

# 1986 International Zoo Yearbook volume 26

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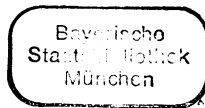


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# Contents

## SECTION I AQUATIC EXHIBITS

Aquarium systems for living corals The Coral Reef exhibit at the John G. Shedd Aquarium	Bruce A. Carlson David D. Lonsdale & Roger Klocek Kristine O. Nelson J. Chin Charles Farwell, John Christiansen, Mark Ferguson, Roger Phillips & Freya Sommer	1 9 18 26 30
The Pacific Coral Reef exhibit at the Seattle Aquarium The Atoll Reef exhibit at Ocean Park in Hong Kong The Wave Crash and Intertidal exhibits at the Monterey Bay Aquarium		
The Children's Cove, a North American tidepools exhibit at the National Aquarium in Baltimore Cephalopods at the Seattle Aquarium The Steinhart Aquarium Fish Roundabout: a decade later	Bruce Hecker Roland C. Anderson John E. McCosker & Edward E. Miller Arne Schiøtz Hiromichi Uchida & Yoshitaka Abe Y. Abe, T. Nagahama, H. Uchida, H. Takahashi & Y. Saito	34 41 48 53 59 62
Keeping an old aquarium young The prevention of goitre in captive sharks		
Breeding the Tokyo bitterling <i>Tanakia tanago</i> at Ueno Zoo Aquarium	Dieter Jauch	64
Breeding the Common four-eyed fish <i>Anableps anableps</i> at the Stuttgart Zoo The life history and captive reproduction of the Wolf-eel <i>Anarrhichthys ocellatus</i> at the Vancouver Public Aquarium The Graham Amazon Gallery at the Vancouver Public Aquarium	Jeffrey B. Marliave Murray A. Newman & Stefani I. Hewlett S. Paulraj, S. Subbarayalu Naidu & J. Pakkiaraj	70 81 90
Rearing the Olive ridley <i>Lepidochelys olivacea</i> in artificial sea water	Erik Holmback R. Dunn, C. Banks & J. Birkett Frank S. Todd	94 98 104
Captive reproduction of the New Guinea side-necked turtle <i>Emydura australis albertisii</i> at the San Antonio Zoo Exhibiting and breeding the Arafura file snake <i>Acrochordus arafurae</i>	Frank S. Todd Steve Graham Kevin Bell & Christina Kelly Christina Joie Slager Heinrich Dathe Donald F. Bruning & Christine Sheppard B. Rau, G. von Hegel & H. Wiesner J. Chin	110 125 132 136 140 142 146 154
The Penguin Encounter at Sea World, San Diego Techniques for propagating King and Emperor penguins <i>Aptenodytes patagonica</i> and <i>A. forsteri</i> at Sea World, San Diego Renovation of the Penguinarium at the Detroit Zoo The penguin and seabird building at the Lincoln Park Zoo		
Penguins in the Park: The Penguin Environment at Steinhart Aquarium The Penguin Cliffs exhibit at the Berlin Tierpark The Seabird Colony at New York Bronx Zoo		
The Polarium at Munich Zoo		
The Wave Cove exhibit at Ocean Park in Hong Kong Breeding European otters <i>Lutra l. lutra</i> in the new otter exhibit at Krefeld Zoo Observations on keeping the Pacific walrus <i>Odobenus rosmarus divergens</i> at Hanover Zoo Pinnipeds at Taronga Zoo: from Seal Theatre to Marinelife Sanctuary	Paul Vogt Lothar Dittrich Laura Mumaw, George Steele, Max Elliott, Ed Lonnon, Kerrie Haynes- Lovell & Ady d'Ettorre	157 163 171

## SECTION 2 NEW DEVELOPMENTS IN THE ZOO WORLD

Breeding the Tuatara <i>Sphenodon punctatus</i> at Auckland Zoo	Vernon Tintinger	183
Fertility following caesarean section in an Aruba Island rattlesnake <i>Crotalus unicolor</i>	M. Loomis & R. Smith	187
Food intake and growth rate of Cassowary chicks <i>Casuarius</i> spp reared at Mendi, Southern Highland Papua New Guinea	Brian Reid	189
Breeding biology of the Humboldt penguin <i>Spheniscus humboldti</i> at Emmen Zoo	C. J. Scholten	198
Breeding the African pygmy goose <i>Nettapus auritus</i> in the Hong Kong Zoological and Botanical Gardens	K. C. Searle	205
Parent-reared Pesquet's parrots <i>Psittichas fulgidus</i> at the Los Angeles Zoo	Dennis Thurslund & Lynda Paul	208
Husbandry and breeding of Matschie's tree kangaroo <i>Dendrolagus m. matschiei</i> at Adelaide Zoological Gardens	Graeme A. Crook & Gert Skipper	212
Parturition and development in the Queensland koala <i>Phascolarctos cinereus adustus</i> at San Diego Zoo	Valerie D. Thompson	217
Keeping and breeding the Eurasian water shrew <i>Neomys fodiens</i> under laboratory conditions	Iwona Michalak	223
Successful breeding of Demidoff's galago <i>Galago d. demidovi</i> at the Cincinnati Zoo	Michael W. Dulaney	229
The integration into a social group of a hand-reared Brown capuchin <i>Cebus apella</i>	Elisabetta Visalberghi & M. Cristina Riviello	232
The Arnhem Zoo colony of Chimpanzees <i>Pan troglodytes</i> : development and management techniques	Otto M. J. Adang, Joep A. B. Wensing & Jan A. R. A. M. van Hooff	236
Behaviour of wild gorillas <i>Gorilla gorilla</i> and their management in captivity	A. H. Harcourt	248
Hand-rearing a Mexican anteater <i>Tamandua mexicana</i> at Tuxtla Gutiérrez Zoo	Alfredo D. Cuaron O.	255
A preliminary report on the breeding of the Volcano rabbit <i>Romerolagus diazi</i> at the Chapultepec Zoo, Mexico City	Jürgen Hoth & Humberto Granados	261
Management and biology of the Prehensile-tailed porcupine <i>Coendou prehensilis</i> at Washington NZP and New York Zoological Park	Miles Roberts, Fred Koontz, Lyndsay Phillips & Eugene Maliniak	265
Management and breeding of the Ringtail or Cacomistle <i>Bassariscus astutus</i> in captivity	Ivo Poglayen-Neuwall	276
A mother-reared second-captive-generation Aardvark <i>Orycteropus afer</i> at the Cincinnati Zoo	Michael W. Dulaney	281
Circulating hormones during pregnancy in the Asian and African elephants <i>Elephas maximus</i> and <i>Loxodonta africana</i> : a diagnostic test based on the measurement of prolactin	J. K. Hodges, A. S. McNeilly & D. L. Hess	285
An analysis of the population of Grevy's zebra <i>Equus grevyi</i> in Dvur Kralove Zoo	Ludek J. Dobroruka, A. Holejsovska, I. Maslova & V. Novotny	290
Breeding season of the Lechwe <i>Kobus leche</i>	Ludek J. Dobroruka	294
Management and breeding of the Rocky Mountain goat <i>Oreamnos americanus</i> at Woodland Park Zoo	Michael Hutchins, Gregg Thompson, Barbara Sleeper & James W. Foster	297
A new educational foyer to the Snake Park at the Port Elizabeth Museum Complex	W. R. Branch & N. Schaefer	309
Panorama of Africa: a complex for large African mammals	Michael Gorgas	315

**SECTION 3 REFERENCE SECTION**

Zoos and aquaria of the world	321
Index to list of zoos and aquaria of the world	395
New buildings and exhibits	407
Species of fishes bred in captivity during 1984 and multiple generation births	412
Species of amphibians bred in captivity during 1984 and multiple generation births	416
Species of reptiles bred in captivity during 1984 and multiple generation births	417
Species of birds bred in captivity during 1984 and multiple generation births	423
Species of mammals bred in captivity during 1984 and multiple generation births	467
Census of rare animals in captivity 1985	507
Studbooks and world registers for rare species of wild animals in captivity	547
Appendix 1: taxonomic authorities consulted in the <i>Yearbook</i>	555
Author index – volumes 22–26	557
Subject index – volumes 22–26	561

## The Polarium at Munich Zoo

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The Polarium at Munich Zoo is a large complex containing three sets of enclosures specifically designed for the display of Arctic species. Completed in 1974, and fully operational in 1975, the 60 × 100 m complex spreads across a shady slope in the southeastern area of the park. Designed by the architect Peter Lanz, it is essentially an isolated concrete construction divided in the centre by a wide public pathway; on one side is an exhibit containing various species of seal and on the other are two adjacent but separate exhibits in which penguins and Polar bears *Thalarctos maritimus* are maintained (Plate 1).

### PENGUIN EXHIBIT

The penguin area comprises two separate glass-fronted indoor display sections lying

on either side of a smaller off-exhibit section which is open to the air from above (Fig. 1). The two indoor enclosures cover an area of 74 m<sup>2</sup> and 77 m<sup>2</sup>, respectively, and are 2.4 m high. A service area lies behind the centrally placed off-exhibit section which measures 38 m<sup>2</sup>. The smaller of the indoor displays contains ten King *Aptenodytes patagonica* and six Gentoo penguins *Pygoscelis papua*, the other holds 32 Humboldt *Spheniscus humboldti* and six Rockhopper penguins *Eudyptes crestatus*; only the two last species have access to the outdoor enclosure. There are no night-time quarters.

All three displays contain a pool at the front and an area of land extending out from the back wall. The water in the pool rises 1.2 m from just below ground level,



Plate 1. General view of the Polarium at Munich Zoo showing the seal exhibit with its pools, the Polar bear *Thalarctos maritimus* enclosure (top right) and penguin enclosures (top left).

occupying the space between the land and the viewing window which forms the front wall of each exhibit. The window, which is made of double-sided safety glass 3·8 cm thick, extends almost to the ground in order to give visitors the opportunity to watch the penguins swimming under water. The land area is c.1 m above ground level, being just a few centimetres above the edge of the water. Visitors are thus given a clear view of the birds' activities at all times. In order to cut down on reflections, and to provide the viewing window with some protection

from wind and rain, a large slab of concrete (which is a continuation of the roof in the case of the two indoor enclosures) juts out over the visitor area to give shade. This has the added benefit of preventing direct sunlight from heating the glass and raising the temperature inside.

Most of the land area in the two indoor enclosures is covered with 2 × 2 cm tiles, laid in order to prevent the occurrence of bumblefoot (with almost complete success). There is also a 5 m<sup>2</sup> gravel bed, 10–30 mm deep with drainage

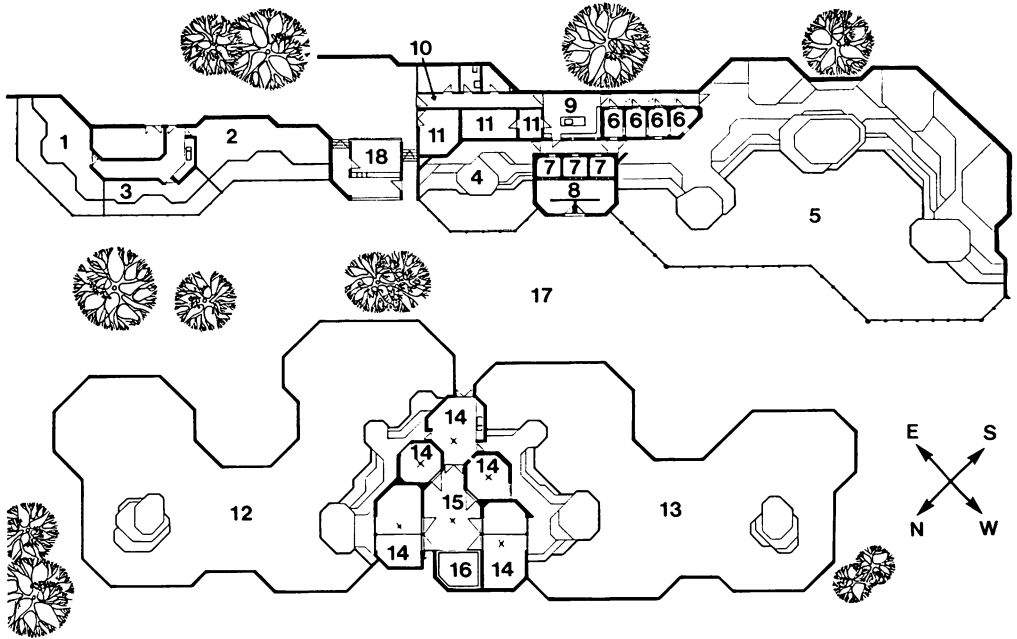


Fig. 1. Plan of the Polarium at Munich Zoo. 1. indoor enclosure for King *Aptenodytes patagonica* and Gentoo penguins *Pygoscelis papua*; 2. indoor enclosure for Humboldt *Spheniscus humboldti* and Rockhopper penguins *Eudyptes crestatus*; 3. outdoor enclosure for Humboldt and Rockhopper penguins; 4. small outdoor enclosure, with a pool at the front, for Polar bears *Thalarctos maritimus* (mainly intended for mothers with young); 5. main Polar bear enclosure with pool; 6. stall; 7. birthing room; 8. visitors' observation room; 9. keepers' work room; 10. service corridor; 11. freezers (capacity: 40 tonnes frozen fish); 12. outdoor enclosure for Southern sealions *Otaria byronia*; 13. outdoor enclosure for Californian sealions *Zalophus californianus* and South American fur seals *Arctocephalus australis*; 14. stall; 15. central service yard; 16. water basin; 17. public path; 18. cafeteria.

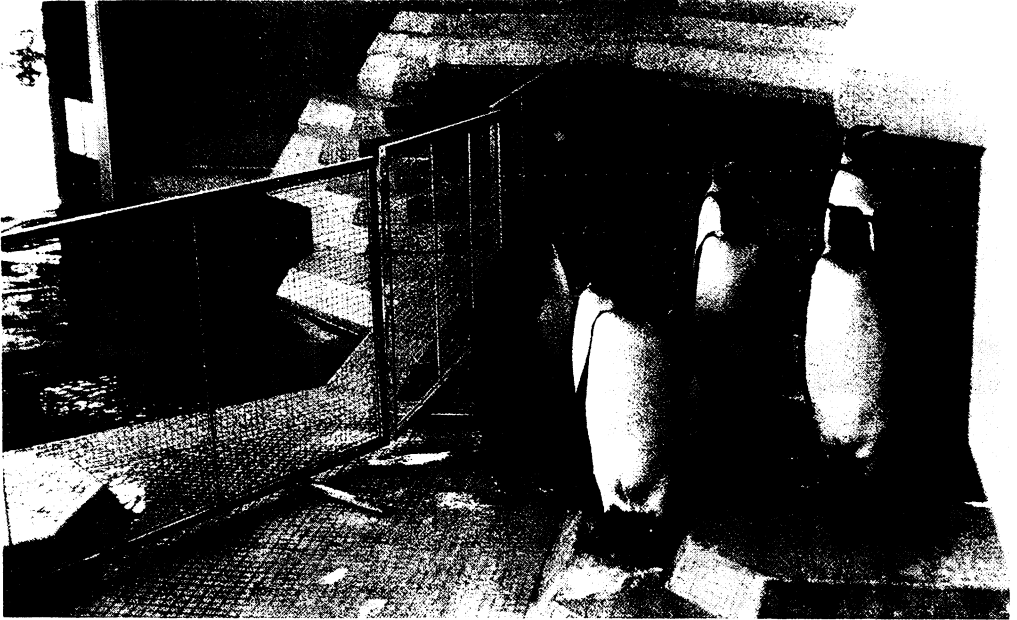
underneath, for use during the moult and at the start of the breeding season when pair bonding begins and nesting material is required. Small caves  $40 \times 30 \times 30$  cm high have been set into the back wall for use as nests. The land area in the King and Gentoo penguin enclosure has proved to be too narrow for young chicks to negotiate with safety, so during the breeding season a fence is erected along the outside edge to prevent the young from drowning (Plate 2).

Natural light enters the indoor exhibits through frosted glass skylights in the ceiling as well as through the front window. When necessary artificial light is provided by 65W incandescent neon tubes (44 for the King penguins and 42 for the Humboldt penguins) and underwater spotlights. A one-year experiment invol-

ving the development of a computerised lighting schedule similar to the natural photoperiod showed no apparent effect on breeding success.

The indoor displays are served by air-conditioning, the temperature usually varying from  $4$ – $12^\circ\text{C}$  depending on the season; if the temperature outside is  $35^\circ\text{C}$ , the maximum inside will be  $12^\circ\text{C}$  and if the temperature outside is  $-15^\circ\text{C}$  the minimum inside will be  $4^\circ\text{C}$ . In the breeding season, however, (February to April for the Humboldt penguins and April to June for the King and Gentoo penguins) the temperature is kept at a constant  $15^\circ\text{C}$ . The air is changed 1.5 times per 24 hours, the main filtration occurring through a dust filter containing glass wool. If necessary fresh air can be sterilised using ultraviolet light beams





**Plate 2.** King penguins *Aptenodytes patagonica* in their enclosure showing the gravel bed, tiled land area and fence erected during the breeding season to prevent the young from falling into the pool and drowning.

within a two-way channel. Relative humidity is kept at 80%.

Water for the pools is obtained from a local spring, owned by the zoo, and is recycled constantly through quartz-sand filters, changed at a rate of 10%/24 h and renewed completely every 14 days. In an emergency, water can be taken from the main supply. The water volume is 43 m<sup>3</sup> and 30 m<sup>3</sup> in the smaller and larger indoor enclosures, respectively, while that in the outdoor pool is 25 m<sup>3</sup>. No chemicals are added.

Neither the King nor the Gentoo penguins are normally allowed outside; during winter, however, the King penguins are released into the park for a 15-minute walk twice a day. Access to the outdoor enclosure is given to the Humboldt and Rockhopper penguins via an 80 × 80 cm underwater channel which is usually blocked by a sliding door which can be opened manually. When the door is left open the birds can choose whether or not to go outside. The outdoor pool remains filled even if the exhibit is not in

use. As mentioned earlier the enclosure is glass fronted, with a concrete overhang to provide shade and protection, but has no roof.

#### POLAR BEAR EXHIBIT

The Polar bear complex lies adjacent to the penguin exhibit and comprises two outdoor areas, each with a pool, and a number of indoor facilities including three small rooms used for ♀♀ giving birth, four stalls for the short-term maintenance of individuals, a visitors' observation room and various service areas (Fig. 1).

One of the outdoor areas is considerably larger than the other (Fig. 1), having a land area of 760 m<sup>2</sup> and an unpainted concrete pool containing 675 m<sup>3</sup> of water, measuring 40 × 8.5 × 2.0 m deep. It is here that the 1.4 Polar bears currently on exhibit spend most of their time. As in the penguin enclosures, the pool lies between the public pathway and the remainder of the exhibit although in this case the edge of

the pool is at ground level with the water's surface being 10 cm below the edge. Visitors view the area from the pathway through a 3.8 m high barrier made of safety glass held in place with steel bars buried in concrete. The barrier forms one side of the exhibit, the other three sides being made of concrete 3.8–4.8 m high. The top section of the back wall is inclined slightly. The land area runs out from the back and side walls, consisting of concrete slabs piled onto one another in various formations to make an uneven surface which varies in height from 0.5–5 m, being highest at the back wall. Part of the surface hangs over the pool.

The smaller outdoor enclosure is intended for use mainly by ♀♀ and their offspring although it is also used for the temporary isolation of one or more individuals when a change in group structure is required or if the larger area is being cleaned. The land section, set at various heights, covers an area of 92 m<sup>2</sup> and the pool, which is 10 × 3.6 × 1.8 m deep, contains 64 m<sup>3</sup> of water. The water in both pools has no added chemicals, is changed at a rate of 10%/24 h and renewed totally every 14 days. The constant flow of water in and out of the pools prevents them from freezing over in winter.

Lying between the two outdoor enclosures is a visitors' observation room, entered from the pathway, at the back of which are the three small birthing rooms 2.5 × 2 × 1.8 m high (Fig. 1). When required the rooms are heated to c.15°C from under the floor, and lit with a red bulb. Unfortunately the observation area is not currently in use since the sound proofing between it and the birthing rooms is too poor.

A corridor behind the birthing rooms links the two outdoor enclosures and also leads into the centrally placed work room (Fig. 1) where all food preparation takes place. Three freezer rooms (for deep-freezing, shock-freezing and defrosting), as well as facilities for the keepers, lie next

to the work room on one side while on the other side at the back is a corridor leading to the four stalls and to the main outdoor enclosure. The stalls, which measure 2.9 × 2 m, 2.9 × 2.5 m and are 2.1 m high, are not used for the isolation of sick animals because it is impossible to keep the rooms warm enough to prevent an individual from developing pneumonia after a short time. Since there is no underfloor heating the floors remain extremely cold even in summer. Instead the rooms are of value for animal movement. All four are interconnected via sliding doors and three exit directly into the large enclosure as well as into the back service corridor. The stall nearest the work room (Fig. 1) exits into the front corridor to allow an animal to be moved into a birthing room or into the small outdoor enclosure. This stall contains a squeeze-cage but, following the development of successful immobilisation techniques for the treatment of sick animals, this is no longer in use. All sliding doors can be operated from the work room or the hallway by a system of pulleys when necessary. The location of the work room means that all enclosures can be serviced easily. The doors to the indoor areas are always left open at night so that the Polar bears have the opportunity to sleep there if they wish; most of them do.

Fresh air is pumped into the indoor complex through pipes set into cavities in the walls and air leaves through vents in the ceiling. A skylight in the roof provides the work room with some natural light but in all other service areas and in the holding rooms the lighting is artificial.

#### SEAL EXHIBIT

The seal exhibit is situated on the other side of the public pathway, forming a separate unit. It consists of two 35 × 20 m unpainted concrete pools with an indoor complex of stalls and service areas lying between them (Fig. 1). The northeastern enclosure contains 1.5 Southern sealions *Otaria byronia* and covers a total area of

668 m<sup>2</sup>, only 80 m<sup>2</sup> of which consists of land. The pool contains a water volume of 1300 m<sup>3</sup> and is 1.8 m deep except for a single 'diving pit' which is 2.8 m deep. Most of the outer edge of the pool is surrounded by a 90 cm barrier of safety glass mounted on a 60 cm concrete wall. One portion, however, has no glass barrier but instead forms a thick wall 80 cm high over which visitors can lean and look into the water.

