prevosti</i> Argus pheasant <i>Argusianus argusianus</i>	17.7 × 4.6 × 2.5 m glass-fronted enclosure	no interaction; pheasants have laid fertile eggs which are artificially incubated; introduction of Greater Malay mouse deer <i>Tragulus napu</i> planned
Bezoar wild goat <i>Capra a. aegagrus</i> Persian red sheep <i>Ovis o. orientalis</i>	c. 24.6 × 24.6 m artificial mountain	goats occupy higher ground than sheep; both species have reared young
Turkmenian markhor <i>Capra falconeri heptneri</i> Celebes black ape <i>Macaca nigra</i>	27.7 × 27.7 m moated enclosure with artificial rockwork	monkeys caused deaths of newborn markhors in 1979; in future will be removed and returned when the youngest kid several weeks old
Pere David's deer <i>Elaphurus davidianus</i> Reeve's muntjac <i>Muntiacus reevesi</i>	29.2 × 18.5 m chain link enclosure	muntjac only have escape route into barn; muntjac have reared young
SOUTH AMERICAN SECTION		
Mountain tapir <i>Tapirus pinchaque</i> Patagonian cavy <i>Dolichotis patagona</i> Coscoroba swan <i>Coscoroba coscoroba</i>	pool: 3 × 5 × 1 m deep land: 13 × 28 m	one new-born cavy drowned by tapirs; ♀♀ with young now removed to holding area until young several weeks old
Crab-eating fox <i>Cerdocyon thous</i> Andean condor <i>Vultur gryphus</i>	13.8 × 6.2 × 4.6 with hollow logs for foxes	given nestbox in separate area for whelping
Spectacled bear <i>Tremarctos ornatus</i> Ring-tailed coati <i>Nasua nasua</i>	24.6 × 21.5 m with dens for coatis inaccessible to bears	bears removed to off-exhibit holding area at night and coatis fed then; coatis sleep outside regardless of bears; have been seen driving bears away from favoured spot

Table 1. Mixed species exhibits at Los Angeles Zoo in which animals have been successfully integrated.

SPECIES HOUSED	REASON COMBINATION ABANDONED
White-cheeked gibbon <i>Hylobates concolor leucogenys</i> Reeve's muntjac <i>Muntiacus reevesi</i>	although the deer were never seriously injured the gibbons harassed them so persistently by swinging down and poking them that the animals were separated
Zebra duiker (1.2) <i>Cephalophus zebra</i> Talapoin monkey (5.4) <i>Miopithecus talapoin</i>	after several months of apparently compatible living (see pp 156 this volume) several monkeys jumped onto the ♂ duiker biting it and pulling at its coat; the species were separated immediately
Ring-tailed coati <i>Nasua nasua</i> Geoffroy's spider monkey <i>Ateles g. geoffroyi</i>	a monkey died from wounds which appeared to have been inflicted by the coatis
American bison <i>Bison b. bison</i> Trumpeter swans <i>C. cygnus buccinator</i> Snow goose <i>Anser caerulescens</i> other waterfowl	several species of waterfowl introduced into the large North American enclosure were removed because the bison chased and injured the birds; the only birds remaining, North American turkeys <i>Meleagris gallopavo</i> , seem to be agile enough to avoid the bison (see Table 1)

Table 2. Unsuccessful combinations in mixed species exhibits.

so avoid duplicate exhibits. Fourthly, some species, while valuable as captive breeding groups, from a conservation standpoint, may, because of their small size or secretive natures, be of limited interest to the public. By housing them with larger and more active companions, the visitor's attention may be drawn to the less spectacular specimens.

When choosing animals for mixed displays, a number of factors have to be considered. The most important is that the needs of both species are met; e.g., if a species is arboreal, climbing apparatus must be provided; if it is a burrower, plenty of earth is essential. The known habits of each species are considered and the likelihood of their being compatible is assessed, but, until the animals are actually integrated, the resultant decision is merely guesswork.

Although most of our experiments have been reasonably successful (Table 1), problems have occurred and some combinations have had to be abandoned (Table 2).

As our mild climate allows us to maintain most species out of doors throughout the year, all the exhibits described are in the open air.

#### AUTHORS' NOTE

Since this article was submitted the following changes have occurred:

1. a ♀ Capybara (now adult) showed aggression towards a newly introduced young ♂ California sealion which was then removed;
2. aggressive behaviour on the part of the Schmidt's spot-nosed guenons towards the Suni have necessitated separating the animals;
3. the Angola giraffe have been replaced by 1.1 Masai giraffe *Giraffa camelopardalis tippelskirchi* which share an enclosure with 1.0 Gerenuk *Littocranius walleri* and 1.0 Lesser kudu *Tragelaphus imberbis*;
4. the Celebes black apes have been permanently removed from the markhor exhibit.

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