

and 7 are level with the public on their western boundaries but extremely precipitous on their eastern boundaries. No. 2 can be viewed from two sides, both looking down. Nos. 6 and 7 can be viewed from two and three sides, respectively – up, across and down – depending on where the visitor is standing. No. 2 is devoted to African mountain animals, the Nubian ibex, *Capra ibex nubiana*, and the Barbary sheep, *Ammotragus lervia*. No. 7 contains Asiatic mountain animals, including Siberian argali, *Ovis ammon*. No. 6 has been assigned to markhor, *Capra falconeri*.

*Temperate Area* consists of four enclosures (Nos. 1, 3, 4 and 5). They are heavily wooded with sharply changing terrain. Several have out-crops of natural rock. Displays are arranged as follows:

- Display No. 1 North American deer, including Mule deer, *Odocoileus hemionus*, White-tailed deer, *O. virginianus*, and prong-horn *Antilocapra americana*.
- 3 Asiatic deer, including Sika deer, *Cervus nippon*, barasingha, *C. duvauceli*, and Axis deer, *Axis axis*
- 4 White and normal-coloured wapiti, *Cervus canadensis*, and Spotted fallow deer, *Dama dama*
- 5 Père David's deer, *Elaphurus davidianus*, and muntjac *Muntiacus muntjak*.

The basic idea underlying the planning of the new ungulate enclosures is to attempt to display the animals in large, spacious natural settings as well as to make every effort to propagate these animals by keeping them in breeding groups. We hope that it will fulfill two important functions: that of an impressive and educational display area and that of an animal breeding centre.

The project has been built with more funds made available from a general bond issue, while the animals have been bought by the Oklahoma Zoological Society.

## EXHIBIT FOR LARGE AFRICAN ANIMALS AT BARCELONA ZOO

*by Antonio Jonch*

**Director, Parque Zoológico de Barcelona, Spain**

THE African Fauna Exhibit at Barcelona Zoo houses African grassland species in a single unit, arranged according to associations existing between the animals it

contains. Many different species live in an enclosure that is apparently communal, though several streams of water form water barriers separating incompatible species. As far as possible, animals of similar habitat and from the same geographical area which naturally associate with each other in the wild are kept together.

The general effect is of a panorama of the African grasslands in which large mammals, such as hippopotamuses, rhinoceroses, elands and zebras, live together with birds such as ostriches, vultures and herons. The animals either live on islands or in enclosures separated by streams of water resembling small rivers, and on these there is a selection of *Anatidae* from African swamps. The trees decorating the banks of the enclosures make the landscape appear more African and at the same time help protect the animals from the sun in the summer.

The enclosure is oval in shape and occupies a surface area of 12,000 square metres (about 120 m.  $\times$  102 m.). The public footpath bordering the whole enclosure slopes upwards from the end of the enclosure near the public entrance to the far side, the total rise in height being about three metres. Height is achieved by a ramp near the entrance and by steps. In this way the public can see the animals from different levels and in different perspectives.

In the centre of the enclosure there is a lake, with an average depth of one metre and round it there are eight sections, divided by moats. These contain drinking water, flowing first from a jet at the furthest end, then down a waterfall and, following the slope already mentioned, to the opposite end of the exhibit. The volume of water and circulation are maintained by a system of pumps located behind Exhibit No. 4.

The resulting network of waterways helps hide the ditches separating the animals and at the same time makes the whole enclosure look more attractive.

The entire enclosure is bordered by flower-beds containing trees, shrubs and flowers characteristic of the areas where the large African animals are found.

#### INDIVIDUAL EXHIBITS

The African Fauna Display is divided into eight sections. These are numbered 1-8, starting with the public entrance and following a circular anti-clockwise direction. (See *Plate 25*.) There are several raised observation platforms and under these there are walks for the public and dens or shelters for the animals.

**Section No. 1** is for a pair of hippopotamuses, *Hippopotamus amphibius*. It covers an area of 184 square metres and contains a pool measuring 60 square metres. It is approximately semi-circular in shape and its shorter boundary is opposite the terrace by the public entrance; its longer boundary is formed by the water of the lake. A sloping path leads to the hippos' sleeping dens, one metre below. These cover 35 square metres and consist of two dens for the two sexes and a

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third reserve den. There is also a pool in the sleeping quarters.