An island lies in one corner of the pool, the remainder of the land area being located on the side leading into the stalls

and service area. The roof of the building is roughly tiered, the various levels having been planted with small shrubs and other greenery. Part of the roof hangs over the land area to give a cave-like atmosphere. Two outcrops of land are suspended over the water and between them is a 'bay' where the land becomes submerged in a series of steps. The diving pit is located under one of the overhangs. When required in the breeding season the pool is divided by a fence which is installed from the bay to the outer wall of the pool (Plate 3). The land area can also be



Plate 3. View of the seal exhibit showing the two display pools and central indoor complex; part of one of the pools has been fenced off to allow a mother and her young to remain separate from the other members of the group while maintaining some contact with them.

divided, allowing a mother and cub to be protected while remaining in contact with the group.

At one time the water level in the pool was varied to simulate low and high tides, the water at 'high tide' being 1.8 m deep so that the whole of the island plus 60% of the land area was under water. It was intended that the procedure would force the seals to exercise more, but this did not happen and the water is now permanently at the high tide level.

The second seal exhibit is similar to the first but contains 2.5 Californian sealions *Zalophus californianus* and 1.2 South American fur seals *Arctocephalus australis*. It covers a total area of 639 m<sup>2</sup>, of which 61 m<sup>2</sup> is land, and has a water volume of 1200 m<sup>3</sup>; the pool is of the same depth as that in the other enclosure.

No chemicals are added to the water of either pool which is renewed at a rate of 10%/24 h and changed completely every 14 days or as needed. At this time the pools are cleaned and algae and other aquatic plants are removed with a high-pressure water jet. Drainage points are located at the lowest point of each diving pit.

Inside the central building are five stalls and a salt-water basin positioned in a circle around a central service yard (Fig. 1). One of the stalls can be accessed from either of the outdoor areas, the

remainder can be entered from only one enclosure or the other. The stall dimensions are 4×3.8 m, 5×3.5 m, 6×5.9 m, 7.8×3.8 m and 7.2×4.0 m. The first two are 2.0 m high, the remainder are 2.5 m high, and the two largest can be divided in half if necessary. All open into the central yard 7×5.2×2.5 m and are intended for the maintenance of one animal at a time although more can be kept together if they are compatible. Each stall is heated electrically from under the floor, which is also provided with drainage, and a skylight in the roof provides natural light. The yard is used for food preparation and acts as a station through which animals can be moved from one place to another with relative ease. In addition, it is valuable as an isolation area for the treatment of individuals. The salt-water basin is used for the treatment of 'blue eyes', a condition probably caused by the animals' being kept in fresh rather than salt water. Heating in the service area is provided by gas, and lighting is mainly artificial. The doors between the exhibit and the two largest stalls (Fig. 1) are left open at night.

#### ANIMAL HISTORY

Stock movements, births and deaths of all the species maintained in the Polarium from 1975 to the present day are given in

SPECIES	STOCK 31 Dec 1975	REC'D	OF WHICH DIED	SOLD	BORN	REARED	STOCK 30 Oct 1986
King penguin <i>Aptenodytes patagonica</i>		10	1.1		2	2	10
Gentoo penguin <i>Pygoscelis papua</i>	10		3.2		4	1	6
Rockhopper penguin <i>Eudyptes crestatus</i>	12		6.0				6
Humboldt penguin <i>Spheniscus humboldti</i>	20		7.3	5	34	27	32
Polar bear <i>Thalarctos maritimus</i>	2.5	2.4	0.2	3.2	1.1.1		1.4
Californian sealion <i>Zalophus californianus</i>	1.3	1.1	0.2		6.2.1	2.1	2.5
South American fur seal <i>Arctocephalus australis</i>	2.1	1.2	1.1	1.0	0.1		1.2
Grey seal <i>Halichoerus grypus</i>			1.2	0.1	1.1		
Southern sealion <i>Otaria byronia</i>	1.5	1.2	1.2		3.2.5		1.5
Southern elephant seal <i>Mirounga leonina</i>	0.1		0.1				

Table 1. Stock movements, births and deaths of all species maintained in the Polarium at Munich Zoo from 1975 to October 1986.

SPECIES	NO. & SEX	DATE ARRIVED	DATE DIED	AGE (years)	POST-MORTEM FINDINGS
King penguin	1.0	Aug 1976	Apr 1979		gout
	0.1	Aug 1976	Jun 1984		renal tumour
Gentoo penguin	0.1	Dec 1975	Jul 1976		trauma
	0.1	Dec 1975	Jun 1977		nephrosis
	1.0	Dec 1975	Apr 1982		foreign object
	1.0	Dec 1975	Mar 1983		degeneration of heart muscle
	0.1	Dec 1975	Feb 1985		aspergillosis
	0.1	Dec 1975	Mar 1985		poisoning
Rockhopper penguin	1.0	Dec 1975	Dec 1978		nephritis
	1.0	Dec 1975	Oct 1978		unknown
	1.0	Dec 1975	Apr 1979		trauma
	1.0	Dec 1975	Aug 1981		aspergillosis
	1.0	Dec 1975	Mar 1983		unknown
	1.0	Dec 1975	Jun 1983		nephritis
Humboldt penguin	0.1	Jun 1979	Jan 1981	1.5	foreign objects (two 5 × 5 cm pieces of wood)
	1.0	Aug 1980	Aug 1981	1	aspergillosis
	0.1	Dec 1975	Aug 1983		trauma
	1.0	Dec 1975	Aug 1985		<i>Pseudomonas</i> infection
	1.0	Jul 1983	Sep 1985	2	foreign object (plastic)
	4.1	1983–1984	1983–1984	90–180 days	aspergillosis
Polar bear	0.1	Oct 1977	Sep 1978	3	encephalitis
	0.1	Sep 1957	Jan 1981	30	acanthosis nigricans
Californian sealion	1.0	Aug 1975	May 1981	11	nephrosis
	1.0	May 1983	Apr 1984	1	foreign object (coin)
South American fur seal	1.0	Dec 1975	May 1981	7	trauma
	0.1	Dec 1975	Feb 1984		foreign object (woollen cap)
Grey seal	0.1	Mar 1976	Jun 1977	4	struggle injuries
Southern sealion	0.1	Nov 1974	Nov 1980		pasteurellosis
	0.1	Dec 1975	Nov 1980		laryngopharyngitis
	1.0	Aug 1975	Jul 1984	14	heart failure
Southern elephant seal	0.1	Aug 1975	May 1982	9	virus pneumonia

**Table 2.** Perinatal mortalities and post-mortem results for all species maintained in the Polarium from 1975, when animals were first introduced into the exhibit, to the end of 1985.

Table 1. The species kept in each section remain the same as those first housed, although in the northeastern pool of the seal exhibit a Southern elephant seal *Mirounga leonina* and a few Grey seals *Halichoerus grypus* have been added to the Southern sealion group on occasion. The elephant seal died after seven years and the Grey seals were removed after about a year because they proved to be incompatible with the Southern sealions; one Grey seal died as a result of injuries caused by a ♂ sealion.

A summary of all perinatal deaths which have occurred in the Polarium,

including post-mortem results, is presented in Table 2. Foreign objects which have been swallowed can be regarded as the main cause of death in mammals as well as in birds. Aspergillosis is another serious problem in the birds, especially the Humboldt penguins. Neonatal mortality within one to 11 days (including abortions in the mammals) has been recorded for 1.1.1 Polar bears, 5.2 Californian sealions, 1.0 South American fur seal, 4.4 Southern sealions, one King penguin, three Gentoo penguins and seven Humboldt penguins. Three Californian sealion pups have survived to

maturity although they had to be hand-reared because their mothers suffered from agalactia.

The Polarium at Munich is an attractive exhibit which provides interesting and unhampered views of Arctic animals in comparatively

naturalistic surroundings. During its 12 years of operation it has proved increasingly popular with our visitors from at home and abroad.

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revised February 1987

## TAXONOMIC AUTHORITIES CONSULTED IN THE YEARBOOK

As in previous years, scientific and common names used in the Yearbook have been standardised and brought up to date in accordance with the latest available works of reference. The following is a list of major taxonomic authorities consulted. Attention is drawn in particular to the rearrangement and reclassification of the birds to follow Morony *et al.* (1975), and the majority of mammals to follow Corbet (1978) and Corbet & Hill (1980).

**Fishes**

FRYER, G. & ILES, T. D. (1972): *The cichlid fishes of the great lakes of Africa*. Edinburgh: Oliver & Boyd.

GREENWOOD, P. H. (1981): *The Haplochromine fishes of the East African lakes*. Munich: Kraus-Thomson Organization.

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# author index to volumes 22–26

A cumulative index to senior authors in Volume 1–17 of the *Yearbook* is contained in Volume 17. The author index for Volumes 17–21, published in Volume 21, additionally includes a cross-reference from co-authors, as does the present index.

## A

- ABE, Y., NAGAHAMA, T., UCHIDA, H., TAKAHASHI, H. & SAITO, Y. **26**, 62–64  
ADANG, O. M. J., WENSING, J. A. B. & VAN HOOFF, J. A. R. A. M. **26**, 236–248  
AMUNDIN, M. **24/25**, 263–271  
AMUNDIN, M. & SVENSSON, U. **23**, 117–121  
ANDEREGG, R., FREY, H. & MÜLLER, H. U. **23**, 35–41  
ANDERSON, D. *see* Beck, B. B.  
ANDERSON, J. L. **24/25**, 192–199  
ANDERSON, P. H. *see* Brush, P. J.  
ANDERSON, R. C. **26**, 41–48  
ANSAH, G. A. *see* Brock, M. K.  
ANTHONEY, T. R. *see* Kaemmerer, K. R.  
ARCHIBALD, G. W. *see* Luthin, C. S.  
ASPER, E. D. *see* Cornell, L. H.  
ASUKE, M. *see* Uchida, I.  
ATKINSON, R. W. **22**, 168–171

## B

- BAKER, S. J. **24/25**, 200–205  
BALLOU, J. D. *see* Kleiman, D. G.  
BANKS, C. **23**, 159–162; *see also* Dunn, R.  
BANKS, D. R. *see* Randall, P.  
BARNES, R. *see* Thomas, W. D.  
BECK, B. B., ANDERSON, D., OGDEN, J., RETTBERG, B., BREJLA, C., SCOLA, R. & WARNEKE, M. **22**, 106–114  
BEHLER, J. L. *see* McCrystal, H. K.  
BELL, K. & KELLY, C. **26**, 132–136  
BELS, V. L. & VAN DEN SANDE, P. A. **24/25**, 231–236  
BENIRSCHKE, K. & KUMAMOTO, A. T. **23**, 220–223  
BERGERHAUSEN, W. *see* Frankenberg, O. von  
BERRY, R. J., TODD, W. & PLASSE, R. **22**, 171–175  
BERTRAM, B. C. R. **22**, 84–87; **24/25**, 99–106  
BEST, R. C., RIBEIRO, G. A., YAMAKOSHI, M. & DA SILVA, V. M. F. **22**, 263–267  
BEUTEL, P. M., DAVIES, S. J. J. F. & PACKER, W. C. **23**, 175–181  
BIGG, K. *see* Maple, T. L.  
BIRCHARD, G. F., SNYDER, G. K., BLACK, C. P., SCHMITT, E., LYVERE, P. & KANE, B. **22**, 164–167  
BIRD, D. M. *see* Brock, M. K.  
BIRKETT, J. *see* Dunn, R.  
BLACK, C. P. *see* Birchard, G. F.  
BLOCK, J. A. *see* Bond, M. R.  
BLODY, D. A. **23**, 206–207  
BLOXAM, Q. M. C. & TONGE, S. J. **24/25**, 49–56

- BOEVER, W. J. *see* Merilan, C. P.  
BOND, M. R. & BLOCK, J. A. **22**, 256–261  
BORNE, B. *see* Widholzer, F. L.  
BOYLAN, T. **23**, 144–148  
BOYLE, H. *see* Law, G.  
BRAIN, P. F. *see* Llewellyn, P. J.  
BRANCH, W. R. & SCHAEFER, N. **26**, 309–314  
BREJLA, C. *see* Beck, B. B.  
BROCK, M. K., BIRD, D. M. & ANSAH, G. A. **23**, 67–71  
BRODIE, E. D., Jr *see* Brodie, E. D., III  
BRODIE, E. D., III, BRODIE, E. D., Jr & JOHNSON, J. A. **22**, 195–197  
BROWN, C. **23**, 71–75  
BRUNING, D. F. **23**, 11–14  
BRUNING, D. F. & SHEPPARD, C. **26**, 142–146  
BRUSH, P. J. & ANDERSON, P. H. **24/25**, 316–321  
BUNKFELDT, L. *see* Maple, T. L.  
BUSSE, H. *see* Minnemann, D.

## C

- CADE, T. J. **24/25**, 1–20  
CARLSON, B. A. **26**, 1–9  
CARMAN, M. *see* Dixon, A. F.  
CARNIO, J., CHUPA, B. & STONER, J. **22**, 207–214  
CARPENTER, J. W. *see* Hillman, C. N.  
CARROLL, J. B. **22**, 101–105  
CHIN, J. **26**, 26–29, 154–157  
CHRISTENSON, T. *see* Maple, T. L.  
CHRISTIANSEN, J. *see* Farwell, C.  
CHUPA, B. *see* Carnio, J.  
COE, J. C. & KLEIN, H. **24/25**, 332–339  
COIMBRA-FILHO, A. F. *see* Mittermeier, R. A.  
CONRADSEN, L. *see* Maple, T. L.  
CONSTABLE, I. D. *see* Mittermeier, R. A.  
CONWAY, W. G. **24/25**, 210–219  
COOPER, J. E. **23**, 1–7; **24/25**, 74–76  
CORNELL, L. H., ASPER, E. D. & DUFFIELD, D. A. **22**, 227–232  
CROOK, G. A. & SKIPPER, G. **26**, 212–216  
CROTTY, M. *see* Thomas, W. D.  
CROXTON, J. M. *see* Shoemaker, A. H.  
CUARON, O. A. D. **26**, 255–260  
CULLEN, L. K. *see* Richardson, K. C.

## D

- D'ETTORRE, A. *see* Mumaw, L.  
DA SILVA, V. M. F. *see* Best, R. C.  
DA SILVEIRA, C. L. & PAIS, J. A. **24/25**, 244–247  
DATHE, H. **26**, 140–142  
DAVIES, S. J. J. F. *see* Beutel, P. M.

DE BOER, L. E. M. **22**, 119–124  
 DENARI, J. H. *see* Nagle, C. A.  
 DENSMORE, M. A. & KRAEMER, D. C. **24/25**,  
 303–306  
 DEVISON, D. *see* Oyarzun, S. E.  
 DITTRICH, L. **26**, 163–170  
 DIXON, A. M. **24/25**, 45–49  
 DIXSON, A. F. **22**, 115–119  
 DIXSON, A. F., KNIGHT, J., MOORE, H. D. M. &  
 CARMAN, M. **22**, 222–227  
 DOBRORUKA, L. J. **26**, 294–296  
 DOBRORUKA, L. J., HOLEJSOVSKA, A., MASLOVA, I.  
 & NOVOTNY, V. **26**, 290–293  
 DOHERTY, J. G. *see* Weeks Thomas, L.  
 DRESSER, B. L. **24/25**, 138–142  
 DRŮWA, P. **24/25**, 271–274  
 DUFFELMEYER, J. *see* Weeks Thomas, L.  
 DUFFIELD, D. A. *see* Cornell, L. H.  
 DULANEY, M. W. **26**, 229–231, 281–285  
 DUNN, R. W. **23**, 83–84, 181–183: **24/25**, 237–240  
 DUNN, R., BANKS, C. & BIRKETT, J. **26**, 98–103

## E

EISENBERG, J. F. *see* Rudran, R.  
 ELLINGTON, S. *see* Maple, T. L.  
 ELLIOTT, M. *see* Mumaw, L.  
 EVANS, D. *see* Maitland, P. S.  
 EVANS, R. F. *see* Kleiman, D. G.

## F

FARWELL, C., CHRISTIANSEN, J., FERGUSON, M.,  
 PHILLIPS, R. & SOMMER, F. **26**, 30–34  
 FENTZLOFF, C. **23**, 18–35  
 FERGUSON, M. *see* Farwell, C.  
 FITZ-GIBBON, J. & HEWLETT, K. G. **23**, 207–209,  
 223–224  
 FONTAINE, R. & HENCH, M. **22**, 77–84  
 FOSTER, J. W. *see* Hutchins, M.  
 FRANKENBERG, O. VON, HERRLINGER, E. &  
 BERGERHAUSEN, W. **23**, 95–100  
 FREY, H. *see* Anderegg, R.

## G

GALLO, J. M. **23**, 209–215  
 GLATSTON, A. R. **24/25**, 162–167  
 GOLDING, R. R. & WILLIAMS, M. G. **24/25**,  
 248–252  
 GOLDMAN, C. A. **24/25**, 286–294  
 GORGAS, M. **26**, 315–318  
 GRAHAM, S. **26**, 125–132  
 GRANADOS, H. *see* Hoth, J.

## H

HAGELIN, M. *see* Larsson, H.-O.  
 HAIGH, J. C. & LATOUR, S. **22**, 262–263  
 HAIGH, R. **23**, 51–58  
 HARCOURT, A. H. **26**, 248–255  
 HARTMAN, L. *see* Luthin, C. S.  
 HAVELKA, P. **23**, 125–132  
 HAYNES-LOVELL, K. *see* Mumaw, L.  
 HEARN, J. P. **22**, 138–143: **24/25**, 148–157  
 HECKER, B. **26**, 34–41

HENCH, M. *see* Fontaine, R.  
 HERBERT, D. *see* Samour, H. J.  
 HERRLINGER, E. *see* Frankenberg, O. von  
 HESS, D. L. *see* Hodges, J. K.  
 HEWLETT, K. G. *see* Fitz-Gibbon, J.  
 HEWLETT, S. I. *see* Newman, M. A.  
 HILLMAN, C. N. & CARPENTER, J. W. **23**, 186–191  
 HJERN, M. *see* Larsson, H.-O.  
 HODGES, J. K. **24/25**, 126–130  
 HODGES, J. K., MCNEILLY, A. S. & HESS, D. L. **26**,  
 285–289  
 HOLEJSOVSKA, A. *see* Dobroruka, L. J.  
 HOLMBACK, E. **23**, 157–158: **26**, 94–98  
 HOTH, J. & GRANADOS, H. **26**, 261–265  
 HUTCHINS, M., THOMPSON, G., SLEEPER, B. &  
 FOSTER, J. W. **26**, 297–308

## J

JAUCH, D. **26**, 64–70  
 JOHNSON, J. A. *see* Brodie, E. D., III  
 JONES, C. G. **23**, 76–82  
 JONES, M. *see* Thomas, W. D.

## K

KAEMMERER, K. R. & ANTHONY, T. R. **22**,  
 131–138  
 KANE, B. *see* Birchard, G. F.  
 KEAR, J. **24/25**, 21–25  
 KELLY, C. *see* Bell, K.  
 KIRKWOOD, J. K. & THOMPSON, K. **23**, 114–117  
 KLEIMAN, D. G., BALLOU, J. D. & EVANS, R. F.  
**22**, 94–101  
 KLEIN, H. *see* Coe, J. C.  
 KLINE, C. *see* Weeks Thomas, L.  
 KLOCEK, R. *see* Lonsdale, D. D.  
 KLÖS, H.-G. **23**, 14–16  
 KLÖS, H.-G. & LANGE, J. **24/25**, 322–332  
 KLÖS, U. **23**, 100–102  
 KNIGHT, J. *see* Dixon, A. F.  
 KNOWLES, J. M. **24/25**, 206–210  
 KONSTANT, W. R. & MITTERMEIER, R. A. **22**,  
 69–77  
 KOONTZ, F. W. **23**, 218–219: *see also* Roberts, M.  
 KRAEMER, D. C. *see* Densmore, M. A.  
 KRANZ, K. R. *see* Ralls, K.  
 KRANZ, K. R. & LUMPKIN, S. **22**, 232–240  
 KRANZ, K. R., XANTEN, W. A., Jr & LUMPKIN, S.  
**23**, 195–203  
 KUMAMOTO, A. T. *see* Benirschke, K.

## L

LANGDON, D. & SCHMIDT, K. **22**, 268–269  
 LANGE, J. *see* Klös, H.-G.  
 LARSSON, H.-O., HAGELIN, M. & HJERN, M. **22**,  
 88–93  
 LASZLO, J. **23**, 166–174  
 LATOUR, S. *see* Haigh, J. C.  
 LAW, G. & BOYLE, H. **23**, 191–195  
 LEEFLANG, P. D. & MARKHAM, R. J. **24/25**,  
 256–260  
 LEO LUNA, M. **22**, 47–52  
 LESHEM, Y. **23**, 41–46

LINDEMANN, H. **23**, 225-233  
 LLEWELLYN, P. J. & BRAIN, P. F. **23**, 121-125  
 LONNON, E. *see* Mumaw, L.  
 LONSDALE, D. D. & KLOCEK, R. **26**, 9-18  
 LOOMIS, M. & SMITH, R. **26**, 187-188  
 LOUWMAN, J. W. W. **22**, 153-156  
 LUCAS, G. & OLDFIELD, S. **24/25**, 123-126  
 LUKAS, J. *see* Maple, T. L.  
 LUMPKIN, S. *see* Kranz, K. R.  
 LUNDRIGAN, B. *see* Ralls, K.  
 LUTHIN, C. S., ARCHIBALD, G. W., HARTMAN, L.,  
 MIRANDE, C. M. & SWENGEL, S. **24/25**, 25-39  
 LYVERE, P. *see* Birchard, G. F.

