

Phenol red	pH Meter	Cl ₂	pH		pH	
			meter	tablet	meter	tablet
6.9	6.72					
7.4	7.2	22	7.60	7.85	7.85	7.85
7.5	7.7	17	7.70	7.90	7.90	7.85
		10	7.70	7.80	7.80	7.80
8.4	8.6	4.5	7.55	7.60	7.65	7.70

Fig. 9

Fig. 10

some indication that the variation between the two levels, as indicated by tablets and meter, depends upon the amount of combined chlorine present in the system. Closer analysis reveals that the phenol red tablets contain sodium thiosulphate, which reacts with the chlorine in the solution, thereby increasing the pH. Fig. 10 illustrates a test carried out by Tintometer Limited, the manufacturers of DPD and phenol red tablets, which shows that the addition of sodium thiosulphate to water at different chlorinated levels affects the pH.

In conclusion, I would like to state that we feel ourselves extremely lucky to be in the happy situation of achieving breakpoint chlorination without fully realising the reasons for it, but we have learnt exactly what happens in our system and how levels can be maintained.

AQUATIC EXHIBITS AT WEST BERLIN ZOO

by Prof. Dr. Heinz-Georg Klös, Direktor Aktien-Verein des Zoologischen Gartens zu Berlin.

Summary

The enclosures for pinnipeds at the West Berlin Zoo are among the few animal enclosures that survived the Second World War. They were designed in 1930 by Prof. Ludwig Heck and have always been among our most successful exhibits. Rockwork forms one of their most important features; this

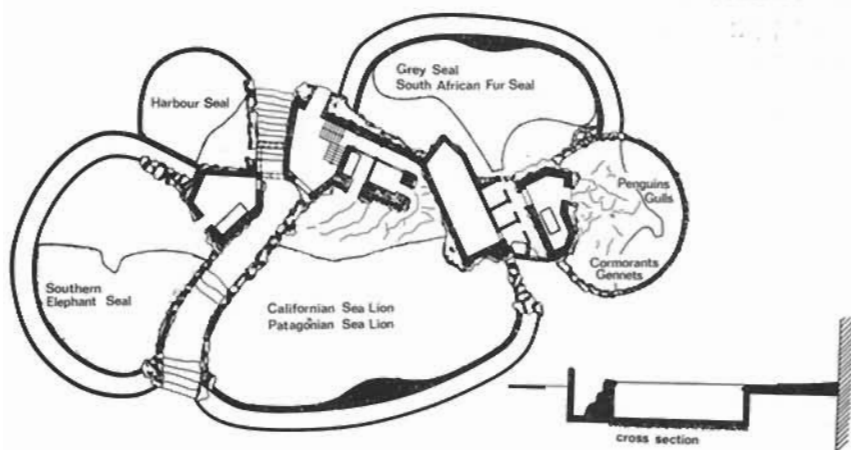


Fig. 1

— = 20 m.

was constructed out of natural rocks from the valley of the river Elbe and selected individually by the architect. It has been arranged in a very natural way. Basically, the exhibit consists of a large central rock, hiding the indoor dens and the keepers' rooms, and five individual enclosures.

Description

The Sealion Pool: This pool has a maximum length of 87 ft, a maximum width of 43 ft and an average depth of 5 ft, with a water volume of about 15,000 cu.ft. The pool is large enough to give the sealions plenty of room to swim and disport themselves in. Two species are kept in the enclosure: one male and two female Californian sealions, *Zalophus californianus*, and one very large male and a female Patagonian sealion, *Otaria byronia*, a species that is characterized by its large bulldog-like mouth. The pool has two dens attached to it and the animals can be shut away in them while their pool is being cleaned. They are not used as winter quarters since we are able to keep the pool free of ice with a water circulation system. Eight feet above the water-level there is a projecting rock from which the big bull sealions dive at feeding time.