**Section No. 2** contains a pair of Grant's zebras, *Equus burchelli boehmi*, a male and two female Brindled gnus, *Connochaetes taurinus*, and two Black vultures, *Aegyptius monachus*. It covers 468 square metres, is oval in shape and the greater part of its boundary is bordered by water. The part adjacent to the public area is two metres below the public terrace, underneath which is the animals' sleeping accommodation. This consists of four stables for the different species and covers 35 square metres.

**Section No. 3** contains a male and two female eland, *Taurotragus oryx*, a male and two female giraffe, *Giraffa camelopardalis*, and a pair of ostriches, *Struthio camelus*. The surface area is 352 square metres. Its shorter boundary is bordered by the lake, the longer boundary is edged with flowers and vegetation. Once again, the indoor dens are below the public terrace and partly visible to the public. There are dens for the giraffe and eland and there are a further six stables for the eland and ostriches. The building is decorated with vegetation and covers an area of 328 metres. A number of African psittacine birds live in the area.

**Section No. 4** is an island for African monkeys. It is situated at the far end of the lake, near the waterfall and covers an area of 76 square metres. It contains a pair of mandrills, *Mandrillus sphinx*, a male and two female Red-crowned mangabeys, *Cercocebus torquatus*, a male and three female, talapoin monkeys *Cercopithecus talapoin*, a pair of Moustached monkeys, *C. cephus*, and a pair of Vervet monkeys, *C. aethiops*.

**Section No. 5** contains a pair of African elephants, *Loxodonta africana*, and covers 328 square metres. It is separated from the public by a ditch one metre deep. A path leads down to the animals' living quarters which contains two stables and an additional reserve den for isolation purposes. The total area of the stables is 60 square metres.

**Section No. 6** is for a pair of Black rhinoceroes, *Diceros bicornis*, and four Griffon vultures, *Gyps fulvus*. It contains some rock formations for the vultures to perch on and a pool for the rhinos. It covers 316 square metres and the three stables are situated, as usual, below the public terrace. The stables cover 90 square metres.

**Section No. 7** contains a pair of Cape buffalos, *Syncerus caffer*, and ten West African crowned cranes, *Balearica pavonina*. It is roughly semi-circular in shape and the longer boundary is next to the public footpath from which it is separated by a ditch, one metre deep and two metres wide. It covers 272 square metres. The sleeping quarters consist of three stables and are adjacent to the animal houses of the next section. It covers 80 square metres.

**Section No. 8** contains one male and two female Greater kudu, *Strepsiceros strepsiceros*, and a pair of Grevy zebras, *Equus grevyi*. The great part of its boundary consists of the lake, while the shorter boundary is formed by the public

terrace, 1.5 metres above it. It covers 232 square metres and a path leads down to the four stables.

Minimum distances between the sections are as follows:

The minimum distance from Section 1 to Section 2 is 4.5 metres

The minimum distance from Section 2 to Section 3 is 3.4 metres

The minimum distance from Section 3 to Section 4 is 6.0 metres

The minimum distance from Section 4 to Section 5 is 5.0 metres

The minimum distance from Section 5 to Section 6 is 2.3 metres

The minimum distance from Section 6 to Section 7 is 3.0 metres

The minimum distance from Section 7 to Section 8 is 2.6 metres

The minimum distance from Section 1 to Section 8 is 4.0 metres

The minimum distance from Section 2 to Section 8 is 4.0 metres

The minimum distance from Section 2 to Section 7 is 3.2 metres

The minimum distance from Section 2 to Section 6 is 6.0 metres

The minimum distance from Section 3 to Section 6 is 6.0 metres

Section No. 3 is separated from the public by a distance of six metres, Section No. 5 by a ditch three metres wide and Sections No. 6 and No. 7 by a ditch two metres wide.

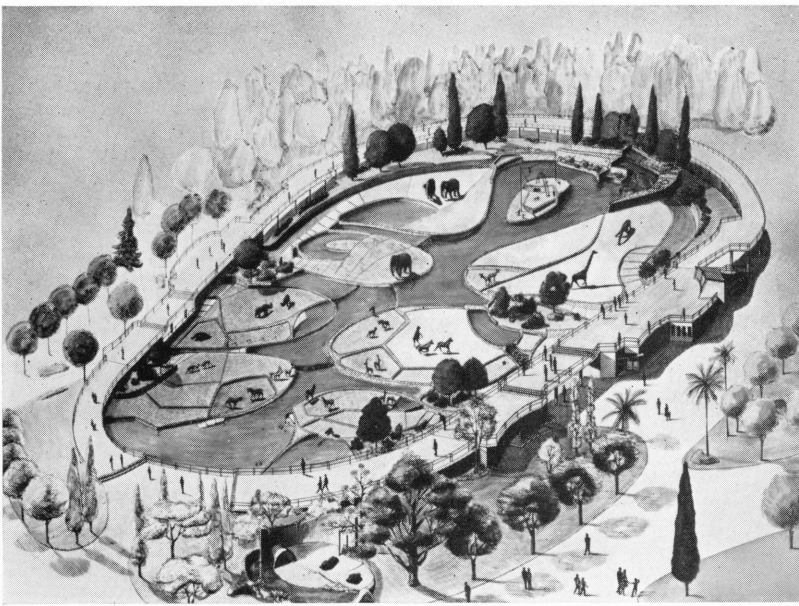
The public footpath and observation terrace is five metres wide and encircles the whole enclosure. Conveniently placed benches provide for the visitors' comfort, as does a snack bar over the giraffe stable.