## M

MACE, G. M. **24/25**, 167-174  
 MACKAY, M. **22**, 250-252  
 MACLAUGHLIN, K. *see* Weeks Thomas, L.  
 MAGILL, R. N. **22**, 156-158; **23**, 139-143  
 MAITLAND, P. S. & EVANS, D. **24/25**, 66-74  
 MALINIAK, E. *see* Roberts, M.  
 MAPLE, T. L., LUKAS, J., MURDOCK, G. K.,  
 BUNKFELDT, L., BIGG, K., CONRADSEN, L.,  
 ELLINGTON, S. & CHRISTENSON, T. **22**, 218-221  
 MARCELLINI, D. L. *see* White, J.  
 MARDER, U. *see* Mendelssohn, H.  
 MARKHAM, R. J. *see* Leeftang, P. D.  
 MARLIAVE, J. B. **26**, 70-81  
 MARUSKA, E. J. **24/25**, 56-65  
 MASLOVA, I. *see* Dobroruka, L. J.  
 MAYOR, J. **23**, 243-248  
 MCCOSKER, J. E. & MILLER, E. E. **26**, 48-53  
 MCCRYSTAL, H. K. & BEHLER, J. L. **22**, 159-163  
 MCNEILLY, A. S. *see* Hodges, J. K.  
 MENDELSSOHN, H. & MARDER, U. **23**, 47-51  
 MERILAN, C. P., READ, B. W. & BOEVER, W. J. **22**,  
 241-244  
 MERITT, D. A., Jr **22**, 128-131  
 MEYBURG, B.-U. **23**, 110-113  
 MEYER, J. R. & WILCOX, C. **22**, 252-255  
 MICHALAK, I. **26**, 223-228  
 MILLER, E. E. *see* McCosker, J. E.  
 MINNEMANN, D. **23**, 16-18, 102-108  
 MINNEMANN, D. & BUSSE, H. **23**, 59-62, 108-110  
 MIRANDE, C. M. *see* Luthin, C. S.  
 MITCHELL, L. A. *see* Murphy, J. B.  
 MITTERMEIER, R. A. **22**, 1-2: *see also* Rylands, A.  
 B., Konstant, W. R.  
 MITTERMEIER, R. A., COIMBRA-FILHO, A. F.,  
 CONSTABLE, I. D., RYLANDS, A. B. & VALLE, C.  
**22**, 2-17  
 MITTERMEIER, R. A. & VAN ROOSMALEN, M. G.  
 M. **22**, 59-68  
 MONTANUCCI, R. R. **23**, 148-156  
 MOORE, H. D. M. *see* Dixon, A. F.  
 MORNER, T. **24/25**, 189-192  
 MOTTRAM, K. *see* Oyarzun, S. E.  
 MÜLLER, H. U. *see* Anderegg, R.  
 MUMAW, L., STEELE, G., ELLIOTT, M., LONNON,  
 E., HAYNES-LOVELL, K. & D'ETTORRE, A. **26**,  
 171-179  
 MURAKAMI, N. *see* Murata, K.

MURATA, K., TANIOKA, M. & MURAKAMI, N.  
**24/25**, 274-279  
 MURDOCK, G. K. *see* Maple, T. L.  
 MURPHY, J. B. *see* Radcliffe, C. W.  
 MURPHY, J. B. & MITCHELL, L. A. **23**, 135-137  
 MURPHY, M. F. **22**, 180-185

## N

NAGAHAMA, T. *see* Abe, Y.  
 NAGLE, C. A. & DENARI, J. H. **22**, 143-150  
 NAIDU, S. S. *see* Paulraj, S.  
 NELSON, K. O. **26**, 18-26  
 NEWMAN, L. *see* Roberts, M.  
 NEWMAN, M. A. & HEWLETT, S. I. **26**, 81-90  
 NOVOTNY, V. *see* Dobroruka, L. J.

## O

O'CONNOR, S. M. **24/25**, 297-303  
 OGDEN, J. *see* Beck, B. B.  
 OLDFIELD, S. *see* Lucas, G.  
 OLNEY, P. J. S. *see* Samour, H. J.  
 OYARZUN, S. E., DEVISON, D. & MOTTRAM, K. **23**,  
 248-253

## P

PACKER, W. C. *see* Beutel, P. M.  
 PAINE, F. L. & WEINHEIMER, C. J. **23**, 204-205  
 PAIS, J. A. *see* da Silveira, C. L.  
 PAKKIARAJ, J. *see* Paulraj, S.  
 PAUL, L. *see* Thurslund, D.  
 PAULL, L. M. *see* Wisniewski, P. J.  
 PAULRAJ, S., NAIDU, S. S. & PAKKIARAJ, J. **26**,  
 90-94  
 PETERSON, G. *see* Roberts, M.  
 PFEIFER, C. **24/25**, 253-256  
 PHILLIPS, J. A. **24/25**, 311-315  
 PHILLIPS, L. *see* Roberts, M.  
 PHILLIPS, R. *see* Farwell, C.  
 PLASSE, R. *see* Berry, R. J.  
 PLATT, J. B. **23**, 84-88  
 POGLAYEN-NEUWALL, I. **26**, 276-280

## R

RADCLIFFE, C. W. & MURPHY, J. B. **23**, 163-166  
 RALLS, K., LUNDRIGAN, B. & KRANZ, K. **22**,  
 244-249  
 RANDALL, P., TAYLOR, P. & BANKS, D. R. **23**,  
 183-185  
 RAU, B., VON HEGEL, G. & WIESNER, H. **26**,  
 146-154  
 READ, B. **24/25**, 294-297  
 READ, B. W. **22**, 269-270: *see also* Merilan, C. P.  
 REID, B. **26**, 189-198  
 RETTBERG, B. *see* Beck, B. B.  
 RIBEIRO, G. A. *see* Best, R. C.  
 RICHARDSON, K. C. & CULLEN, L. K. **23**, 215-218  
 RIDLEY, M. W. **24/25**, 40-44  
 RIVIELLO, M. C. *see* Visalberghi, E.  
 ROBERTS, M., KOONTZ, F., PHILLIPS, L. &  
 MALINIAK, E. **26**, 265-275  
 ROBERTS, M., NEWMAN, L. & PETERSON, G. **22**,  
 185-194

- ROWE, B. E. **24/25**, 306-310  
 RUDRAN, R. & EISENBERG, J. F. **22**, 52-59  
 RÜEDI, D. **23**, 257-259  
 RYDER, O. A. **24/25**, 157-162  
 RYLANDS, A. B. *see* Mittermeier, R. A.  
 RYLANDS, A. B. & MITTERMEIER, R. A. **22**, 17-37

## S

- SAITO, Y. *see* Abe, Y.  
 SAMOUR, J. H. **24/25**, 143-148  
 SAMOUR, H. J., OLNEY, P. J. S., HERBERT, D.,  
 SMITH, F., WHITE, J. & WOOD, D. **23**, 7-11  
 SCHAEFFER, N. *see* Branch, W. R.  
 SCHERPNER, C. **22**, 276-287  
 SCHIÖTZ, A. **26**, 53-59  
 SCHMIDT, C. R. **24/25**, 107-123  
 SCHMIDT, K. *see* Langdon, D.  
 SCHMITT, E. *see* Birchard, G. F.  
 SCHOLTEN, C. J. **26**, 198-204  
 SCOLA, R. *see* Beck, B. B.  
 SEAL, U. S. **24/25**, 174-179  
 SEARLE, K. C. **26**, 205-207  
 SEIDENSTICKER, J. **23**, 234-236  
 SHEPPARD, C. *see* Bruning, D. F.  
 SHOEMAKER, A. H. **22**, 124-127, 198-206  
 SHOEMAKER, A. H. & CROXTON, J. M. **22**, 176-180  
 SKIPPER, G. *see* Crook, G. A.  
 SLAGER, C. J. **26**, 136-139  
 SLEEPER, B. *see* Hutchins, M.  
 SMITH, F. *see* Samour, H. J.  
 SMITH, R. *see* Loomis, M.  
 SNYDER, G. K. *see* Birchard, G. F.  
 SOINI, P. **22**, 37-47  
 SOMMER, F. *see* Farwell, C.  
 STANLEY PRICE, M. R. **24/25**, 179-188  
 STEELE, G. *see* Mumaw, L.  
 STONER, J. *see* Carnio, J.  
 STUDER-THIERSCH, A. **24/25**, 240-243  
 STYLES, T. E. **22**, 215-217  
 SUMMERS, P. M. **24/25**, 131-138  
 SVENSSON, U. *see* Amundin, M.  
 SWENGEL, S. *see* Luthin, C. S.

## T

- TAKAHASHI, H. *see* Abe, Y.  
 TANIOKA, M. *see* Murata, K.  
 TAYLOR, P. *see* Randall, P.  
 TESCHE, T. *see* Widholzer, F. L.  
 THOMAS, W. D., BARNES, R., CROTTY, M. &  
 JONES, M. **24/25**, 77-99  
 THOMPSON, G. *see* Hutchins, M.  
 THOMPSON, K. *see* Kirkwood, J. K.

- THOMPSON, V. **26**, 217-222  
 THOMSETT, S. **23**, 62-64  
 THURSLUND, D. & PAUL, L. **26**, 208-212  
 TINTINGER, V. **26**, 183-186  
 TODD, F. S. **26**, 104-109, 110-124  
 TODD, W. *see* Berry, R. J.  
 TONGE, S. J. *see* Bloxam, Q. M. C.

## U

- UCHIDA, H. *see* Abe, Y.  
 UCHIDA, H. & YOSHITAKA, A. **26**, 59-61  
 UCHIDA, I. & ASUKE, M. **22**, 271-276  
 UDELL, C. C. **23**, 237-242

## V

- VALLE, C. *see* Mittermeier, R. A.  
 VAN DEN SANDE, P. A. *see* Bels, V. L.  
 VAN HOOFF, J. A. R. A. M. *see* Adang, O. M. J.  
 VAN ROOSMALEN, M. G. M. *see* Mittermeier, R. A.  
 VISALBERGHI, E. & RIVIELLO, M. C. **26**, 232-236  
 VOGT, P. **26**, 157-163  
 VON HEGEL, G. *see* Rau, B.

## W

- WARBURTON, T. **23**, 88-95  
 WARNEKE, M. *see* Beck, B. B.  
 WEEKS THOMAS, L., KLINE, C., DUFFELMEYER, J.,  
 MACLAUGHLIN, K. & DOHERTY, J. G. **24/25**,  
 279-285  
 WEINHEIMER, C. J. *see* Paine, F. L.  
 WENNRICH, G. **23**, 64-66  
 WENSING, J. A. B. *see* Adang, O. M. J.  
 WHARTON, D. C. **24/25**, 260-263  
 WHITE, J. *see* Samour, H. J.  
 WHITE, J. & MARCELLINI, D. L. **24/25**, 340-343  
 WIDHOLZER, F. L., BORNE, B. & TESCHE, T. **24/25**,  
 226-230  
 WIESNER, H. *see* Rau, B.  
 WILCOX, C. *see* Meyer, J. R.  
 WILKE, H. **23**, 137-139  
 WILLIAMS, M. G. *see* Golding, R. R.  
 WISNIEWSKI, P. J. & PAULL, L. M. **24/25**, 223-226  
 WOOD, D. *see* Samour, H. J.  
 WYLIE, S. R. **23**, 253-257

## X

- XANTEN, W. A., Jr *see* Kranz, K. R.

## Y

- YAMAKOSHI, M. *see* Best, R. C.  
 YOSHITAKA, A. *see* Uchida, H.

# cumulative index to volumes 22–26

Previous cumulative indexes are contained in Volume 11 (Volumes 1–11), Volume 16 (Volumes 12–16) and Volume 21 (Volumes 17–21). In the present index figures in bold indicate the volume number. Plates are indicated by (Pl) after the relevant page number(s). Where the name of a town is indexed this refers to the zoo, aquarium or other institution in that town. Animal species covered at any length in the text are cross-referenced from the vernacular to the scientific name and the main reference to the species appears under the scientific name and/or the name of the institution concerned.

## A

- Aardvark, see *Orycteropus afer*  
*Abramis brama*, **24/25**, 70  
*Abudefduf cyaneus*, **26**, 23  
*Abudefduf saxatilis*, **26**, 16  
*Acanthis cannabina*, **24/25**, 146  
*Acanthurus bahainus*, **26**, 16  
*Acanthurus chirurgus*, **26**, 16  
*Acanthurus coeruleus*, **26**, 16, 17  
*Acanthurus triostegus*, **26**, 23  
*Accipiter*, breeding, artificial incubation, **23**, 51–58  
*Accipiter cooperii*, **24/25**, 4, 8  
*Accipiter fasciatus*, **24/25**, 8  
*Accipiter gentilis*, **23**, 19, 51, 54, 104, 109, 119:  
**24/25**, 2, 4, 8  
*Accipiter melanoleucus*, **23**, 6: **24/25**, 8  
*Accipiter nisus*, **23**, 51, 72, 73, 119, 122: **24/25**, 4, 8  
*Accipiter novaehollandiae*, **24/25**, 8  
*Accipiter striatus*, **24/25**, 4, 8  
*Achatina*, **24/25**, 74  
*Acinonyx jubatus*, **24/25**, 194, 317, 318  
*Acipenser brevirostrum*, **24/25**, 71  
*Acipenser fulvescens*, **24/25**, 69  
*Acipenser oxyrhynchus*, **24/25**, 69  
*Acipenser sturio*, **24/25**, 69  
*Acipenser transmontanus*, **26**, 51  
*Acrochordus arafurae*,  
breeding, Melbourne, **26**, 98–103(Pl)  
*Acrochordus granulatus*, **26**, 98  
*Acrochordus javanicus*, **26**, 98–99, 102  
*Actophilornis africana*, **26**, 206  
*Addax nasomaculatus*, **24/25**, 83, 92, 162, 319  
reproductive data in captivity, review, **24/25**,  
303–306  
Adelaide,  
breeding, Matschie's tree kangaroo, **26**, 212–216  
*Aegolius funereus*, **23**, 100, 105  
*Aegypti monachus*, **23**, 19, 47, 102, 104, 109:  
**24/25**, 7  
*Aepyceros melampus*, **22**, 243: **24/25**, 159, 195, 197  
*Aetobatus narinari*, **26**, 15  
African plains exhibit, Augsburg, **26**, 315–318  
African savanna exhibit, Seattle WP, **24/25**,  
332–339  
African wildlife,  
reintroduction, national park, **24/25**, 192–199  
*Afropavo congensis*, **24/25**, 43  
*Agalychnis callidryas*, **24/25**, 57–58(Pl)  
*Agkistrodon bilineatus*, **23**, 165  
*Agkistrodon piscivorus*, **23**, 164  
*Ailuropoda melanoleuca*, **24/25**, 129, 155, 317, 318  
oestrous behaviour, related to urinary oestrogen,  
**24/25**, 274–279(Pl)  
*Ailurus fulgens*, **22**, 100: **24/25**, 163  
*Aix galericulata*, **24/25**, 203  
*Aix sponsa*, **24/25**, 203  
*Alburnus bipunctatus*, **24/25**, 69, 70  
*Alca torda*, **26**, 107, 134  
*Alcelaphus buselaphus caama*, **24/25**, 93, 195, 198  
*Alces alces*, **24/25**, 198, 318  
Algae, in intertidal exhibit, **26**, 32  
*Allenopithecus nigroviridis*, **24/25**, 113  
*Alligator mississippiensis*, **22**, 157: **24/25**, 227, 328  
*Alligator sinensis*, **24/25**, 213  
*Allocebus trichotis*, **24/25**, 109  
*Alopex lagopus*, **24/25**, 189, 203  
*Alopias vulpinus*, **26**, 51  
*Alopothen aegyptiacus*, **24/25**, 333  
*Alouatta*, **22**, 13–14, 47, 125, 132  
*Alouatta belzebul*, **22**, 5, 25, 32, 34  
*Alouatta belzebul belzebul*, **22**, 29, 32, 34  
*Alouatta belzebul discolor*, **22**, 29, 32  
*Alouatta belzebul nigerrima*, **22**, 29, 32  
*Alouatta belzebul ululata*, **22**, 4, 5, 29, 32, 34  
*Alouatta caraya*, **22**, 13  
acclimatisation, feeding, Chicago LP, **22**,  
128–131  
*Alouatta fusca*, **22**, 4, 5, 6, 7, 13–14: **24/25**, 110  
*Alouatta fusca beniensis*, **22**, 13  
*Alouatta fusca clamitans*, **22**, 4, 5, 6, 13  
*Alouatta fusca fusca*, **22**, 5, 13  
*Alouatta palliata*, **22**, 37  
*Alouatta seniculus*, **22**, 13, 25, 32, 39, 40, 44, 53, 54,  
61–65, 67, 72, 79, 128  
*Alouatta seniculus sara*, **22**, 129  
*Alouatta seniculus seniculus*, **22**, 43, 45  
*Alouatta villosa*, **24/25**, 110  
Alpha-tocopherol, levels in plasma, zoo animals,  
**24/25**, 316, 321  
Amazon regional exhibit, Vancouver Aqu, **26**,  
81–90 (Pl)  
*Amazona leucocephala hesterna*, **24/25**, 145

- Amazona vittata*, **23**, 67  
*Amblyglyhidodan xanthurus*, **26**, 29  
*Ambystoma andersoni*, **24/25**, 64  
*Ambystoma dumerili dumerili*, **24/25**, 63–64(PI)  
*Ambystoma mexicanum*, **23**, 167: **24/25**, 64  
*Ambystoma talpoideum*, **23**, 166  
*Ambystoma taylori* (= *subsalsum*), **24/25**, 64  
*Ameiva ameiva*,  
 breeding, NY Bronx, **22**, 159–163(PI)  
*Ameiva ameiva petersii*, **22**, 162  
*Ameiva ameiva tobagana*, **22**, 160, 162  
*Ameiva bifrontata*, **22**, 162  
*Ameiva chrysolema*, **22**, 160  
*Ameiva festiva*, **22**, 162  
*Ameiva quadrilineata*, **22**, 162  
*Ammotragus lervia*, **24/25**, 319  
 Amphibians,  
 bred in captivity, **22**, 366–367: **23**, 266–267:  
**24/25**, 430–431: **26**, 416  
 rare, census, **22**, 439: **23**, 342: **24/25**, 566: **26**, 508  
 reproductive patterns, **23**, 166–174  
 review, breeding programmes, **24/25**, 56–65(PI)  
*Anableps anableps anableps*, breeding, Stuttgart, **26**,  
 64–70(PI)  
*Anableps dowi*, **26**, 64, 68  
*Anableps microlepis*, **26**, 64  
 Anaesthesia, small macropods, **23**, 215–218  
*Anarrhichthys ocellatus*, breeding, Vancouver  
 Aquarium, **26**, 70–81 (PI)  
*Anas aucklandica chlorotis*, **24/25**, 24  
*Anas aucklandica nesiotis*, **24/25**, 24  
*Anas capensis*, **24/25**, 333, 337: **26**, 316  
*Anas hottentota*, **26**, 206  
*Anas platyrhynchos*, **24/25**, 21, 202  
*Anas platyrhynchos platyrhynchos*, **24/25**, 143  
*Anas poecilorhyncha superciliosa*, **24/25**, 202  
*Andrias*, **23**, 167  
*Andrias davidianus*, **23**, 166: **24/25**, 62  
*Andrias japonicus*, **23**, 166: **24/25**, 62–63  
*Anisotremus virginicus*, **26**, 16, 17  
*Anodonta*, **26**, 62  
*Anolis carolinensis*, **24/25**, 341  
*Anolis lividus*, **24/25**, 52  
*Anser erythropus*, **24/25**, 190  
*Anser fabalis*, **24/25**, 190  
 Antarctic penguin exhibit, San Diego, Sea World,  
**26**, 104–109(PI)  
 Anteater, Giant, see *Myrmecophaga tridactyla*;  
 Mexican see *Tamandua mexicana*  
 Antelope, Sable, see *Hippotragus niger*  
*Anthias*, **26**, 23  
*Anthropoides paradisea*, **24/25**, 28  
*Anthropoides virgo*, **24/25**, 143  
*Antilocapra marsupialis*, **22**, 243: **24/25**, 194, 195,  
 333  
 hand-rearing, reintegration, **22**, 269–270  
*Antilocapra americana*, **24/25**, 81, 88  
*Antelope cervicapra*, **24/25**, 319  
*Antrozous pallidus*, **26**, 229  
 Antwerp,  
 breeding, Australian carpet python, **24/25**,  
 231–236  
*Aotus*, **22**, 1, 28, 125: **24/25**, 159  
*Aotus trivirgatus*, **22**, 25, 28, 39, 40, 41, 53, 54, 79,  
 85, 86  
 karyological studies, **22**, 119–124  
 reproductive physiology, behaviour, **22**, 115–119  
*Aotus trivirgatus azarae*, **22**, 122  
*Aotus trivirgatus boliviensis*, **22**, 120, 122  
*Aotus trivirgatus griseimembra*, **22**, 115, 121, 122  
*Aotus trivirgatus nigriceps*, **22**, 41, 45, 121, 122  
*Aotus trivirgatus roberti*, **22**, 122  
*Aotus trivirgatus trivirgatus*, **22**, 41, 45, 121, 122  
*Aotus trivirgatus vociferans*, **22**, 121, 122  
*Aphanius iberus*, **24/25**, 69  
*Aphyosemion*, **26**, 56  
*Apis mellifera*, **24/25**, 329, 330  
*Aplopelia larvata*, **26**, 206  
*Apogon kallopterus*, **26**, 23  
*Aptenodytes forsteri*, **26**, 104, 127  
 breeding, San Diego, Sea World, **26**, 110–124(PI)  
*Aptenodytes patagonica*, **26**, 104, 105, 127, 146, 148,  
 149(PI), 152  
 breeding, San Diego, Sea World, **26**, 110–124(PI)  
 Aquarium (incl. reptiles/amphibians/invertebrates),  
 Berlin W, **24/25**, 322–332(PI)  
 Aquarium systems, living corals, a review, **26**, 1–9  
 Aquarium, modernisation of exhibits, **26**, 53–59  
*Aquila audax*, **23**, 17, 102, 104, 109: **24/25**, 9  
 breeding, Berlin E, **23**, 59–62(PI)  
*Aquila chrysaetos*, **23**, 17, 60, 104, 108(PI), 111, 119:  
**24/25**, 4, 9  
*Aquila chrysaetos daphanea*, **23**, 72, 73  
*Aquila clanga*, **23**, 104, 109, 112: **24/25**, 9  
*Aquila heliaca*, **23**, 109: **24/25**, 9  
*Aquila heliaca adalberti*, **23**, 111  
*Aquila heliaca heliaca*, **23**, 111  
*Aquila pomarina*, **23**, 107, 109, 110  
*Aquila rapax*, **23**, 19, 60, 104, 106(PI), 107, 109:  
**24/25**, 9  
*Aquila rapax nipalensis*, **23**, 29  
*Aquila verreauxi*, **23**, 110  
*Ara chloroptera*, **24/25**, 145  
*Ara macao*, **24/25**, 145  
*Arapaima gigas*, **24/25**, 69: **26**, 83  
*Aratinga guarouba*, **24/25**, 145  
*Arctocephalus*, **22**, 231  
*Arctocephalus australis*, **22**, 228: **26**, 148, 152  
*Arctocephalus forsteri*, **26**, 171, 173  
*Arctocephalus pusillus*, **22**, 228: **26**, 154  
 breeding, Toronto, **22**, 207–215  
*Arctocephalus pusillus doriferus*, **26**, 171, 173  
*Arctocephalus tropicalis*, **26**, 167, 171, 173  
*Ardea cinerea*, **23**, 19, 29, 33  
*Argonauta*, **26**, 48  
*Arius felis*, **26**, 16  
 Armadillo, Large hairy, see *Chaetophractus villosus*  
 Arnhem,  
 Chimpanzee colony, **26**, 236–248  
*Artibeus jamaicensis*, **22**, 187: **26**, 266  
 Artificial breeding techniques,  
 problems/practicalities, **24/25**, 148–157  
 recent advances, birds/reptiles, **24/25**, 143–148  
 Artificial insemination,