The Elephant Seal Pool: This is separated from the sealion enclosure by a broad flight of steps in natural stone, cutting right across the whole enclosure. The stairway is very

popular with the public owing to the excellent view it provides of the seal pools and the feeding performances. The elephant seal pool is adapted to the size and tranquil temperament of its inhabitants. It has a maximum length of 43 ft, maximum width of 32 ft and average depth of 5 ft; it holds about 5,000 cu.ft of water. The edge of the pond is flanked by a flat shore and shallow steps so as to cause the elephant seals as little discomfort as possible getting out of the water. The den attached to the enclosure can be closed by means of three vertical iron bars. We use it occasionally to separate the animals, for instance during mating time. The enclosure houses a pair of southern elephant seals, *Mirounga leonina*.

The Fur Seal Pool: It was built in 1972 as an addition to the already existing exhibit and is sited on the north side of the complex. In spite of the impossibility of acquiring the same sandstone from the river Elbe it matches the older exhibits very well. The pool has a maximum length of 79.21 ft, a maximum width of 32.67 ft and holds about 5608.8 cu. ft of water. Two species are kept in this enclosure: three South African fur seals, *Arctocephalus pusillus*, and two grey seals, *Halichoerus grypus*. The animals are very active, profiting by the extended form of the pool. There are two dens attached to the enclosure, measuring 5.74 x 5.74 ft each. Also there is a small indoor-pool for rearing purposes.

The sealion -, the elephant seal - and fur seal enclosures are surrounded by a ditch that has steps on the animals' side. Thus the animals can re-enter their pool without much difficulty if they fall into the ditch. In the sealion and the fur seal enclosure, the area between the water and the ditch has a small platform where the animals often lie, just in front of the visitors.

The Seal Pool: This pool is much smaller than the other pools and has a maximum length of 27 ft, maximum width of 20 ft, and average depth of 3 ft and holds about 2,250 cu.ft of water. It contains two flat islands on which the seals lie when it is sunny. There is no ditch in this enclosure and the public is separated from the animals by a wall: the visitor can lean over this and see the seals swimming and diving immediately below him. Inside the rockwork there is a den for the seals. The enclosure contains one male and

seven female harbor seals, *Phoca vitulina*, five of which were born at the West Berlin Zoo.

All four seal pools are lined with a greenish opaque glass. The animals can be easily seen moving in the water against this light coloured background.

The Penguin Pool: The penguin enclosure has an average area of 500 sq.ft, an average depth of 2 ft and a water volume of about 950 cu.ft. The pool was not made any bigger so that the water could be changed easily and give the public a good view of these rather small animals. The enclosure is separated from the visitors by a low wall made out of uneven blocks of stone. At the back of the pool there is a sandy shore which turns into a rocky slope. Breeding niches have been built into the rocks and 4 Humboldt's penguins, *Spheniscus humboldti*, and 7 black-footed penguins, *Spheniscus demersus*, breed there regularly. As well as these species, the enclosure contains rockhopper penguins, *Eudyptes cristatus*, two northern gannets, *Sula bassana*, four king cormorants, *Phalacrocorax bougainvillei*, three guano cormorants, *Ph. albiventer*, three great-black-backed gulls, *Larus marinus*, two herring gulls, *Larus argentatus*. The walls of spacious indoor accommodation can be covered with running water so that even in the summer the temperature does not exceed 15°C. A refrigerated room is available for storing up to two tons of fish at -1°C.

SEAL RESEARCH IN THE WADDENSEA

by Dr. J.L. van Haften, Research Institute for Nature Management, Arnhem, Netherlands.

In starting the Dutch part of the Waddensea, we know that around 1930 there was an estimated number of 2000 seals, *Phoca vitulina*. The fact that there was a bounty on the capture of seals at that time shows that they were probably much more numerous. This bounty system was connected with the suspected serious damage caused by seals to the fisheries. Our seal research began in 1950 when we were asked to see if there was something wrong with the seals because the number of seals permitted by the ministry of agriculture had not been shot for some years. This could be caused by a lesser value of the