A selection of Anatidae occupy the central lake. These include eight Hartlaub's ducks, *Pteronetta hartlaubi*, ten Red-crested pochards, *Netta rufina*, and thirty mallard, *Anas platyrhynchos*.

Birds generally living on all eight sections include seven Grey herons, *Ardea cinerea*, six Purple herons, *A. purpurea*, eight Crested pelicans, *Pelecanus crispus*, twenty-five Herring gulls, *Larus argentatus*, and four cormorants, *Phalacrocorax carbo*. We have found that we can keep mammals and birds together throughout the year if the mammals are shut in their sleeping quarters immediately after sunset until the following day. This system gives the birds an undisturbed period for feeding.

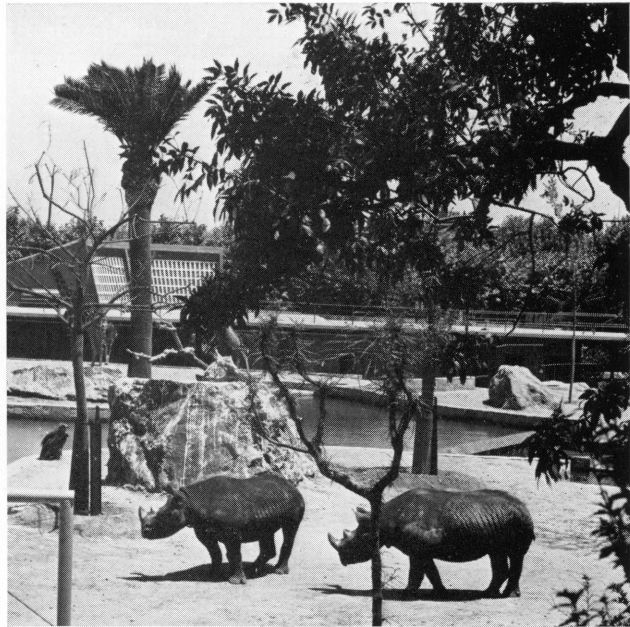
The only serious compatibility difficulty occurred with the hippos which attacked and killed three of the Crowned cranes in their enclosure. We have found that the hippos are the only species that will not live together with another species. It was some time before the Greater kudu settled into their new enclosure and they succeeded in escaping several times and caused a considerable amount of trouble. However, they have finally settled down.

So far (spring 1964) the Greater kudu and the Brindled gnu have bred successfully in the enclosure; and the birth of a Grant's zebra is expected shortly.



25. Ground-plan of the African Exhibit at Barcelona Zoo. (see pp. 82-85). The whole exhibit covers 12,000 sq. m. and the animals live on peninsulas and islands in a lake. The average depth of the water is 1 m. The animals' houses are situated below the public footpath. *Servicio Municipal de Parques y Jardines*

26. The rhinoceros enclosure at Barcelona Zoo covers 316 sq. m. The birds on the rock are Griffon vultures, *Gyps fulvus*. Mammals are shut into their sleeping quarters at sunset until the following day which means that the birds have a period when they are undisturbed. *Parque Zoológico Barcelona*



27. New giraffe exhibit at San Diego Zoo (see pp. 86-88). The two outside enclosures, each 2,500 sq. ft. in area, are divided by a pool with a waterfall, 13 ft high. The giraffe house, which is closed to the public, can be seen at the back of the photograph: the doors are concealed behind a 12 ft.-high curtain wall of cement plaster pneumatically applied against metal lath on a steel skeleton. The enclosure floor is 2 ft higher than the level of the public footpath and is separated from it by a dry moat, 15 ft. wide and 4 ft. deep. *San Diego Zoo Photo*