- cryogenic preservation, spermatozoa, *Falco sparverius*, **23**, 67–71(PI)  
 semen collection, **22**, 241–244  
*Arvicola terrestris*, **24/25**, 202  
*Asio flammeus*, **23**, 72, 73, 94  
*Asio otus*, **23**, 105, 119  
*Asio otus otus*, **23**, 100  
*Asio otus wilsonianus*, **23**, 110  
*Aspidites melanocephalus*, **23**, 169  
*Ataenobius toweri*, **24/25**, 70  
*Atelrix pruneri*,  
   breeding, Adelphi University, **22**, 195–197(PI)  
*Ateles*, **22**, 14, 32, 34, 44, 125: **24/25**, 159  
   housing, outdoors, low temperature, **22**, 131–138  
*Ateles belzebuth*, **22**, 25, 33, 39, 40, 53, 54, 57, 85: **24/25**, 110  
*Ateles belzebuth belzebuth*, **22**, 33, 43, 45, 51  
*Ateles belzebuth marginatus*, **22**, 29, 33  
*Ateles fusciceps*, **24/25**, 110  
*Ateles fusciceps robustus*, **22**, 132  
*Ateles geoffroyi*, **22**, 133(PI): **24/25**, 108, 110, 114  
*Ateles geoffroyi ornatus*, **22**, 132  
*Ateles geoffroyi panamensis*, **22**, 70  
*Ateles paniscus*, **22**, 25, 33, 39, 40, 43, 61, 65, 77, 85: **24/25**, 108, 110, 114  
*Ateles paniscus chamek*, **22**, 33, 43, 45, 51  
*Ateles paniscus paniscus*, **22**, 33, 62, 63, 64, 66(PI), 67, 68  
*Atelopus bufoniformis*, **23**, 167  
*Atelopus ignescens*, **23**, 167  
*Athene brama*, **23**, 72, 73, 105  
*Athene noctua*, **23**, 19, 72, 73, 101, 102, 105: **24/25**, 1, 204  
 Atoll reef exhibit, Hong Kong OP, **26**, 26–29  
*Attractoscion nobilis*, **26**, 51  
*Atta sexdens limas*, **24/25**, 329  
 Auckland,  
   breeding, Tuatara, **26**, 183–186(PI)  
 Augsburg,  
   African plains exhibit, **26**, 315–318(PI)  
*Avahi laniger occidentalis*, **24/25**, 109  
*Aviceda subcristata*, **24/25**, 6  
*Axis axis*, **24/25**, 318  
*Aythya novaeseelandiae*, **24/25**, 238  
 AZWU, reintroduction to the wild, European eagle owls, **23**, 95–100
- B**
- Balaeniceps rex*, **24/25**, 34  
*Balaenoptera musculus*, **24/25**, 175  
*Balearica regulorum*, **24/25**, 333: **26**, 316  
*Balistes capriscus*, **26**, 16  
 Baltimore Aquarium,  
   tidepool exhibit, **26**, 34–41  
*Barbus cumingi*, **24/25**, 69, 70  
*Barbus nigrofasciatus*, **24/25**, 68, 69, 70  
*Barbus titteya*, **24/25**, 69  
*Barbus treurenensis*, **24/25**, 69  
*Barbus trevelyani*, **24/25**, 69  
*Basiliscus plumifrons*, **24/25**, 51, 53, 329  
 Basle,  
   enclosure, Dwarf mongoose, **23**, 257–259(PI)  
   sexing by tarsus length, flamingos, **24/25**, 240–243  
*Basariscus astutus*,  
   management, biology, Tucson Reid Park, **26**, 276–280  
*Basariscus astutus arizonensis*, **26**, 277  
 Bear, American black, see *Ursus (Euarctos) americanus*  
*Begonia socotrana*, **24/25**, 125  
 Behavioural studies,  
   data, collection, volunteers, **22**, 244–249  
*Belontia signata*, **24/25**, 69  
 Berlin, East (Berlin Tierpark),  
   breeding, American bald eagle, **23**, 16–18(PI)  
   Wedge-tailed eagle, **23**, 59–62(PI)  
   breeding, cross-fostering, birds of prey, **23**, 102–108(PI)  
   longevity, birds of prey, **23**, 108–110  
   penguin exhibit, **26**, 140–142(PI)  
 Berlin, West,  
   Aquarium (incl. reptiles/amphibians/invertebrates), **24/25**, 322–332(PI)  
   breeding, Andean condor, **23**, 14–16  
   owls, **23**, 100–102  
*Bettongia penicillata*, **24/25**, 104, 213, 215  
 Bird house, St Louis, **23**, 254–257(PI)  
 Birds,  
   bred in captivity, **22**, 372–405: **23**, 272–307: **24/25**, 445–506: **26**, 423–466  
   captive management for conservation, **24/25**, 45–49  
   rare, census, **22**, 444–450: **23**, 346–351: **24/25**, 573–582: **26**, 513–520  
 Birds of prey,  
   breeding, Berlin E, **23**, 102–108(PI)  
   in captivity, review, **24/25**, 1–20  
   longevity, **23**, 108–110  
   marking techniques, **23**, 125–132(PI)  
   nutrition, **23**, 114–117  
   principles conservation, captive management, **23**, 1–7  
   veterinary care/release, injured wild, **23**, 117–121, 121–125  
 Birmingham, USA,  
   breeding, hand-rearing, Long-billed corella, **24/25**, 253–256(PI)  
*Bison bison*, **24/25**, 141, 318  
*Bison bonasus*, **22**, 198: **24/25**, 162, 174, 318  
*Bitis arietans* (= *lachesis*), **23**, 169  
*Bitis atrops*, **23**, 169  
*Bitis gabonica gabonica*, **23**, 169  
*Bitis gabonica rhinoceros*, **23**, 169  
 Bitterling, Tokyo, see *Tanakia tanago*  
*Blastocerus dichotomus*, **24/25**, 79, 80  
*Boa constrictor constrictor*, **23**, 169, 171  
*Boa constrictor occidentalis*, **23**, 171  
 BOBARS, breeding, reintroduction, Barn owl, **23**, 88–95(PI)  
*Bombina bombina*, **24/25**, 331  
*Bombina orientalis*, **24/25**, 331  
*Bombyx mori*, **24/25**, 74

- Bongo, see *Tragelaphus euryceros*  
*Bos gaurus*, **22**, 100: **24/25**, 82, 90, 101, 133, 134, 141, 163, 318  
*Bos indicus*, **24/25**, 134, 141  
*Bos javanicus*, **22**, 243: **24/25**, 82, 90, 141  
*Bos sauveli*, **24/25**, 218  
*Bos taurus*, **24/25**, 134, 141: **26**, 316  
*Boselaphus tragocamelus*, **24/25**, 318  
*Bothrops undulatus*, **23**, 169  
*Brachylophus fasciatus*, **23**, 169  
*Brachyteles arachnoides*, **22**, 5, 6, 7, 14-15(Pl): **24/25**, 111  
*Branta canadensis*, **24/25**, 190  
*Branta canadensis leucopareia*, **24/25**, 25  
*Branta leucopsis*, **24/25**, 190  
*Branta sandvicensis*, **22**, 199: **23**, 67: **24/25**, 24, 143  
Brazil, Atlantic forest region, primates, status and conservation, **22**, 2-17  
Brazilian Amazonia, primates, status and conservation, **22**, 17-37  
Bristol,  
  food/energy consumption, birds of prey, **23**, 114-117  
*Bubalus bubalis*, **24/25**, 141  
*Bubalus depressicornis*, **24/25**, 81, 90, 91, 162  
*Bubalus mindorensis*, **24/25**, 218  
*Bubalus quarlesi*, **24/25**, 81, 90  
*Bubo africanus*, **23**, 101  
*Bubo africanus africanus*, **23**, 105  
*Bubo africanus cinerascens*, **23**, 72, 73  
*Bubo bubo*, **23**, 19, 20, 21, 29, 33, 114, 115, 119: **24/25**, 189-190  
*Bubo bubo bengalensis*, **23**, 72, 73, 105, 110  
*Bubo bubo bubo*, **23**, 72, 73, 94, 100, 105: **24/25**, 200  
  reintroduction to wild, **23**, 95-100  
*Bubo bubo nikolskii*, **23**, 72, 73  
*Bubo bubo omissus*, **23**, 105, 110  
*Bubo capensis mackinderi*, **23**, 105  
*Bubo lacteus*, **23**, 101, 102, 105  
*Bubo poensis*, **23**, 105  
*Bubo sumatrana*, **23**, 100, 105, 110  
*Bubo virginianus*, **23**, 19, 29, 100, 105, 110  
*Buceros bicornis*, breeding, Burford, **24/25**, 248-252(Pl)  
*Bucorvus cafer*, **26**, 316  
*Budorcas taxicolor taxicolor*, **24/25**, 84, 95  
Buffalo,  
  tube feeding, frogs, **23**, 204-205  
*Bufo blombergi*, **24/25**, 60  
*Bufo houstonensis*, **24/25**, 60  
*Bufo lemur*, **24/25**, 60, 64, see also *Peltophryne lemur*  
*Bufo marinus*, **24/25**, 341  
  use for pest control, **26**, 88  
*Bugeranus carunculatus*, **24/25**, 26, 27, 213  
Burford,  
  breeding, Great Indian hornbill, **24/25**, 248-252(Pl)  
*Burhinus oedicnemus*, **23**, 85  
*Buteo*, **22**, 79: **23**, 107  
  breeding, artificial incubation, **23**, 51-58  
*Buteo buteo*, **23**, 51, 54, 72, 73, 104, 107, 119, 121, 122, 123: **24/25**, 8, 16  
*Buteo jamaicensis*, **23**, 51, 104, 109: **24/25**, 4, 8, 14  
*Buteo lagopus*, **23**, 104: **24/25**, 4, 8  
*Buteo lagopus santijohannis*, **23**, 109  
*Buteo lineatus*, **24/25**, 8  
*Buteo nitidus*, **24/25**, 9  
*Buteo regalis*, **23**, 51, 54, 104, 107: **24/25**, 4, 9  
*Buteo rufinus*, **23**, 16, 19, 29, 104, 109: **24/25**, 9  
*Buteo rufofuscus*, **24/25**, 9  
*Buteogallus urubitinga*, **24/25**, 8
- C**
- Cabassous*, **22**, 194  
*Cabassous centralis*, **22**, 186, 192  
*Cacajao calvus*, **22**, 25, 30-31, 40, 44  
*Cacajao calvus calvus*, **22**, 29, 30-31(Pl), 34: **24/25**, 110  
*Cacajao calvus rubicundus*, **22**, 30, 42(Pl), 45, 79: **24/25**, 110  
*Cacajao melanocephalus*, **22**, 25, 30-31, 53, 54, 55(Pl), 58: **24/25**, 110  
*Cacatua sanguinea*, **24/25**, 253  
*Cacatua tenuirostris pastinator*, **24/25**, 253  
*Cacatua tenuirostris tenuirostris*,  
  breeding, hand-rearing, Birmingham, **24/25**, 253-256(Pl)  
Cacomistle, see *Bassariscus astutus*  
Caesarean section/subsequent birth, Aruba Island rattlesnake, **26**, 187-188  
*Caiman crocodilus*, **24/25**, 328  
*Caiman crocodilus fuscus*, **23**, 168  
*Caiman crocodilus yacare*, **23**, 168: **26**, 83, 95  
*Caiman latirostris*, **24/25**, 328  
  breeding, Sao Leopoldo, **24/25**, 226-230  
Caiman, Broad-nosed, see *Caiman latirostris*  
Cainism/captive breeding, birds of prey, **23**, 110-113  
*Cairina moschata*, **24/25**, 143  
*Cairina scutulata*, **24/25**, 21, 23  
Calgary,  
  stillbirth, Lowland gorilla, **23**, 183-185  
*Callicebus*, **22**, 125  
*Callicebus moloch*, **22**, 25, 28, 39, 40, 44, 79, 85, 132, 136  
*Callicebus moloch brunescens*, **22**, 28  
*Callicebus moloch brunneus*, **22**, 41, 45  
*Callicebus moloch cupreus*, **22**, 28, 41, 45  
*Callicebus moloch discolor*, **22**, 41, 45  
*Callicebus moloch donacophilus*, **22**, 28  
*Callicebus moloch hoffmannsi*, **22**, 28, 29  
*Callicebus moloch moloch*, **22**, 28, 29  
*Callicebus personatus*, **22**, 6, 11: **24/25**, 110  
*Callicebus personatus melanochir*, **22**, 5, 7, 11  
*Callicebus personatus nigrifrons*, **22**, 5, 6, 11  
*Callicebus personatus personatus*, **22**, 5, 6, 7, 11  
*Callicebus torquatus*, **22**, 25, 28, 40, 44, 45, 53, 54  
*Callicebus torquatus lugens*, **22**, 28  
*Callicebus torquatus torquatus*, **22**, 28, 41, 45  
*Callimico goeldii*, **22**, 25, 27, 39, 40, 41, 45, 77, 85: **24/25**, 104, 108, 110, 114, 207



- breeding, Chicago Brookfield, **22**, 106–114  
 Jersey, **22**, 101–105
- Callithrix*, **22**, 9
- Callithrix argentata*, **22**, 24, 25, 77, 85
- Callithrix argentata argentata*, **22**, 24, 29
- Callithrix argentata leucippe*, **22**, 24, 29, 34: **24/25**, 110
- Callithrix argentata melanura*, **22**, 24
- Callithrix aurita*, **22**, 5, 6, 7, 8: **24/25**, 110
- Callithrix flaviceps*, **22**, 5, 6, 7, 8(Pl): **24/25**, 110
- Callithrix geoffroyi*, **22**, 5, 7, 8, 85
- Callithrix humeralifer*, **22**, 24, 25: **24/25**, 110
- Callithrix humeralifer chrysoleuca*, **22**, 24, 29, 34
- Callithrix humeralifer humeralifer*, **22**, 24(Pl), 29
- Callithrix humeralifer intermedius*, **22**, 24, 29
- Callithrix jacchus*, **22**, 1, 4, 5, 6, 7, 9, 71, 85, 96, 104, 111, 118, 132: **24/25**, 102, 133, 134, 153: **26**, 83
- physiology, **22**, 138–143(Pl)
- Callithrix jacchus jacchus*, **24/25**, 120
- Callithrix kuhli*, **22**, 5, 7, 8(Pl), 9, 11
- Callithrix penicillata*, **22**, 4, 5, 7, 9
- Callorhinus ursinus*, **22**, 228, 231
- Callosciurus prevosti*, **22**, 177
- Caloenas nicobarica*, **22**, 168
- Camelus* spp, **24/25**, 316
- Camelus bactrianus*, **22**, 241, 242, 247
- Camelus dromedarius*, **22**, 241, 242: **24/25**, 318
- Camelus ferus* (= *bactrianus*), **24/25**, 318
- Candoia carinatus paulsoni*, **23**, 169
- Canis familiaris*, **23**, 235
- Canis latrans*, **24/25**, 79
- Canis lupus*, **23**, 45: **24/25**, 160, 189, 203
- Canis lupus lupus*, **24/25**, 191
- Canis lupus tundrarum*, **24/25**, 213
- Canthigaster jactator*, **26**, 23
- Capra*, **24/25**, 95–96
- Capra aegagrus*, **24/25**, 85, 96
- Capra aegagrus blythi*, **24/25**, 85, 96
- Capra aegagrus cretica*, **24/25**, 85, 96
- Capra aries*, **23**, 251
- Capra caucasica*, **24/25**, 96
- Capra caucasica* (= *severtzovi*), **24/25**, 96
- Capra falconeri*, **24/25**, 85, 96, 319
- Capra falconeri falconeri*, **24/25**, 85
- Capra falconeri hepineri*, **24/25**, 86
- Capra falconeri megaceros*, **24/25**, 86
- Capra hircus*, **22**, 243: **23**, 251, 252
- Capra ibex*, **24/25**, 96
- Capra ibex caucasica*, **24/25**, 96
- Capra ibex caucasica* (= *severtzovi*), **24/25**, 96
- Capra ibex cylindricornis*, **24/25**, 96
- Capra ibex ibex*, **24/25**, 85, 201
- Capra ibex nubiana*, **23**, 44: **24/25**, 85
- hand-rearing, Metro Toronto, **23**, 248–253
- Capra ibex severtzovi*, **24/25**, 96
- Capra ibex sibirica*, **24/25**, 85
- Capreolus capreolus*, **22**, 238: **24/25**, 189
- Capricornis*, **26**, 297
- Capricornis crispus crispus*, **24/25**, 84, 95
- Capuchin, Brown, see *Cebus apella*
- Carcharhinus galapagensis*, **26**, 59
- Carcharhinus melanopterus*, **26**, 23, 24, 59
- Carcharhinus plumbeus*, **26**, 59, 60(Pl)
- Carcharodon carcharias*, **26**, 51
- Carduelis carduelis*, **24/25**, 145
- Carduelis spinus*, **24/25**, 145
- Caretta caretta*, **24/25**, 324
- Carettochelys insculpta*, **24/25**, 213
- Carollia perspicillata*, **22**, 187: **26**, 266
- Carpococcyx renauldi*,  
 breeding, Toronto, **22**, 168–171
- Casarea dussumieri*, **24/25**, 50, 51, 52, 55
- Cassowary, see *Casuarus*
- Castor canadensis*, **24/25**, 203
- Castor fiber*, **24/25**, 201
- Casuarus* spp.,  
 food intake, growth rate, **26**, 189–198
- Casuarus casuarus*,  
 artificial incubation, humidity, **22**, 164–167
- Cat, Geoffroy's, see *Felis geoffroyi*
- Catharacta skua lonnbergi*, **26**, 105
- Cathartes aura*, **23**, 109: **24/25**, 6
- Cathartes aura aura*, **23**, 104
- Cathartes burrovianus*, **24/25**, 6
- Catreus wallichi*,  
 reintroduction to wild, **24/25**, 40–43
- Caulolatilus princeps*, **26**, 108
- Cavia aperea*, **26**, 282
- Cavia porcellus*, **26**, 286
- Cebuella pygmaea*, **22**, 24, 25, 39, 40, 44, 45  
 breeding, Skansen Aquarium, **22**, 88–93(Pl)
- Cebus*, **22**, 57  
 reproductive physiology, **22**, 143–150
- Cebus albifrons*, **22**, 25, 27, 28, 39, 40, 53, 54, 72, 132, 143
- Cebus albifrons cuscinus*, **22**, 42, 45
- Cebus albifrons juracus*, **22**, 42, 45
- Cebus albifrons unicolor*, **22**, 42, 45
- Cebus apella*, **22**, 6, 11–13, 25, 27, 39, 40, 44, 53, 54, 61–65, 67, 85, 86, 143  
 hand-rearing, reintroduction, **26**, 232–236
- Cebus apella apella*, **22**, 62
- Cebus apella libidinosus*, **22**, 4, 5, 12
- Cebus apella macrocephalus*, **22**, 42, 45
- Cebus apella nigrinus*, **22**, 4, 5, 6, 10, 12
- Cebus apella robustus*, **22**, 5, 7, 12(Pl)
- Cebus apella xanthosternus*, **22**, 5, 7, 12(Pl), 13
- Cebus capucinus*, **22**, 72, 143
- Cebus nigrivittatus*, **22**, 25, 27, 53, 54, 61–67, 143
- Cephalophus dorsalis*, **22**, 233, 234, 239: **24/25**, 91
- Cephalophus jentinki*, **24/25**, 82, 91
- Cephalophus maxwelli*, **22**, 232: **24/25**, 91
- Cephalophus monticola*, **22**, 232, 233
- Cephalophus rufilatus*, **22**, 239: **24/25**, 91
- Cephalophus spadix*, **22**, 233
- Cephalophus sylvicultor*, **23**, 199, 238: **24/25**, 82, 91  
 husbandry, breeding, Washington NZP, **22**, 232–240
- Cephalophus zebra*, **22**, 232: **24/25**, 82, 91
- Cephalopods, keeping, exhibiting, Seattle Aquarium, **26**, 41–48(Pl)
- Cephalorhynchus commersoni*, **22**, 228
- Cepphus columba*, **26**, 107

- Ceratophrys*, 23, 168  
*Ceratophrys ornata*, 24/25, 59  
*Ceratotherium simum*, 24/25, 160  
*Ceratotherium simum cottoni*, 24/25, 160, 297  
*Ceratotherium simum simum*, 24/25, 160, 195, 196, 317  
 activity cycles in captivity, Whipsnade, 24/25, 297-303  
*Cercocebus galeritus galeritus*, 24/25, 111  
*Cercocebus torquatus*, 24/25, 108, 113, 114  
*Cercopithecus aethiops*, 24/25, 129  
*Cercopithecus aethiops sabaeus*, 22, 74  
*Cercopithecus diana*, 24/25, 108, 113, 114, 312  
*Cercopithecus dryas*, 24/25, 113  
*Cercopithecus erythrogaster*, 24/25, 113  
*Cercopithecus erythrotis*, 24/25, 113  
*Cercopithecus hamlyni*, 24/25, 108, 113, 114  
*Cercopithecus lhoesti*, 24/25, 113  
*Cercopithecus salongo*, 24/25, 113  
*Cereopsis novaehollandiae gizeus*, 24/25, 23  
*Cerorhinca monocerata*, 26, 107  
*Cervus duvauceli*, 24/25, 79, 80, 318  
*Cervus elaphus*, 23, 247  
*Cervus eldi thamin*, 22, 238: 24/25, 79, 80, 213  
*Cervus nippon*, 24/25, 318  
*Cervus nippon pseudaxis*, 24/25, 79, 80  
*Cervus nippon taiouanus*, 24/25, 79, 80  
*Chaetodipterus faber*, 26, 16, 17  
*Chaetodon auriga*, 26, 23  
*Chaetodon kleini*, 26, 23  
*Chaetodon lunula*, 26, 23  
*Chaetodon multicinctus*, 26, 23  
*Chaetodon quadrimaculatus*, 26, 23  
*Chaetodon sedentarius*, 26, 16  
*Chaetodon vagabundus*, 26, 23  
*Chaetophractus nationi*, 22, 185  
*Chaetophractus vellerosus*, 22, 185  
*Chaetophractus villosus*,  
 breeding, Washington NZP, 22, 185-194(PI)  
*Chamaeleo*, 23, 170  
*Charadrius novaeseelandiae*, transport, eggs, 24/25, 306  
*Cheirodon axelrodi*, 26, 57  
*Cheirogaleus medius*, 24/25, 104, 105, 108, 114  
*Chelodina longicollis*, 23, 168: 26, 95  
*Chelodina novaeguineae*, 23, 168  
*Chelonia mydas*, 24/25, 146, 324: 26, 27  
*Chelys fimbriata*, 23, 168  
*Chersina angulata*, 26, 314  
 Chicago Aquarium,  
 Coral Reef exhibit, 26, 9-18(PI)  
 Chicago, Brookfield,  
 breeding, Goeldi's monkey, 22, 106-114  
 Chicago, Lincoln Park,  
 acclimatisation and feeding, Black howler  
 monkey, 22, 128-131  
 penguin/seabird exhibit, 26, 132-136  
*Chiloscyllium punctatum*, 26, 29  
 Chimpanzee, see *Pan troglodytes*; Pygmy, see *Pan paniscus*  
*Chinchilla laniger*, 24/25, 103  
*Chionis alba*, 26, 105  
*Chiropotes albinasus*, 22, 25, 29, 31, 32: 24/25, 110  
*Chiropotes satanas*, 22, 25, 31, 32, 53, 54, 57, 61  
*Chiropotes satanas chiropotes*, 22, 31, 32, 62-68  
*Chiropotes satanas satanas*, 22, 29, 31, 32, 34: 24/25, 110  
*Chlamydotis undulata*, 23, 85  
*Chlamyphorus*, 22, 185, 186, 189, 191, 192, 194  
*Choeraododis*, 26, 88  
*Choeropsis liberiensis*, 22, 247  
 hand-rearing, Melbourne, 22, 268-270  
*Choloepus didactylus*, 22, 187: 26, 87  
*Chondropython*, 23, 168, 172  
*Chondropython viridis*, 23, 169  
*Choriotis kori*, 24/25, 333  
 Christchurch, Orana Park,  
 hand-feeding, reintegration, Scimitar-horned  
 oryx, 23, 243-248  
*Chromis*, 26, 23  
*Chromis agilis*, 26, 23  
*Chromis hanui*, 26, 23  
 Chromosomes,  
 paternity diagnosis, Pygmy chimpanzee, 23,  
 220-223(PI)  
*Chrysocyon brachyurus*, 24/25, 207  
 exhibited with *Myrmecophaga tridactyla*,  
 Osnabruck, 24/25, 271-274(PI)  
*Ciccaba woodfordi*, 23, 101, 102, 105  
*Ciconia*, 23, 66  
*Ciconia abdimii*, 24/25, 34  
*Ciconia ciconia*, 24/25, 189  
*Ciconia ciconia boyciana*, 24/25, 27, 35-37(PI)  
*Ciconia ciconia ciconia*, 24/25, 34, 35  
*Ciconia episcopus*, 24/25, 34  
*Ciconia maguari*, 24/25, 34  
*Ciconia nigra*, 24/25, 34, 248  
*Ciconia stormi*, 24/25, 34  
 Cincinnati,  
 breeding, Demidoff's galago, 26, 229-231  
 embryo transfer, birth Bongo to Eland surrogate,  
 24/25, 138-141(PI)  
 mother-reared, second-generation, Aardvark, 26,  
 281-285(PI)  
*Circus*, 24/25, 13  
*Circus aeruginosus*, 24/25, 8  
*Cnemidophorus*, 22, 163: 23, 157  
 Cock-of-the-rock, Scarlet/Andean, see *Rupicola peruviana*  
*Coendou prehensilis*,  
 management, biology, Washington NZP/NY  
 Bronx, 26, 265-275(PI)  
*Colobus badius*, 24/25, 107, 113  
*Colobus badius gordonorum*, 24/25, 111  
*Colobus badius kirki*, 24/25, 111  
*Colobus badius preussi*, 24/25, 111  
*Colobus badius rufomitratus*, 24/25, 111  
*Colobus satanas*, 24/25, 111  
*Colobus verus*, 24/25, 111  
*Columba livia*, 22, 234  
 Columbia (Riverbanks Zoological Park),  
 breeding, Ground cuscus, 22, 176-180(PI)  
 White-faced saki, 22, 124-127(PI)  
 Condor, Andean, see *Vultur gryphus*

- Connochaetes gnou*, 22, 243: 24/25, 93  
*Connochaetes taurinus*, 22, 246, 247, 248: 24/25, 195, 197
- Copenhagen Aquarium (Danmarks Akvarium), exhibit modernisation, 26, 53–59
- Copysychus seychellarum*, 24/25, 45
- Coracias caudata*, 24/25, 333, 337
- Coragyps atratus*, 23, 12, 46, 104, 109: 24/25, 6
- Coral Reef exhibit, artificial corals,  
 Chicago Aqu, 26, 9–18(PI)  
 Hong Kong OP, 26, 26–29(PI)  
 Seattle Aqu, 26, 18–26(PI)
- Corallus canina*, 23, 168, 169
- Corals, living, suitability in aquaria, 26, 4–6
- Corella, Long-billed, see *Cacatua t. tenuirostris*
- Coreobagrus ichikawai*, 24/25, 69
- Coris guimardi*, 26, 23
- Corucia zebrata*, 23, 169: 24/25, 213
- Corvus ruficollis*, 23, 46
- Corythoichthys intestinalis*, 26, 4
- Cosmopsarus regius*, 26, 206
- Cossypha albicapilla*, 26, 206
- Cotswold Wild Life Park, see Burford
- Cottus aeneus*, 26, 38
- Cranes,  
 breeding endangered, review, 24/25, 25–39(PI)
- Crax blumenbachi*, breeding, Rio de Janeiro, 24/25, 244–247
- Crax fasciolata*, 24/25, 246
- Crax rubra*, 26, 87
- Cricetomys gambianus*, 26, 229
- Crociodura russula*, 26, 227
- Crocodile, African slender-snouted, see *Crocodylus cataphractus*: Siamese, see *Crocodylus siamensis*
- Crocodylus acutus*, 24/25, 227, 328
- Crocodylus cataphractus*,  
 breeding, Miami Metro Zoo, 23, 139–143
- Crocodylus intermedius*, 23, 142: 24/25, 329
- Crocodylus johnsoni*, 24/25, 329
- Crocodylus niloticus*, 23, 142: 24/25, 329: 26, 313
- Crocodylus novaeguineae*, 24/25, 329
- Crocodylus porosus*, 22, 157
- Crocodylus rhombifer*, 24/25, 213, 329
- Crocodylus siamensis*, 23, 141, 142: 24/25, 329  
 breeding, Miami Metro Zoo, 22, 156–158
- Crocota crocuta*, 24/25, 194
- Cromileptis altivelis*, 26, 23
- Crossoptilon crossoptilon*, 24/25, 43
- Crossoptilon mantchuricum*, 24/25, 43
- Crotalus*, 23, 168
- Crotalus adamanteus*, 23, 169
- Crotalus atrox*, 23, 163, 169
- Crotalus basiliscus basiliscus*, 23, 169
- Crotalus catalinensis*, 23, 164
- Crotalus durissus*, 23, 170
- Crotalus enyo*, 23, 164
- Crotalus intermedius*, 23, 170, 171
- Crotalus lepidus*, 23, 168, 171
- Crotalus molossus*, 23, 171
- Crotalus polystictus*, 23, 168, 170, 171
- Crotalus pricei*, 23, 170, 171
- Crotalus pusilus*, 23, 171
- Crotalus scutulatus*, 23, 171
- Crotalus transversus*, 23, 171
- Crotalus triseriatus*, 23, 170, 171
- Crotalus unicolor*,  
 caesarean section/subsequent birth, 26, 187–188
- Crotalus willardi*, 23, 163, 170, 171
- Cryptobranchus alleganiensis*, 23, 166
- Cryptotis parva*, 26, 227
- Ctenopharyngodon idella*, 24/25, 73
- Ctenosaura pectinata*, 26, 260
- Ctenosaura similis*, 26, 260
- Cuckoo, Renault's ground, see *Carpococcyx renauldi*
- Cuniculus paca*, 26, 258
- Cuon alpinus*, 24/25, 312, 314
- Curassow, Red-billed, see *Crax blumenbachi*
- Cuscus, Ground, see *Phalanger gymnotis*
- Cyaniliseus patagonus patagonus*, 26, 143
- Cyanoramphus malherbi*, transport, eggs, 24/25, 306
- Cyclura collei*, 24/25, 53
- Cyclura cornuta cornuta*, 24/25, 51, 53, 55  
 breeding, Sydney, 23, 144–148(PI)
- Cyclura nubila lewisi*, 24/25, 53
- Cyclura pinguis*, 24/25, 53
- Cygnus olor*, 23, 119
- Cynictis penicillata*, 22, 287
- Cynolebias constanciae*, 24/25, 68, 69, 70
- Cyprinodon bovinus*, 24/25, 71
- Cyprinodon elegans*, 24/25, 71
- Cyprinodon macularius*, 24/25, 69, 71
- Cystophora cristata*, 22, 229

## D

- Dacelo leachi*,  
 breeding, hand-rearing, Melbourne, 23, 181–183(PI)
- Dacelo novaeguineae*, 23, 83, 181
- Dallas,  
 behaviour, Long-nosed echidna, 23, 209–215  
 breeding, Aquatic box turtle, 23, 135–137(PI)
- Dama dama*, 24/25, 318
- Damaliscus dorcas dorcas*, 24/25, 83, 93
- Damaliscus dorcas phillipsi*, 22, 234, 243: 24/25, 319
- Damaliscus hunteri*, 24/25, 83, 93
- Damaliscus lunatus*, 24/25, 195
- Dasyllus trimaculatus*, 26, 23
- Dasyatis akajei*, 26, 60
- Dasyatis americana*, 26, 16
- Dasyatis violacea*, 26, 51
- Dasyypus*, 22, 189, 191, 193
- Dasyypus novemcinctus*, 22, 186, 192: 26, 258
- Daubentonia madagascariensis*, 24/25, 109
- Deep-sea fishes, exhibiting, San Francisco Aquarium, 26, 48–53(PI)
- Deer, White-tailed, see *Odocoileus virginianus*
- Delphinapterus leucas*, 22, 228, 231
- Delphinus delphis*, 22, 228
- Demographic survey, Black rhinoceros, 23, 225–233
- Dendrobates auratus*, 23, 168: 24/25, 58(PI), 331
- Dendrobates histrionicus*, 24/25, 58, 331
- Dendrobates leucomelas*, 24/25, 58

- Dendrobates tinctorius*, **24/25**, 58–59  
*Dendrocygna viduata*, **24/25**, 333, 337: **26**, 316  
*Dendrolagus*, **26**, 212–213  
*Dendrolagus goodfellowi*, **22**, 287  
*Dendrolagus matschiei matschiei*,  
 breeding, Adelaide, **26**, 212–216  
 Denver,  
 artificial incubation, humidity, Cassowary eggs,  
**22**, 164–167  
*Dermochelys coriacea*, **26**, 90  
*Desmana moschata*, **24/25**, 200  
*Desmognathus fuscus*, **23**, 167  
 Detroit,  
 Penguinarium, renovation, graphics, **26**,  
 125–132(PI)  
*Dialommus fuscus*, **26**, 65  
*Dicerorhinus sumatrensis*, **24/25**, 174  
*Diceros bicornis*, **24/25**, 101, 160, 194, 195, 207,  
 301, 317  
 demographic survey, **23**, 225–233  
*Diemictylus viridescens*, **23**, 167  
*Dinomys*, **26**, 271  
 Dolphin, Bottle-nosed, see *Tursiops truncatus*  
*Dorcopsis muelleri luctuosa*, **26**, 213  
 Douroucouli, see *Aotus trivirgatus*  
*Dromaius*, **26**, 195  
*Dromaius novaehollandiae*,  
 physical/physiological data, eggs, chicks, **23**,  
 175–181  
*Drosophila*, **24/25**, 329  
*Drosophila melanogaster*, **24/25**, 74  
*Drymarchon*, **23**, 170  
*Ducula bicolor bicolor*, **22**, 168  
 Duiker, Yellow-backed, see *Cephalophus*  
*sylviculor*  
*Duscicyon*, **22**, 193  
 Dvur Kralove,  
 birth seasons, Lechwe, **26**, 294–296  
 population trends, Grevy's zebra, **26**, 290–293  
*Dynastes hercules*, **26**, 88
- E**
- Eagle owl, European, see *Bubo b. bubo*  
 Eagle, American bald, see *Haliaeetus leucocephalus*;  
 Crowned, see *Stephanoaetus coronatus*; Wedge-  
 tailed, see *Aquila audax*  
*Echeneis naucrates*, **26**, 16, 51  
 Echidna, Long-nosed, see *Zaglossus bruijini*  
*Echinocactus grunsonii*, **24/25**, 125  
 Education,  
 family learning centre, amphibians/reptiles,  
 Washington NZP, **24/25**, 340–343  
 touch tank, Himeji Aquarium, **22**, 271–276(PI)  
 graphics, Snake Park entrance, Port Elizabeth,  
**26**, 309–314 (PI)  
*Elanus caeruleus*, **23**, 109  
*Elaphe*, **24/25**, 232  
*Elaphe guttata*, **24/25**, 341  
*Elaphe obsoleta obsoleta*, **24/25**, 147  
*Elaphe quadrivittata*, **22**, 80  
*Elaphurus davidianus*, **22**, 247, 248: **24/25**, 79, 162,  
 203, 218  
 Elephant, African, see *Loxodonta africana*; Asian,  
 see *Elephas maximus*  
*Elephantulus rufescens*, one-way viewing screen, **23**,  
 218–219  
*Elephas maximus*, **24/25**, 160, 298, 317  
 pregnancy, diagnostic test, prolactin, **26**, 285–289  
*Eleutherodactylus johnstonei*, **24/25**, 52  
*Eliomys quercinus*, **24/25**, 203  
*Embiotoca jacksoni*, **26**, 108  
 Embryo transfers,  
 Bongo, birth to Eland, **24/25**, 138–141(PI)  
 Grant's zebra, birth to pony, **24/25**, 135(PI), 137  
 Emmen,  
 breeding biology, sexing, Humboldt penguin, **26**,  
 198–204  
 Emu, see *Dromaius novaehollandiae*  
*Emydura albertisi*, **23**, 168  
*Emydura australis albertisii*,  
 breeding, San Antonio, **26**, 94–98  
*Emys orbicularis*, **24/25**, 51, 54  
 Endangered species, see Rare species  
*Enhydra lutris*, **22**, 228, 231: **26**, 44  
 transport container, Vancouver Aqu, **23**,  
 223–224(PI)  
*Ephippiorhynchus asiaticus*, **24/25**, 34  
*Ephippiorhynchus senegalensis*, **24/25**, 34  
*Epicrates*, **23**, 168, 170  
*Epicrates angulifer*, **23**, 169: **24/25**, 51, 52–53  
*Epicrates inornatus*, **23**, 169: **24/25**, 51, 52  
*Epicrates striatus*, **23**, 165  
*Epicrates subflavus*, **23**, 169: **24/25**, 51, 52, 55  
*Epinephelus akaara*, **26**, 29  
*Epinephelus cruentatus*, **26**, 15, 16  
*Epinephelus guttatus*, **26**, 15, 16  
*Epinephelus hoedtii*, **26**, 29  
*Epinephelus itajara*, **26**, 15, 16  
*Epinephelus striatus*, **26**, 17  
*Equus africanus (asinus)*, **24/25**, 159  
*Equus burchelli*, **22**, 247, 248: **24/25**, 195, 196, 316:  
**26**, 292  
*Equus burchelli antiquorum*, **24/25**, 333  
*Equus burchelli boehmi*, **24/25**, 132, 133, 317  
 embryo transfer, birth to domestic pony, **24/25**,  
 135(PI), 137  
*Equus burchelli chapmani*, **26**, 316  
*Equus caballus*, **24/25**, 160: **26**, 292  
*Equus grevyi*, **24/25**, 168–174: **26**, 316, 317(PI)  
 population trends, Dvur Kralove, **26**, 290–293  
*Equus hemionus*, **22**, 247: **24/25**, 159, 160  
*Equus hemionus kulan*, **24/25**, 158, 159, 160  
*Equus hemionus onager*, **24/25**, 158, 159, 160, 162,  
 317  
*Equus przewalskii*, **22**, 198: **24/25**, 132, 133, 154,  
 160, 162, 218, 317  
*Equus zebra hartmannae*, **24/25**, 207, 317  
*Erethizon*, **26**, 271  
*Erethizon dorsatum*, **26**, 265, 276  
*Eretmochelys imbricata*, **24/25**, 324: **26**, 15, 16, 27  
*Erinaceus*, **22**, 195–197  
*Erinaceus (Atelerix) alviventris*, **26**, 229  
*Erinaceus europaeus*, **22**, 195: **24/25**, 159  
*Erythrocebus patas*, **24/25**, 333, 335

Escapes/releases, exotic species, **24/25**, 200–205

*Esox lucius*, **26**, 54

*Etheostoma fonticola*, **24/25**, 71

*Eublepharis*, **23**, 171

*Eublepharis macularius*, **24/25**, 341

*Eudocimus ruber*, **22**, 59: **24/25**, 34: **26**, 84

*Eudypetes chrysolophus*, **26**, 105, 127, 131(PI), 134

*Eudypetes crestatus*, **26**, 105, 127, 134, 142, 146, 148, 152, 176

*Eudiptula minor*, **26**, 127, 177

breeding, Melbourne, **24/25**, 237–240(PI)

*Eumetopias jubata*, **22**, 228, 231, 265: **26**, 154

*Eunectes murinus*, **23**, 171: **26**, 83, 85(PI)

*Eunectes notaeus*, **23**, 171

*Euphractus sexcinctus*, **22**, 186, 189, 192, 193

*Euphractus villosus*, **22**, 186

## F

*Falco*, breeding, artificial incubation, **23**, 51–58 (PI)

*Falco berigora*, **23**, 83: **24/25**, 10

*Falco biarmicus*, **23**, 19, 29, 51, 54, 56–57(PI), 72, 73: **24/25**, 1, 4, 10

*Falco cenchroides*, **24/25**, 10

*Falco cherrug*, **23**, 51, 72, 73, 74(PI): **24/25**, 4, 10, 16

breeding, ssp, Sulman Falcon Centre, Arabia, **23**, 84–88

*Falco chicquera*, **24/25**, 10

*Falco columbarius*, **23**, 55: **24/25**, 4, 10

*Falco columbarius aesalon*, **23**, 119

*Falco deiroleucus*, **24/25**, 10

*Falco eleonorae*, **24/25**, 4, 11, 12

*Falco femoralis*, **24/25**, 11

*Falco jugger*, **23**, 51, 54: **24/25**, 11

*Falco mexicanus*, **23**, 51, 105: **24/25**, 3, 4, 11

breeding, Sulman Falcon Centre, Arabia, **23**, 85–88

*Falco naumanni*, **24/25**, 11

*Falco novaeseelandiae*, **24/25**, 11

*Falco peregrinus*, **23**, 4, 19, 46, 51, 67, 85, 107, 120: **24/25**, 1, 4, 11, 15–16, 145

*Falco peregrinus babylonicus*, **24/25**, 11

*Falco peregrinus macropus*,

breeding, Melbourne, **23**, 83–84  
Sulman Falcon Centre, Arabia, **23**, 85–88

*Falco peregrinus submelanogenys*, **23**, 83

*Falco punctatus*, **23**, 1, 71, 88, 107: **24/25**, 11, 12, 15  
captive management, breeding biology, **23**, 76–82(PI)

*Falco ruficularis*, **24/25**, 11

*Falco rupicoloides*, **24/25**, 11

*Falco rusticolus*, **24/25**, 4, 5, 12

breeding, Sulman Falcon Centre, Arabia, **23**, 85–88

*Falco sparverius*, **23**, 3, 4, 51, 72, 73, 78, 105: **24/25**, 3, 4, 12, 15, 144

cryogenic preservation, spermatozoa, **23**, 67–71(PI)

*Falco subbuteo*, **23**, 119: **24/25**, 12

*Falco tinnunculus*, **23**, 4, 19, 29, 51, 82, 105, 107, 121, 129: **24/25**, 12

breeding, hand-rearing, Harpenden, **23**, 71–75

*Falco vespertinus*, **24/25**, 12

Falcon, Peregrine, see *Falco peregrinus*

Feeding, reptiles, mechanical aid, **23**, 206–207(PI)

*Felis geoffroyi*,

breeding, Glasgow, **23**, 191–195(PI)

*Felis lynx*, **24/25**, 189

*Felis marmorata*, **24/25**, 104

*Felis nigripes*, **22**, 284(PI), 287

*Felis rubiginosus*, **22**, 287

*Felis rufus*, **23**, 235: **24/25**, 79

*Felis serval*, **22**, 276: **26**, 157

*Felis tigrinus*, **24/25**, 103

Ferret, Black-footed, see *Mustela nigripes*

File snake, Arafura, see *Acrochordus arafurae*

Fire salamander, European, see *Salamandra s. salamandra*

Fishes,

bred in captivity, **22**, 364–366: **23**, 264–266:

**24/25**, 422–430: **26**, 412–415

breeding, endangered spp, review, **24/25**, 66–74  
suitability for displaying with living corals, **26**, 7

Flamingos,

breeding programmes, Wildfowl Trust, **24/25**, 21–25

Food/energy consumption, birds of prey, Bristol, **23**, 114–117

Food intake/growth rate, Cassowaries, **26**, 189–198

*Forcipiger longirostris*, **26**, 23

*Formica rufa*, **24/25**, 329, 330

*Foudia flavicans*, **23**, 76

Foureyed fish, Common, see *Anableps anableps*

Frankfurt,

breeding, Pancake tortoise, **23**, 137–139

Small Mammal House, **22**, 276–287(PI)

*Fratercula arctica*, **26**, 107, 134

*Fratercula corniculata*, **26**, 107

Fratricide/breeding, birds of prey, **23**, 110–113

*Fringilla coelebs*, **24/25**, 146

Frogs, tube-feeding, **23**, 204–205

*Fulmarus glacialis*, **26**, 167

*Fundulus heteroclitus*, **26**, 35

## G

*Gabianus scoresbii*, **26**, 109

*Galago crassicaudatus*, **24/25**, 287

*Galago demidovi*, **22**, 287

*Galago demidovi demidovi*,

breeding, Cincinnati, **26**, 229–231

*Galeorhinus galeus*, **26**, 51

*Gallinula chloropus*, **24/25**, 229

*Gallus domesticus*, **23**, 67

*Gambusia affinis*, **24/25**, 71

*Gambusia amistadensis*, **24/25**, 70

*Gambusia gaigei*, **24/25**, 71

*Gambusia nobilis*, **24/25**, 71

*Gastrotheca*, **26**, 312

*Gazella*, **22**, 236

*Gazella dama*, **22**, 247: **24/25**, 83, 94, 319

*Gazella dama mhorrr*, **24/25**, 94

*Gazella dorcas*, **22**, 199, 234, 246, 247, 248: **23**, 44  
breeding history, Washington NZP, **23**, 195–203

*Gazella dorcas massaesyala*, **23**, 195, 196

- Gazella dorcas pelzelni*, **23**, 195  
*Gazella dorcas saudiya*, **23**, 195  
*Gazella gazella*, **23**, 198  
*Gazella gazella arabica*, **23**, 200: **24/25**, 84, 94, 319  
*Gazella gazella cora*, **24/25**, 181  
*Gazella leptoceros*, **24/25**, 84, 94  
*Gazella soemmerringi*, **24/25**, 158, 159  
*Gazella spekei*, **22**, 243: **23**, 198: **24/25**, 84, 94, 218  
*Gazella subgutturosa*, **23**, 200: **24/25**, 94, 159  
*Gazella thomsoni*, **23**, 200  
 Gazelle, Dorcas, see *Gazella dorcas*  
 Genetics,  
   management, small populations, **24/25**,  
   167–174(Pl)  
   techniques for use in breeding programmes,  
   **24/25**, 157–162  
*Geocapromys browni*, **24/25**, 104, 105  
*Geochelone carbonaria*, **24/25**, 51, 54, 55  
*Geochelone elephantopus*, **24/25**, 146, 329  
*Geochelone emys*,  
   breeding, Wassenaar Zoo, **22**, 153–158(Pl)  
*Geochelone gigantea*, **22**, 155: **23**, 168: **24/25**, 329  
*Geochelone radiata*, **23**, 168: **24/25**, 51, 53–54  
*Geochelone sulcata*, **23**, 168  
*Geochelone yniphora*, **24/25**, 54  
*Geopelia striata*, **22**, 168  
*Geranoaetus melanoleucus*, **23**, 109  
*Geranospiza caerulescens*, **24/25**, 8  
 German Raptor Centre,  
   breeding, reintroduction, White-tailed sea eagle,  
   **23**, 18–35  
*Geronticus calvus*, **24/25**, 35  
*Geronticus eremita*, **24/25**, 27, 35  
*Gerres cinereus*, **26**, 16  
*Gerygone albofrontata*, **24/25**, 47  
*Gila cypha*, **24/25**, 71  
*Gila elegans*, **24/25**, 71  
*Gila nigrescens*, **24/25**, 71  
*Ginglymostoma cirratum*, **26**, 13, 15, 16  
*Giraffa camelopardalis*, **22**, 247: **24/25**, 195, 197,  
   318, 335  
*Giraffa camelopardalis reticulata*, **24/25**, 333  
*Giraffa camelopardalis rothschildi*, **26**, 316, 317(Pl)  
*Girella nigricans*, **26**, 109  
 Glasgow,  
   breeding, Geoffroy's cat, **23**, 191–195(Pl)  
*Glaucidium passerinum*, **23**, 119  
*Glis glis*, **24/25**, 203  
*Globicephala*, **22**, 228  
*Glossina*, **24/25**, 75  
*Glossophaga soricina*, **26**, 266  
 Goat, Rocky Mountain, see *Oreamnos americanus*  
*Gobiosoma oceanops*, **26**, 15, 16  
*Gomphosus varius*, **26**, 23  
*Gopherus agassizi*, **23**, 145  
*Gorilla gorilla*, **22**, 74, 222: **24/25**, 108, 112, 114,  
   128, 175, 176  
   behaviour in wild/captive management, **26**,  
   248–255(Pl)  
*Gorilla gorilla beringei*, **22**, 182: **24/25**, 120: **26**, 249  
*Gorilla gorilla gorilla*, **24/25**, 118, 119, 120, 176: **26**,  
   249  
   breeding data, US zoos, **22**, 180–185  
   stillbirth, Calgary, **23**, 183–185  
*Gorilla gorilla graueri*, **24/25**, 120  
 Grand Rapids, HERPlab, **24/25**, 340  
 Grande Porto Alegre, see Sao Leopoldo  
*Grapsus*, **26**, 55  
 Grass mouse, Striped, see *Lemniscomys striatus*  
*Grus americana*, **23**, 67: **24/25**, 26, 27, 30, 46  
*Grus antigone antigone*, **24/25**, 31  
*Grus antigone sharpii*, **24/25**, 26, 27, 32–33(Pl)  
*Grus canadensis*, **23**, 67: **24/25**, 30  
*Grus canadensis nesiotis*, **24/25**, 26, 27  
*Grus canadensis pulla*, **24/25**, 26, 27  
*Grus canadensis tabida*, **24/25**, 46  
*Grus grus*, **24/25**, 29, 32  
*Grus japonensis*, **24/25**, 26, 27, 168–174  
*Grus leucogeranus*, **23**, 88: **24/25**, 26, 29–32(Pl)  
*Grus monacha*, **24/25**, 26, 27  
*Grus nigricollis*, **24/25**, 26  
*Grus rubicunda*, **24/25**, 31  
*Grus vipio*, **24/25**, 26, 27, 213, 215, 218  
*Gulo gulo*, **24/25**, 189  
*Gymnobilideus leadbeateri*, **24/25**, 104  
*Gymnogyps californianus*, **23**, 1, 47, 67: **24/25**, 5,  
   218  
*Gymnomuraena zebra*, **26**, 23  
*Gymnothorax funebris*, **26**, 13, 15, 16  
*Gypaetus barbatus*, **23**, 104, 111: **24/25**, 1, 7  
*Gypaetus barbatus aureus*, **24/25**, 200  
   breeding, reintroduction to wild, **23**, 35–41(Pl)  
*Gypohierax angolensis*, **23**, 109  
*Gyps*, **23**, 49  
*Gyps africanus*, **23**, 114, 115  
*Gyps bengalensis*, **23**, 109: **24/25**, 7  
*Gyps coprotheres*, **24/25**, 7  
*Gyps fulvus*, **23**, 43, 49, 104: **24/25**, 7  
*Gyps fulvus fulvus*, **23**, 48  
*Gyps himalayensis*, **23**, 104, 109: **24/25**, 7  
*Gyps rueppellii*, **24/25**, 7  
*Gyrinophilus palleucus*, **24/25**, 61, 62(Pl)
- ## H
- Haematopus bachmani*, **26**, 143  
*Haemulon*, **26**, 16, 17  
*Haemulon flavolineatum*, **26**, 16  
*Haemulon melanurum*, **26**, 16  
*Haemulon sciurus*, **26**, 16  
*Halcyon malimbica*, **26**, 206  
*Haliaeetus*, **23**, 21  
*Haliaeetus albicilla*, **23**, 104, 109, 111, 119, 120:  
   **24/25**, 2, 6, 200  
   breeding, reintroduction, **23**, 18–35(Pl)  
*Haliaeetus leucocephalus*, **23**, 5, 23, 60, 67, 102, 104:  
   **24/25**, 2, 4, 7  
   breeding, Berlin E, **23**, 16–18(Pl)  
*Haliaeetus leucoryphus*, **23**, 104: **24/25**, 13  
*Haliaeetus pelagicus*, **23**, 23, 60, 104  
*Haliaeetus vociferoides*, **23**, 112  
*Haliaeetus vocifer*, **23**, 109  
*Haliastur indus*, **24/25**, 6  
*Haliastur indus indus*, **23**, 109  
*Haliastur sphenurus*, **23**, 83: **24/25**, 6

- Halichoeres ornatissimus*, **26**, **23**  
*Halichoeres grypus*, **22**, **229**, **231**: **24/25**, **189**, **191**,  
**265**, **284**: **26**, **152**, **153**, **167**
- Hanover,  
 exhibit, management, Pacific walrus, **26**,  
**163–170(PI)**
- Hapalemur griseus*, **24/25**, **104**, **109**  
*Hapalemur simus*, **24/25**, **109**  
*Hapalochlaena*, **26**, **48**  
*Hapalochlaena maculosa*, **26**, **42**, **47**
- Harpندن,  
 breeding, hand-rearing, Common kestrel and  
 others, **23**, **71–75(PI)**
- Harpia harpyja*, **23**, **102**, **103(PI)**, **104**: **24/25**, **9**, **14**  
 Heated bed modules, San Diego, **24/25**,  
**311–315(PI)**
- Hedgehog, African, see *Atelerix pruneri*  
*Heliconius*, **24/25**, **76**  
*Heloderma*, **23**, **170**, **172**  
*Helogale parvula*,  
 enclosure, Basle, **23**, **257–259(PI)**
- Hemidactylus*, use for pest control, **26**, **88**  
*Hemigalus derbyanus*, **22**, **285(PI)**  
*Hemitragus hylocrius*, **24/25**, **84**, **95**
- HERPlab, amphibians/reptiles,  
 family learning centre, **24/25**, **340–343**
- Heniochus acuminatus*, **26**, **23**  
*Heniochus diphreutes*, **26**, **23**  
*Heterandria formosa*, **26**, **54**  
*Heterocephalus glaber*, **24/25**, **103**  
*Heterodontus japonicus*, **26**, **59**  
*Hexagrammos decagrammus*, **26**, **73**, **108**  
*Hexanchus griseus*, **26**, **51**  
*Hieraetus morphnoides*, **23**, **83**  
*Himantopus himantopus*, **24/25**, **333**, **337**: **26**, **206**  
*Himantopus mexicanus*, **23**, **212**  
*Himantopus novaezelandiae*, transport, eggs, **24/25**,  
**307**
- Himeji Aquarium,  
 touch tank, construction, stock, **22**, **271–276(PI)**
- Hippocampus*, **26**, **58**  
*Hippopotamus amphibius*, **22**, **247**: **24/25**, **198**, **318**,  
**333**, **335**  
*Hippopotamus*, Pygmy, see *Choeropsis liberiensis*  
*Hippotragus equinus*, **23**, **243**: **24/25**, **82**, **92**, **195**,  
**318**  
*Hippotragus niger*, **22**, **243**, **246**, **247**, **248**: **24/25**,  
**92**, **195**, **197**, **318**: **26**, **316**  
 hand-rearing, reintroduction, **22**, **269–270**  
 parturition, **22**, **218–221**
- Hirudo medicinalis*, **24/25**, **75**  
*Histrionicus histrionicus*, **26**, **107**  
*Holacanthus passer*, **26**, **23**  
*Holocentrus*, **26**, **16**
- Hong Kong,  
 breeding, African pygmy goose, **26**, **205–207**
- Hong Kong, Ocean Park,  
 Atoll reef exhibit, **26**, **26–29(PI)**  
 Wave cove exhibit, **26**, **154–157(PI)**
- Honolulu Aquarium,  
 collecting, displaying, living corals, **26**, **1–9**
- Hornbill, Great Indian, see *Buceros bicornis*
- Houston,  
 breeding, Scarlet cock-of-the-rock, **22**, **171–175**  
 (PI)
- Hucho hucho*, **24/25**, **71**  
*Huso huso*, **24/25**, **69**  
*Hyaena brunnea*, **24/25**, **163**, **312**  
*Hyaena hyaena*, **23**, **45**
- Hybrids, birds of prey spp, bred, **24/25**, **4–5**  
*Hydrochoerus hydrochaeris*, **24/25**, **317**  
*Hydromedusa tectifera*, **23**, **168**: **26**, **95**  
*Hydomys chrysogaster*, **22**, **287**  
*Hydropotes inermis*, **24/25**, **78**, **203**, **318**  
*Hydrosaurus amboinensis*, **24/25**, **53**  
*Hydrurga leptonyx*, **22**, **229**: **26**, **171**, **173**, **177**  
*Hyla crucifer*, **23**, **166**  
*Hylobates concolor*, **24/25**, **111**, **114**  
*Hylobates klossi*, **24/25**, **108**, **111**  
*Hylobates lar*, **24/25**, **116**  
*Hylobates moloch*, **24/25**, **108**, **111**, **114**  
*Hylobates muelleri*, **24/25**, **108**  
*Hylobates pileatus*, **24/25**, **111**, **114**, **115**  
*Hynobius*, **23**, **167**  
*Hyposcopus rubicundus*, **26**, **108**  
*Hystrix*, **24/25**, **203**, **204**  
*Hystrix cristata*, **24/25**, **204**, **287**  
*Hystrix hodgsoni*, **24/25**, **203**

## I

- Ibex, Nubian, see *Capra ibex nubiana*
- Ibises,  
 breeding endangered, review, **24/25**, **25–39**  
*Iguana iguana*, **23**, **146**: **24/25**, **312**, **314**: **26**, **87**, **260**  
*Iguana iguana iguana*, **23**, **169**  
 Iguana, Rhinoceros, see *Cyclura cornuta*
- Inbreeding,  
 rare leopards, **22**, **198–206**
- Incubator, portable, for developing eggs, **24/25**,  
**306–310(PI)**
- Indri indri*, **24/25**, **109**  
*Inia geoffrensis*, **22**, **228**  
*Inversiden japonensis*, **26**, **62**
- Invertebrates,  
 breeding, conservation, **24/25**, **66–74**  
 in coral reef exhibit, **26**, **27(PI)**  
 in intertidal exhibit, **26**, **33**  
 in tidepool exhibits, **26**, **35**, **38**, **40**

## J

- Jabiru mycteria*, **24/25**, **34**
- Jacksonville,  
 hand-rearing, reintegration, Lion-tailed macaque,  
**22**, **252–255**
- Japatella*, **26**, **48**  
*Japatella heathi*, **26**, **42**
- Jersey,  
 breeding, Goeldi's monkey, **22**, **101–105**  
 programmes, endangered reptiles/snails, **24/25**,  
**49–56**
- John G. Shedd Aquarium, see Chicago Aquarium

## K

- Kangaroo, Matschie's tree, see *Dendrolagus matschiei*
- Kerodon rupestris*, 22, 177
- Kestrel, American, see *Falco sparverius*; Common, see *Falco tinnunculus*; Mauritius, see *Falco punctatus*
- Ketupa ketupu*, 23, 100, 105
- Ketupa zeylonensis*, 23, 100, 110
- Koala, Queensland, see *Phascolarctos cinereus adustus*
- Kobus ellipsiprymnus*, 22, 247: 24/25, 195, 318
- Kobus ellipsiprymnus defassa*, 26, 316
- Kobus kob leucotis*, 24/25, 92
- Kobus kob thomasi*, 26, 295
- Kobus leche*, 24/25, 318  
breeding seasons, in wild/captivity, 26, 294–296
- Kobus leche kafuensis*, 26, 294, 295
- Kobus leche leche*, 26, 294
- Kobus leche robertsi*, 26, 294
- Kobus leche smithemani*, 26, 294
- Kobus megaceros*, 24/25, 92: 26, 316
- Kolmarden Dolphinarium,  
breeding, Bottle-nosed dolphin, 24/25, 263–271(P1)
- Kolmarden Rescue Centre, birds of prey, 23, 117–121
- Krefeld,  
exhibiting, breeding, European otters, 26, 157–163(P1)
- Kuhlia sandvicensis*, 26, 23
- Kyphosus sectatrix*, 26, 16
- L
- Labroides dimidiatus*, 26, 23
- Lacerta*, 23, 157
- Lacerta galloti stehlini*, 24/25, 329
- Lagenorhynchus obliquidens*, 22, 228
- Lagodon rhomboides*, 26, 16
- Lagothrix*, 22, 14, 32, 34, 125
- Lagothrix flavicauda*, 22, 40, 43, 44, 45: 24/25, 111  
status and conservation in Peru, 22, 47–52(P1)
- Lagothrix lagothricha*, 22, 25, 33, 34, 39, 40, 44, 47, 48, 71, 132: 24/25, 108, 111, 114, 115
- Lagothrix lagothricha cana*, 22, 33, 43, 45
- Lagothrix lagothricha lagothricha*, 22, 33, 43, 45
- Lagothrix lagothricha poeppigi*, 22, 33, 40, 43, 45
- Lagothrix (Oreonax) hendeei*, 22, 48
- Lama glama*, 22, 241, 242: 24/25, 318
- Lama guanicoe*, 24/25, 318
- Lammergeier, see *Gypaetis barbatus*
- Lampropeltis mexicana*, 23, 163, 170
- Lampropeltis pyromelana*, 23, 170
- Lampropeltis triangulum*, 23, 164, 170, 171
- Lampropeltis triangulum sinaloae*, 24/25, 147
- Lamprotornis splendidus*, 26, 206
- Larosterna inca*, 26, 143
- Larus dominicanus*, 26, 105
- Larus novaehollandiae*, 26, 143
- Larus ridibundus*, 23, 180: 26, 167
- Larus serranus*, 26, 143
- Lasiorhinus latifrons*, 26, 213
- Latimera chalumnae*, 26, 54
- Lechwe, see *Kobus leche*
- Leiopisma telfairi*, 24/25, 49, 50–52
- Leiothrix lutea*, 22, 168
- Lemniscomys striatus*, 24/25, 212, 213, 215  
breeding, NY Bronx, 24/25, 260–263
- Lemur*, 24/25, 108
- Lemur coronatus*, 24/25, 104
- Lemur macaco flavifrons*, 24/25, 109
- Lemur macaco fulvus*, 24/25, 100, 159
- Lemur macaco macaco*, 24/25, 100, 104, 109, 114, 207, 218
- Lemur macaco rufus*, 24/25, 100, 104, 109, 114, 207
- Lemur macaco sanfordi*, 24/25, 109
- Lemur mongoz*, 24/25, 104: 26, 282
- Lemur mongoz coronatus*, 24/25, 109
- Lemur mongoz mongoz*, 24/25, 109, 112, 114, 115
- Leontopithecus*, 22, 9–11, 15–16
- Leontopithecus chrysomelas*, 22, 5, 7, 9–11, see also *L. rosalia chrysomelas*
- Leontopithecus chrysopygus*, 22, 5, 6, 9–11, see also *L. rosalia chrysopygus*
- Leontopithecus rosalia*, 22, 5, 6, 7, 8, 9–11, 102
- Leontopithecus rosalia chrysomelas*, 22, 94: 24/25, 108, 110
- Leontopithecus rosalia chrysopygus*, 22, 94: 24/25, 110
- Leontopithecus rosalia rosalia*, 22, 74, 77, 78, 85, 287: 24/25, 102, 104, 107, 10, 164  
breeding, population analysis, 22, 94–101
- Lepidochelys olivacea*,  
rearing, artificial sea water, Madras, 26, 90–94
- Lepidophyma flavimaculatum*,  
parthenogenesis, San Antonio, 23, 157–158
- Lepilemur mustelinus dorsalis*, 24/25, 109
- Lepilemur mustelinus leucopus*, 24/25, 109
- Lepilemur mustelinus ruficaudatus*, 24/25, 109
- Leptobotia curta*, 24/25, 69
- Leptoptilos crumeniferus*, 24/25, 34
- Leptoptilos dubius*, 24/25, 34
- Leptoptilos javanicus*, 24/25, 34
- Lepus*, 23, 85
- Lepus capensis*, 24/25, 200
- Lepus timidus*, 24/25, 202
- Leucopsar rothschildi*, 24/25, 48
- Lichanura roseofusca*, 23, 164
- Lichanura trivirgata*, 23, 169
- Limulus*, 26, 54
- Litocranius walleri*, 24/25, 83
- Litoria caerulea*, 24/25, 57(P1)
- Lizard, Central American night, see *Lepidophyma flavimaculatum*; Giant ameiva, see *Ameiva ameiva*; Short-horned, see *Phrynosoma douglassi*
- Locusta*, 24/25, 74
- Loligo*, 26, 48
- Loligo opalescens*, 26, 41, 45–46
- London ZSL,  
breeding, Andean condor, 23, 7–11  
New World monkeys, 22, 84–87  
reproductive physiology, Common marmoset, 22, 138–143(P1)  
Owl monkey, 22, 115–119



- sexual development, male Orang-utan, **22**, 222-227
- Longevity, birds of prey, Berlin E. **23**, 108-110
- Lophaetus occipitalis*, **24/25**, 9
- Lophalticus*, **26**, 55
- Lophophorus lhuysii*, **24/25**, 43-44
- Lophura bulweri*, **24/25**, 43
- Lophura edwardsi*, **24/25**, 43
- Lophura imperialis*, **24/25**, 43
- Lophura swinhoii*, **24/25**, 43
- Loris tardigradus*, **22**, 287
- Los Angeles,
  - breeding, husbandry, behaviour, Bongo, **23**, 237-242
  - Pesquet's parrot, **26**, 208-212
  - ungulates, **24/25**, 77-99
- caesarean section/subsequent birth, Aruba Island rattlesnake, **26**, 187-188
- Lotus berthelotii*, **24/25**, 125
- Loxigilla portoricensis*, **22**, 74
- Loxodonta africana*, **24/25**, 100, 127, 160, 194, 195, 298, 317
  - breeding, Toronto, **22**, 215-217
  - pregnancy, diagnostic test, prolactin, **26**, 285-289
- Lunda cirrhata*, **26**, 107
  - transport containers, Vancouver Aqu, **23**, 207-209(PI)
- Lutjanus peru*, **26**, 51
- Lutra lutra lutra*, **24/25**, 189
  - exhibit, breeding, Krefeld, **26**, 157-163(PI)
- Lycaena dispar batavus*, **24/25**, 75
- Lycaon pictus*, **22**, 234
- Lyncodon*, **22**, 193
- M**
- Macaca fascicularis*, **22**, 74, 79: **24/25**, 47
- Macaca fuscata*, **22**, 73
- Macaca mulatta*, **22**, 70: **24/25**, 133: **26**, 233
- Macaca pagensis*, **24/25**, 111
- Macaca silenus*, **24/25**, 108, 111, 114, 312: **26**, 234
  - hand-rearing, reintegration, Jacksonville, **22**, 252-255
- Macaca sylvanus*, **24/25**, 108, 111, 114
- Macaque, Lion-tailed, see *Macaca silenus*
- Macdonald Raptor Research Centre,
  - cryogenic preservation spermatozoa, American kestrel, **23**, 67-71(PI)
- Macronectes giganteus*, **26**, 105
- Macropods, physical/chemical restraint of small, **23**, 215-218
- Macropus*, **26**, 212, 215
- Macropus eugenii*, **23**, 215: **26**, 213
- Macropus parma*, **24/25**, 317
- Macropus robustus erubescens*, **26**, 213
- Macropus rufogriseus*, **24/25**, 152, 203, 317
- Madoqua kirki*, **22**, 234, 247: **24/25**, 93
- Madras (Arignar Anna Zoo),
  - rearing, Olive ridley, artificial sea water, **26**, 90-94
- Malacocheirus tornieri*, breeding, Frankfurt, **23**, 137-139
- Malpultta kretseri*, **24/25**, 70
- Mammal House, Small, Frankfurt, **22**, 276-287(PI)
- Mammals,
  - bred in captivity, **22**, 405-438: **23**, 307-340: **24/25**, 506-564: **26**, 467-506
  - rare, census, **22**, 450-473: **23**, 352-374: **24/25**, 582-622: **26**, 520-546
  - small, status in zoos, review, **24/25**, 99-106
- Manatee, Amazonian, see *Trichechus inunguis*
- Mandrillus leucophaeus*, **24/25**, 108, 114
- Mandrillus sphinx*, **24/25**, 108, 111, 113, 114
- Marine mammals,
  - species kept/bred, North America, **22**, 227-232
- Marking techniques, birds of prey, **23**, 125-132(PI)
- Marmoset, Common, see *Callithrix jacchus*:
  - Pygmy, see *Cebuella pygmaea*
- Martes zibellina*, **24/25**, 200
- Mazama americana*, **24/25**, 88: **26**, 295
- Mazama americana temama*, **24/25**, 88
- Mazama gouazoubira*, **24/25**, 88
- Mazama gouazoubira pandora*, **24/25**, 88
- Medialuna californiensis*, **26**, 108
- Megaleia rufa*, **22**, 241, 242
- Megalops atlanticus*, **26**, 15, 16
- Megophrys nasuta*, **24/25**, 59
- Melbourne,
  - breeding, Arafura file snake, **26**, 98-103(PI)
  - Australian peregrine falcon, **23**, 83-84
  - Little/Fairy/Blue penguin, **24/25**, 237-240(PI)
  - Taipan, **23**, 159-162
  - hand-rearing, Blue-winged kookaburra, **23**, 181-183(PI)
  - Pygmy hippopotamus, **22**, 268-270
- Meleagris gallopavo*, **23**, 67: **26**, 191
- Meles meles*, **24/25**, 204
- Melichthys niger*, **26**, 16, 17, 23
- Melierax metabates*, **23**, 109
- Melospittacus undulatus*, **24/25**, 144
- Mephitis mephitis*, **26**, 276
- Mergus albellus*, **26**, 107
- Mergus merganser*, **24/25**, 22
- Mesocricetus auratus*, **24/25**, 203
- Mexico, Chapultepec,
  - breeding, Volcano rabbit, **26**, 261-265
- Miami, Metro Zoo,
  - breeding, African slender-snouted crocodile, **23**, 139-143
  - Siamese crocodile, **22**, 156-158
- Miami, Monkey Jungle,
  - breeding, New World monkeys, **22**, 77-84
- Microcanthus strigatus*, **26**, 23
- Microcebus coquereli*, **24/25**, 109
- Microcebus murinus*, **22**, 287
- Microhierax caerulescens*, **23**, 105, 109: **24/25**, 10
- Microspathodon chrysurus*, **26**, 16, 17
- Milvago chimachima*, **24/25**, 10
- Milvus migrans*, **23**, 104: **24/25**, 6, 13
- Milvus migrans govinda*, **23**, 72, 73
- Milvus milvus*, **23**, 5, 104: **24/25**, 6, 13
- Mirounga angustirostris*, **22**, 229
- Mirounga leonina*, **26**, 152, 153, 167, 171, 177
- Mixed species exhibit, Augsburg, **26**, 315-318
- Osnabruck, **24/25**, 271-274(PI)

- Mola mola*, **26**, 51, 54  
 Mongoose, Dwarf, see *Helogale parvula*  
 Monkey, Black howler, see *Alouatta caraya*;  
 Goeldi's, see *Callimico goeldii*; Owl, see *Aotus trivirgatus*; squirrel, see *Saimiri*; spider, see *Ateles*  
*Monodactylus*, **26**, 56  
 Monterey Bay Aquarium,  
 Wave crash/intertidal exhibits, **26**, 30-34  
*Morelia spilotes variegata*, breeding, Antwerp, **24/25**, 231-236  
*Morone saxatilis*, **26**, 51  
*Moroteuthis*, **26**, 48  
*Moroteuthis robusta*, **26**, 42  
*Morpho menelaus*, **26**, 88  
 Mount Hagen,  
 hand-rearing, Long-nosed echidna, **22**, 250-252  
 Munich,  
 Polarium, aquatic mammals/birds exhibit, **26**, 146-154(PI)  
*Muntiacus muntjak*, **24/25**, 318  
*Muntiacus reevesi*, **22**, 247: **24/25**, 203  
*Mus caroli*, **24/25**, 135  
*Mus musculus*, **24/25**, 135, 159, 203  
*Musophaga violacea*, **26**, 206  
*Mustela*, **24/25**, 202  
*Mustela eversmanni*, **23**, 190  
*Mustela nigripes*,  
 breeding biology, behaviour, Patuxent, **23**, 186-191  
*Mustela putorius*, **23**, 187: **24/25**, 291  
*Mustela vison*, **24/25**, 203  
*Mustelus californicus*, **26**, 51  
*Mustelus griseus*, **26**, 59  
*Mycteria americana*, **24/25**, 35  
*Mycteria cinerea*, **24/25**, 35  
*Mycteria ibis*, **24/25**, 34  
*Mycteria leucocephala*, **24/25**, 34  
*Myliobatis californica*, **26**, 51  
*Myocaster coypus*, **23**, 22: **24/25**, 200  
*Myosotidium hortensia*, **24/25**, 125  
*Myripristis berndti*, **26**, 23  
*Myrmecophaga tridactyla*, **22**, 51  
 exhibited with *Chrysocyon brachyurus*,  
 Osnabruck, **24/25**, 271-274(PI)

## N

- Naja kaouthia*, **23**, 169  
*Naja melanoleuca melanoleuca*, **23**, 169  
*Naja naja*, **23**, 161  
*Naja naja naja*, **23**, 169  
*Naja nigricollis pallida*, **24/25**, 213, 215  
*Nasalis larvatus*, **24/25**, 108, 111, 114, 213  
*Naso unicornis*, **26**, 23  
*Nautichthys oculoasciatus*, **26**, 38  
*Nautilus pompilius*, **26**, 41, 46  
*Necrosyrtes monachus*, **23**, 104: **24/25**, 7  
*Nemorhaedus*, **26**, 297  
*Neoceratus forsteri*, **24/25**, 69  
*Neomys anomalus*, **26**, 227  
*Neomys fodiens*,  
 breeding in laboratory, **26**, 223-228(PI)  
*Neophoca cinerea*, **26**, 171  
*Neophron percnopterus*, **23**, 19, 46, 104, 109, 114,  
 115: **24/25**, 7  
*Neotragus moschatus*, **24/25**, 83, 93  
*Nesoenas mayeri*, **23**, 76, 88: **24/25**, 47-48, 213, 215  
*Nesospiza wilkinsi*, **24/25**, 45  
*Nettapus auritus*, breeding, Hong Kong, **26**,  
 205-207  
*Nettapus coromandelianus coromandelianus*, **26**, 205  
 New Orleans (Audubon Zoological Garden),  
 Sable antelope, birth, **22**, 218-221  
 New World monkeys,  
 breeding, London ZSL, **22**, 84-87  
 Miami Monkey Jungle, **22**, 77-84  
 New York Bronx,  
 breeding, Andean condor, **23**, 11-14  
 Giant ameiva lizard, **22**, 159-163(PI)  
 Striped grass mouse, **24/25**, 260-263  
 hand-rearing, reintegration, Californian sealion,  
**24/25**, 279-285(PI)  
 management, biology, Prehensile-tailed  
 porcupine, **26**, 265-275  
 seabird colony, **26**, 142-146(PI)  
 New York, St Catherine's Island Survival Center,  
 Sable antelope birth, **22**, 218-221  
*Ninox novaeseelandiae*, **23**, 101, 102, 105  
*Nipponia nippon*, **24/25**, 27, 35, 37  
*Notopterus blanci*, **24/25**, 69  
*Notorynchus cepedianus*, **26**, 51  
*Notropis formosus*, **24/25**, 71  
*Novaculichthys taeniourus*, **26**, 23  
*Numida meleagris*, **26**, 316  
 Nutrition,  
 Vitamin E, levels in plasma, zoo animals, **24/25**,  
 316-321  
*Nyctea scandiaca*, **23**, 19, 29, 72, 73, 94, 101, 102,  
 105, 110, 114, 115  
*Nyctereutes procyonoides*, **24/25**, 159  
*Nycticorax nycticorax*, **24/25**, 204  
*Nymphicus hollandicus*, **24/25**, 145

## O

- Observing small spp, one-way viewing screen, **23**,  
 218-219  
*Octopus cyanea*, **26**, 42, 47  
*Octopus dofleini*, **26**, 41, 44-45, 48, 72  
*Octopus leioderma*, **26**, 42, 47, 48  
*Octopus rubescens*, **26**, 41, 42-43(PI), 48  
*Ocyurus chrysurus*, **26**, 15, 16  
*Odobenus rosmarus*, **22**, 228, 231  
*Odobenus rosmarus divergens*,  
 exhibit, management, Hanover, **26**, 163-170(PI)  
*Odobenus rosmarus rosmarus*, **26**, 163  
*Odocoileus hemionus columbianus*, **22**, 235  
*Odocoileus virginianus*, **24/25**, 320: **26**, 302  
 management, free-living herd, Washington NZP,  
**23**, 234-236  
*Odontaspis taurus*, **26**, 51  
*Oenanthe*, **23**, 46, 49  
 Oestrogen, urinary, related to oestrous behaviour,  
 Giant panda, **24/25**, 274-279(PI)

- Okapia johnstoni*, **22**, 205: **24/25**, 81, 88, 159, 163  
*Ondatra zibethicus*, **24/25**, 200  
*Ophiophagus hannah*, **23**, 169: **24/25**, 213  
*Opisthoteuthis californiana*, **26**, 48  
Orang-utan, see *Pongo pygmaeus*  
*Orcinus orca*, **22**, 228, **231**: **24/25**, 159  
*Oreamnos americanus*, **24/25**, 84, 95  
management, breeding, Seattle WP, **26**, 297–308(PI)  
*Oreonax hendeei*, **22**, 48  
*Oreotragus oreotragus*, **24/25**, 83, 93  
*Ortalis vetula*, **26**, 260  
*Orycteropus afer*, **22**, 276, 286(PI): **24/25**, 155  
breeding, Cincinnati, **26**, 281–285(PI)  
management, review, **24/25**, 286–294  
*Oryctolagus cuniculus*, **24/25**, 200, 275  
*Oryx dammah*, **22**, 246, 247, 248: **24/25**, 82, 92, 162, 168–174(PI), 319  
hand-feeding, reintegration, Christchurch OP, **23**, 243–248  
*Oryx gazella*, **24/25**, 194, 195  
*Oryx gazella callotis*, **24/25**, 182  
*Oryx gazella gazella*, **24/25**, 319  
*Oryx leucoryx*, **24/25**, 82, 92, 101, 160, 162, 212, 213, 215, 218  
reintroduction, Oman, **24/25**, 179–188  
*Oryx*, Arabian, see *Oryx leucoryx*; Scimitar-horned, see *Oryx dammah*  
Osnabruck,  
mixed species exhibit, **24/25**, 271–274(PI)  
*Osteolaemus tetraspis tetraspis*, **23**, 168  
*Otaria byronia*, **22**, 228, **231**: **26**, 148, 150, 152, 167  
*Otaria flavescens*, see *O. byronia*  
*Otis tarda*, **24/25**, 201  
*Otocyon megalotes*, **23**, 238  
Otter, European, see *Lutra l. lutra*; Sea, see *Enhydra lutris*  
Otter exhibit, Krefeld, **26**, 157–163  
*Otus bakkamoena*, **23**, 105  
*Otus scops*, **23**, 100–105  
*Ourebia ourebi*, **24/25**, 83, 93: **26**, 296  
*Ovibos moschatus*, **24/25**, 319  
*Ovis*, **24/25**, 96  
*Ovis ammon*, **24/25**, 159  
*Ovis canadensis*, **22**, 205: **24/25**, 86, 96, 319  
*Ovis canadensis californiana*, **24/25**, 86, 96  
*Ovis canadensis nelsoni*, **24/25**, 86, 96  
*Ovis dalli*, **24/25**, 86, 96  
*Ovis dalli stonei*, **24/25**, 86, 96  
*Ovis musimon*, **24/25**, 133, 134, 319  
*Ovis orientalis*, **24/25**, 87, 96  
*Ovis orientalis cycloceros*, **24/25**, 87, 96  
*Ovis orientalis ophion*, **24/25**, 87  
*Ovis orientalis orientalis*, **24/25**, 87  
Owl, Barn, see *Tyto alba*; Eagle, see *Bubo bubo*  
Owls, breeding, Berlin W, **23**, 100–102  
*Oxyrhopus trigeminus*, **23**, 170  
*Oxyura jamaicensis*, **24/25**, 204  
*Oxyura leucocephala*, **24/25**, 24  
*Oxyuranus scutellatus*, breeding, Melbourne, **23**, 159–162  
*Ozotoceros bezoarticus*, **24/25**, 79, 80
- P**
- Pan paniscus*, **24/25**, 112, 114, 117, 119, 160  
paternity diagnosis, **23**, 220–223(PI)  
*Pan troglodytes*, **22**, 72, 222, 242: **23**, 220, 222: **24/25**, 108, 114, 158, 257: **26**, 250  
breeding colony, Arnhem, **26**, 236–248  
*Pan troglodytes schweinfurthi*, **24/25**, 117  
*Pan troglodytes troglodytes*, **24/25**, 112, 117  
*Pan troglodytes verus*, **24/25**, 117  
Panda, Giant, see *Ailuropoda melanoleuca*  
*Pandion haliaetus*, **23**, 5  
care/release of injured, **23**, 119  
*Panthera leo*, **22**, **234**: **24/25**, 155, 194, 316, 333, 335  
*Panthera onca*, **24/25**, 312, 314, 317, 318, 320  
*Panthera pardus*, **22**, 234  
inbreeding, rare ssp, **22**, 198–206  
*Panthera pardus japonensis*, **24/25**, 312, 314  
inbreeding, **22**, 198–206  
*Panthera pardus kotiya*, inbreeding, **22**, 198–206  
*Panthera pardus orientalis*, inbreeding, **22**, 198–206  
*Panthera pardus saxicolor*, inbreeding, **22**, 198–206  
*Panthera tigris*, **24/25**, 116, 160  
*Panthera tigris altaica*, **22**, 199: **24/25**, 163, 174, 175, 177, 207, 208, 212, 213, 215  
*Panthera tigris corbetti*, **24/25**, 177  
*Panthera tigris sumatrae*, **24/25**, 177  
*Panthera tigris tigris*, **24/25**, 177  
*Panthera uncia*, **24/25**, 207  
*Pantholops hodgsoni*, **24/25**, 95  
*Pantodon buchholzi*, **26**, 65  
*Papio cynocephalus*, **24/25**, 133  
*Papio hamadryas*, **24/25**, 108, 113, 114, 203  
*Parabuteo unicinctus*, **23**, 51: **24/25**, 3, 4, 8, 14  
*Parabuteo unicinctus* × *Buteo jamaicensis*, **24/25**, 4  
*Paracanthurus hepatus*, **26**, 23, 29  
*Paracirrhites arcatus*, **26**, 23  
*Paralabrax clathratus*, **26**, 108  
*Paralabrax nebulifer*, **26**, 108  
*Paranthias colonus*, **26**, 23  
*Paraoria*, **26**, 84  
Parrot, Pesquet's, see *Psittichas fulgidus*  
Parthenogenesis, lizards, **23**, 157–158  
*Partula*, **24/25**, 54, 75  
*Partula tohiveana*, **24/25**, 54, 55  
*Parupeneus multifasciatus*, **26**, 23  
*Passer domesticus*, **24/25**, 200  
Patuxent,  
breeding biology, behaviour, Black-footed ferrets, **23**, 186–191  
*Pavo cristatus*, **24/25**, 44  
*Pavo muticus*, **24/25**, 43, 44  
*Pedetes capensis*, **22**, 287  
*Peltophryne lemur*, **24/25**, 64, see also *Bufo lemur*  
Penguin, Emperor, see *Aptenodytes forsteri*;  
Humboldt, see *Spheniscus humboldti*;  
King, see *Aptenodytes patagonica*;  
Little/Fairy/Blue, see *Eudyptula minor*  
Penguin/alcid exhibit, San Diego SW, **26**, 104–109  
Penguin cliffs, Berlin Tierpark, **26**, 140–142(PI)

- Penguin exhibit, San Francisco Aqu. **26**, 136–139(Pl)
- Penguin/seabird building, Chicago LP, **26**, 132–136
- Penguinarium, renovation, Detroit, **26**, 125–132(Pl)
- Peponocephala electra*, **22**, 228
- Perdix perdix*, **24/25**, 200
- Peregrine, see *Falco peregrinus*
- Periophthalmus*, **26**, 54
- Pernis apivorus*, **23**, 119
- Perodicticus potto*, **24/25**, 287
- Perth,  
strongyloidiasis in Orang-utans, control of, **24/25**, 256–260
- Peruvian Amazonia, primates, status and conservation, **22**, 37–47
- Petaurus breviceps*, **22**, 177, 287
- Petroica macrocephala chathamensis*, **24/25**, 47
- Petroica traversi*, **24/25**, 45, 47  
transport, eggs, **24/25**, 307
- Phacochoerus aethiopicus*, **24/25**, 195, 198, 318
- Phagophilus groenlandica*, **22**, 229
- Phalacrocorax atriceps*, **26**, 105
- Phalacrocorax bougainvillei*, **26**, 143, 145(Pl)
- Phalanger*, **24/25**, 100
- Phalanger gymnotis*, **22**, 287  
breeding, husbandry, Columbia, **22**, 176–180(Pl)
- Phalanger interpositus*, **24/25**, 103
- Phalanger maculatus*, **22**, 177
- Phalcoboenus australis*, **23**, 105: **24/25**, 10
- Phalcoboenus megalopterus*, **24/25**, 10
- Phaner furcifer*, **24/25**, 109
- Phascolarctos cinereus adustus*,  
breeding, San Diego, **26**, 217–222
- Phascolarctos cinereus cinereus*, **26**, 217
- Phascolarctos cinereus victor*, **26**, 217
- Phasianus colchicus*, **24/25**, 40, 200
- Pheasant, Cheer, see *Catreus wallichi*
- Pheasants,  
breeding endangered, review, **24/25**, 40–44
- Phelsuma*, **23**, 81
- Phelsuma guentheri*, **24/25**, 50, 51, 52
- Phelsuma laticauda*, **24/25**, 329
- Philadelphia, HERPlab, **24/25**, 340
- Phoca hispida*, **24/25**, 189
- Phoca largha*, **22**, 228
- Phoca sibirica*, **22**, 228
- Phoca vitulina*, **22**, 229, 231: **26**, 167, 171, 173
- Phodilus badius*, **23**, 110
- Phoebiconaias minor*, **24/25**, 22
- Phoenicoparrus andinus*, **24/25**, 23
- Phoenicoparrus jamesi*, **24/25**, 22
- Phoenicopteropus chilensis*, **24/25**, 23  
sexing by tarsus length, **24/25**, 240–243
- Phoenicopteropus ruber roseus*,  
sexing by tarsus length, **24/25**, 240–243
- Phoenicopteropus ruber ruber*, **24/25**, 212, 213, 215  
sexing by tarsus length, **24/25**, 240–243
- Pholis gunellus*, **26**, 38
- Photoblepharon*, **26**, 57
- Phractocephalus hemiliopterus*, **26**, 83
- Phrynomerus bifasciatus*, **24/25**, 59
- Phrynosoma asio*, **23**, 148
- Phrynosoma douglassi*, breeding, care, longevity, **23**, 148–156(Pl)
- Phrynosoma douglassi brevirostre*, **23**, 148, 150
- Phrynosoma douglassi douglassi*, **23**, 148, 150
- Phrynosoma douglassi hernandesi*, **23**, 148, 150, 153
- Phrynosoma douglassi ornatissimum*, **23**, 148, 150, 155
- Phrynosoma modestum*, **23**, 148, 149
- Phrynosoma platyrhinos*, **23**, 148, 149
- Phrynosoma solare*, **23**, 149
- Phyllobates vittatus*, **24/25**, 331
- Physignathus cocincinus*, **24/25**, 51, 53
- Pica pica*, **24/25**, 302
- Pinniped exhibit, Sydney, **26**, 171–179
- Pipa pipa*, **24/25**, 59: **26**, 312
- Pisaster brevispinus*, **26**, 108
- Pisaster gigantea*, **26**, 108
- Pithecia*, **24/25**, 100
- Pithecia albicans*, **22**, 25, 29, 30, 34
- Pithecia hirsuta*, **22**, 25, 30, 39, 40, 41, 45
- Pithecia monachus*, **22**, 25, 30, 40, 41, 45, 79, 132
- Pithecia pithecia*, **22**, 25, 30, 44, 53, 54, 61–65, 67, 85, 87, 287  
breeding, Columbia, **22**, 124–127(Pl)
- Pithecopaga jefferyi*, **23**, 6: **24/25**, 14
- Plagiodontia aedium*, **24/25**, 103
- Plagopterus argentissimus*, **24/25**, 71
- Plants, conservation in zoos, **24/25**, 123–126  
in intertidal exhibit, Monterey, **26**, 31
- Platalea minor*, **24/25**, 35
- Platax*, **26**, 53
- Platemys platycephala*, **23**, 168
- Plethodon glutinosus*, **24/25**, 61(Pl)
- Plica plica*, **23**, 157
- Ploceus intermedius*, **24/25**, 333, 337
- Podocnemis expansa*, **22**, 22
- Podocnemis sextuberculata*, **22**, 22
- Podocnemis unifilis*, **22**, 22
- Poeciliopsis occidentalis occidentalis*, **24/25**, 71
- Poicephalus senegalus versteri*, **24/25**, 144
- Polarium, Munich, aquatic mammals/birds exhibit, **26**, 146–154(Pl)
- Polihierax semitorquatus*, **23**, 105, 109: **24/25**, 10
- Polyboroides typus*, **24/25**, 7
- Polyborus plancus*, **23**, 19, 29: **24/25**, 10
- Polyodon spathula*, **24/25**, 69
- Polypedates leucomystax*, **23**, 204
- Polyplectron emphanum*, **24/25**, 43
- Pomacanthus arcuatus*, **26**, 17
- Pomacanthus imperator*, **26**, 23, 27
- Pomacanthus partitus*, **26**, 17
- Pomacanthus paru*, **26**, 16, 17
- Pomacentrus*, **26**, 15, 16
- Pomatomus saltatrix*, **26**, 51
- Pongo pygmaeus*, **22**, 72: **24/25**, 108, 112, 114, 117, 118, 158, 159, 317, 318, 320: **26**, 250  
growth, development, twins, **22**, 256–261  
sexual development, males, **22**, 222–227  
strongyloidiasis, control of, Perth Zoo, **24/25**, 256–260
- Pongo pygmaeus abeli*, **22**, 222, 223, 225: **24/25**, 116
- Pongo pygmaeus pygmaeus*, **22**, 222–227

- Population management, **24/25**, 167–174(Pl)  
 contraception, culling, **24/25**, 206–210
- Porcupine, Prehensile-tailed, see *Coendou prehensilis*
- Port Elizabeth,  
 Educational graphics area, Snake Park entrance, **26**, 309–314(Pl)
- Potorous longipes*, **24/25**, 103
- Praomys natalensis*, **24/25**, 260
- Presbytis geei*, **24/25**, 111
- Presbytis johni*, **24/25**, 111
- Presbytis potenziani*, **24/25**, 111
- Primates,  
 breeding programmes, review, **24/25**, 107–123
- Priodontes*, **22**, 194
- Priodontes giganteus*, **22**, 51, 192
- Prionace glauca*, **26**, 51
- Pristis pectinata*, **26**, 16
- Procyon lotor*, **24/25**, 200; **26**, 277
- Propithecus diadema perrieri*, **24/25**, 109
- Propithecus verreauxi*, **24/25**, 109
- Proteles cristatus*, **22**, 286(Pl); **26**, 157
- Pseudacris ornata*, **23**, 166
- Pseudacris streckeri*, **23**, 166
- Pseudechis guttatus*, **23**, 161
- Pseudemys scripta*, **26**, 87(Pl)
- Pseudemys scripta elegans*, **24/25**, 146
- Pseudibis davisoni*, **24/25**, 35
- Pseudochelirus*, **26**, 212
- Pseudois nayaur*, **24/25**, 86, 96
- Pseudonaja nuchalis*, **23**, 160
- Pseudonaja textilis*, **23**, 160
- Pseudopleuronectes americanus*, **26**, 38
- Pseudorca crassidens*, **22**, 228
- Psittacula eques*, **24/25**, 48
- Psittacula krameri*, **24/25**, 49, 204
- Psittrichas fulgidus*,  
 breeding, Los Angeles, **26**, 208–212
- Pterocnemia pennata*, **23**, 180; **26**, 189
- Pterocnemia*, **26**, 195
- Pteroglossus aracari*, **26**, 84
- Pteropus giganteus*, **26**, 282
- Pteropus niger*, **23**, 76
- Pteropus rodricensis*, **23**, 76; **24/25**, 104, 105
- Ptychocheilus lucius*, **24/25**, 71, 73
- Ptychoramphus aleuticus*, **26**, 107
- Pudu pudu*, **24/25**, 79, 81
- Puffin, see *Lunda cirrhata*
- Puffinus pacificus*, **26**, 176
- Pulsatrix perspicillata*, **23**, 100, 105
- Pusa caspica*, **26**, 167
- Pusa hispida*, **26**, 167
- Pygathrix nemaeus*, **24/25**, 108, 111, 114
- Pygmy goose, African, see *Nettapus auritus*
- Pygoscelis adeliae*, **26**, 104, 105, 116, 127, 199
- Pygoscelis antarctica*, **26**, 105, 134
- Pygoscelis papua*, **26**, 105, 142, 146, 148, 152
- Pyrrhura perlata*, **24/25**, 145
- Python anchietae*, **23**, 172
- Python, Australian carpet, see *Morelia spilotes*
- Python molurus*, **24/25**, 329
- Python molurus bivittatus*, **24/25**, 312, 315
- Python regius*, **23**, 172; **24/25**, 329
- Python reticulatus*, **24/25**, 213
- Pyxicephalus adspersus*, **24/25**, 341; **26**, 312

## R

- Rabbit, Volcano, see *Romerolagus diazi*
- Raja binoculata*, **26**, 51
- Raja ocellata*, **26**, 38
- Ramphastos tucanus*, **26**, 87
- Rana catesbeiana*, **23**, 167; **24/25**, 212, 213, 215
- Rana esculenta*, **23**, 167
- Rana ridibunda*, **23**, 167
- Rana sylvatica*, **23**, 167
- Rana temporaria*, **23**, 167
- Rangifer tarandus*, **22**, 246, 247, 248; **24/25**, 191, 318
- Rare species,  
 breeding, finance, practical difficulties, **24/25**, 210–219  
 priorities, goals, **24/25**, 174–179  
 conservation role, zoos, Sweden, **24/25**, 198–192  
 policy on conservation, **24/25**, 206–210
- Rattlesnake, Aruba Island, see *Crotalus unicolor*
- Rattus exulans*, **26**, 183
- Rattus norvegicus*, **24/25**, 200
- Rattus rattus*, **24/25**, 24, 47, 51, 203
- Redunca*, **24/25**, 92
- Redunca arundinum*, **24/25**, 195
- Redunca fulvorufula*, **24/25**, 195, 198
- Reintroduction to wild,  
 African national park, native spp, **24/25**, 192–199  
 Arabian oryx, Oman, **24/25**, 179–188  
 Barn owl, Britain, **23**, 88–95(Pl)  
 Bearded vulture, Europe, **23**, 35–41(Pl)  
 Cheer pheasants, Pakistan, further report, **24/25**, 40–42  
 Crowned eagle, **23**, 62–64  
 in Sweden, **24/25**, 189–192  
 injured birds of prey, **23**, 117–121, 121–125  
 neotropical primates, reintroduction, translocation, **22**, 69–77  
 releases, responsibilities, safeguards, **24/25**, 200–205  
 White-tailed sea eagle, **23**, 18–35(Pl)
- Reproductive studies,  
*Ailuropoda melanoleuca*, **24/25**, 274–279(Pl)  
*Aotus trivirgatus*, **22**, 115–119  
 artificial breeding techniques,  
 problems/practicalities, **24/25**, 148–157  
 recent advances, birds/reptiles, **24/25**, 143–148  
*Callithrix jacchus*, **22**, 138–143(Pl)  
*Cebus*, **22**, 143–150  
 embryo transfers, birth, Bongo, **24/25**, 138–142(Pl)  
 embryos, collection, storage, use, **24/25**, 131–138(Pl)  
 monitoring changes, **24/25**, 126–130  
*Pongo pygmaeus*, **22**, 222–227  
 pregnancy in elephants, diagnostic test, prolactin, **26**, 285–289

## Reptiles,

- bred in captivity, **22**, 367–371: **23**, 267–272: **24/25**, 432–445: **26**, 417–422
- breeding/conservation programmes, Jersey, **24/25**, 49–56
- rare, census, **22**, 440–444: **23**, 342–346: **24/25**, 567–573: **26**, 509–513
- reproductive patterns, **23**, 166–174
  - crotalids, others, **23**, 163–166
- tool for feeding, **23**, 206–207(PI)

## Reserves/national parks,

- African, reintroduction of native spp, **24/25**, 192–199
- Brazil, Atlantic forest region, **22**, 3–7
- Brazilian Amazonia, **22**, 19–22
- Peru, proposed, **22**, 49, 51
- Peruvian Amazonia, **22**, 38–40
- Surinam, **22**, 59–61
- Venezuela, **22**, 55–56

Restraint, small macropods, physical/chemical, **23**, 215–218

- Rhacophorus leucomystax*, **24/25**, 58
  - Rhacophorus viridis*, tube-feeding, **23**, 204–205
  - Rhacophorus viridis amamiensis*, **23**, 204
  - Rhacophorus viridis oustoni*, **23**, 204
  - Rhacophorus viridis viridis*, **23**, 204–205
  - Rhamphocottus richardsoni*, **26**, 38
  - Rhea*, **26**, 195
  - Rhea americana*, **22**, 166: **23**, 175: **26**, 196
  - Rheobatrachus*, **26**, 312
  - Rhinecanthus aculeatus*, **26**, 23
  - Rhinecanthus rectangulus*, **26**, 23
  - Rhinoceros, Black, see *Diceros bicornis*; White, see *Ceratotherium simum*
  - Rhinoceros unicornis*, **24/25**, 207, 213, 215, 297, 301, 317
  - Rhinopithecus roxellanae*, **24/25**, 111
  - Rhinoptera bonasus*, **26**, 15
  - Rhinopteryx clamator*, **23**, 100
  - Rhodius ocellatus*, **26**, 62
  - Rhyacotriton*, **23**, 167
  - Ridley, Olive, see *Lepidochelys olivacea*
  - Ringtail, see *Bassariscus astutus*
  - Rio de Janeiro, breeding, Red-billed curassow, **24/25**, 244–247
  - Rio de Janeiro Primate Centre, **22**, 15–16
  - Riverbanks Zoological Park, see Columbia
  - Rollulus rouloul*, **22**, 168
  - Romerolagus diazi*, **24/25**, 101, 104
    - breeding, Mexico, Chapultepec, **26**, 261–265
  - Rossia pacifica*, **26**, 41, 43–44
  - Rostrhamus sociabilis*, **24/25**, 4
  - Rostrhamus sociabilis sociabilis*, **24/25**, 6
  - Rupicapra rupicapra*, **24/25**, 97: **26**, 297
  - Rupicola peruviana*,
    - breeding, Houston, **22**, 171–175(PI)
  - Rutilus arcasi*, **24/25**, 69
  - Rynchocyon chrysopygus*, **22**, 235
- S
- Sagittarius serpentarius*, **23**, 105, 109: **24/25**, 9, 333
    - breeding, Walsrode, **23**, 64–66(PI)
  - Saguinus*, **22**, 25–27, 78, 111

- Saguinus bicolor*, **22**, 24–27: **24/25**, 110
- Saguinus bicolor bicolor*, **22**, 24–27, 29, 34
- Saguinus bicolor martinsi*, **22**, 24–27, 29, 34
- Saguinus bicolor ochraceus*, **22**, 24–27, 29
- Saguinus fuscicollis*, **22**, 1, 24–27, 34, 39, 40, 44, 77, 85, 177
- Saguinus fuscicollis acrensis*, **22**, 25, 26, 29, 34
- Saguinus fuscicollis avilapirensi*, **22**, 25, 26, 29, 34
- Saguinus fuscicollis crandalli*, **22**, 25, 26, 29, 34
- Saguinus fuscicollis cruzlimai*, **22**, 25, 26, 29, 34
- Saguinus fuscicollis fuscicollis*, **22**, 25, 26, 40, 45
- Saguinus fuscicollis fuscus*, **22**, 25, 26
- Saguinus fuscicollis illigeri*, **22**, 40, 45
- Saguinus fuscicollis lagonotus*, **22**, 40, 45
- Saguinus fuscicollis leucogenys*, **22**, 40, 45
- Saguinus fuscicollis melanoleucus*, **22**, 25, 26, 29, 34
- Saguinus fuscicollis nigrifrons*, **22**, 40, 45
- Saguinus fuscicollis primitivus*, **22**, 25, 26, 29, 34
- Saguinus fuscicollis tripartitus*, **22**, 25, 26, 40, 45
- Saguinus fuscicollis weddelli*, **22**, 25, 26, 40, 45
- Saguinus imperator*, **22**, 25–27, 39, 40, 287: **24/25**, 104, 108, 110, 114
  - Saguinus imperator imperator*, **22**, 25–27, 29, 34
  - Saguinus imperator subgriseus*, **22**, 25–27, 41, 45
- Saguinus inustus*, **22**, 25, 26
- Saguinus labiatus*, **22**, 25, 26, 40, 44, 77
- Saguinus labiatus labiatus*, **22**, 25, 26, 41, 45
- Saguinus labiatus thomasi*, **22**, 25, 26, 29, 34
- Saguinus leucopus*, **24/25**, 110
- Saguinus midas*, **22**, 25, 60, 61, 66, 102
- Saguinus midas midas*, **22**, 25, 26, 62, 63, 64(PI), 65, 67, 72
  - Saguinus midas niger*, **22**, 25, 26, 29
- Saguinus mystax*, **22**, 1, 25–27, 34, 40, 44, 85
- Saguinus mystax mystax*, **22**, 25, 26, 41, 45, 71
- Saguinus mystax pileatus*, **22**, 25, 26, 29, 34
- Saguinus mystax pluto*, **22**, 25, 26, 29, 34
- Saguinus nigricollis*, **22**, 25, 26, 40, 45
- Saguinus nigricollis graellsii*, **22**, 41, 45
- Saguinus nigricollis nigricollis*, **22**, 25, 26, 41, 45
- Saguinus oedipus*, **22**, 118, 132
- Saguinus oedipus geoffroyi*, **22**, 77, 85: **24/25**, 100
- Saguinus oedipus oedipus*, **22**, 77, 85: **24/25**, 100, 103, 104, 107, 110, 114
- Saiga tatarica*, **24/25**, 84, 95
- Saimiri*, **22**, 125, 126
- Saimiri oerstedii*, **22**, 28: **24/25**, 104, 110
- Saimiri sciureus*, **22**, 1, 25, 28–30, 39, 40, 44, 53, 54, 57, 61–68, 70, 71, 79, 85, 86: **24/25**, 159
  - housing, outdoors, low temperatures, **22**, 131–138(PI)
- Saimiri sciureus macrodon*, **22**, 42, 45
- Saimiri sciureus nigriceps*, **22**, 42, 45
- St Louis,
  - Bird house renovation, **23**, 254–257(PI)
  - breeding, management, Malayan tapir, **24/25**, 294–297
  - hand-rearing, reintegration, antelopes, **22**, 269–270
- Saki, White-faced, see *Pithecia pithecia*
- Salamandra salamandra salamandra*, breeding, **24/25**, 223–226
- Salamandra salamandra terrestris*, **24/25**, 225

- Salmo clarki utah*, **24/25**, 69  
*Salmo salar*, **26**, 79  
 San Antonio,  
   breeding, New Guinea side-necked turtle, **26**,  
   94–98  
   parthenogenesis, Central American night lizard,  
   **23**, 157–158  
   reptiles/amphibians, reproductive patterns, **23**,  
   166–174  
 San Diego,  
   breeding, Queensland koala, **26**, 217–222  
   heated bed modules, use for mammals/reptiles,  
   **24/25**, 311–315(PI)  
   paternity diagnosis, Pygmy chimpanzee, **23**,  
   220–223(PI)  
 San Diego, Sea World,  
   breeding, King/Emperor penguins, **26**,  
   110–124(PI)  
   penguin/alcid exhibit, **26**, 104–109(PI)  
 San Francisco Aquarium,  
   Fish Roundabout exhibit, deep-sea fishes, **26**,  
   48–53(PI)  
   penguin exhibit, **26**, 136–139(PI)  
 Sao Leopoldo, breeding, Broad-nosed caiman,  
   **24/25**, 226–230  
*Sarcogyps calvus*, **23**, 109  
*Sarcoramphus papa*, **23**, 12, 46: **24/25**, 6  
*Sarkidiornis melanotos*, **24/25**, 333, 337  
*Scarus*, **26**, 16  
*Scarus coeruleus*, **26**, 16, 17  
*Scatophagus*, **26**, 56  
*Sciurus carolinensis*, **24/25**, 202  
*Sciurus vulgaris*, **24/25**, 202  
*Scleropages formosus*, **24/25**, 69, 70  
*Scotopelia bouvieri*, **23**, 105, 110  
*Scotopelia peli*, **23**, 100  
 Sea eagle, White-tailed, see *Haliaeetus albicilla*  
 Seabird exhibit, Chicago LP, **26**, 132–136  
   New York Bronx, **26**, 142–146(PI)  
   San Diego SW, **26**, 104–109  
 Seal, South African fur, see *Arctocephalus pusillus*  
 Sealion, Californian, see *Zalophus c. californianus*  
 Seattle Aquarium,  
   keeping, exhibiting, cephalopods, **26**, 41–48(PI)  
   Pacific coral reef exhibit, **26**, 18–26(PI)  
 Seattle, Woodland Park,  
   African savanna exhibit, **24/25**, 332–339  
   management, breeding, Rocky Mountain goat,  
   **26**, 297–308(PI)  
*Sebastes carnatus*, **26**, 108  
*Sebastes chrysomelas*, **26**, 108  
*Sebastes nigrocinctus*, **26**, 73  
 Secretary bird, see *Sagittarius serpentarius*  
*Selene vomer*, **26**, 16  
*Semicossyphus pulcher*, **26**, 108  
*Sepia officinalis*, **26**, 41, 46–47(PI)  
*Serinus canaria*, **24/25**, 145  
*Serinus mozambicus*, **24/25**, 337  
*Seriola lalandi dorsalis*, **26**, 50(PI), 51  
*Seriola rivoliana*, **26**, 51  
*Serrasalmus nattereri*, **26**, 85  
*Serrasalmus piraya*, **26**, 53  
*Setonix brachyurus*, **23**, 215  
 Sexing techniques,  
   Humboldt penguin, **26**, 198–204  
   tarsus length, flamingos, **24/25**, 240–243  
 Sharks, prevention of goitre, **26**, 59–61(PI)  
*Sicista*, **24/25**, 203  
*Simia flavicauda*, **22**, 47, 48  
*Simias concolor*, **24/25**, 111  
*Sistrurus ravus*, **23**, 168, 171  
 Skansen Aquarium,  
   breeding, Pygmy marmoset, **22**, 88–93(PI)  
*Skiffia francesae*, **24/25**, 69, 70  
 Snails,  
   breeding programme, Moorea Island spp, Jersey,  
   **24/25**, 54  
*Somateria fischeri*, **26**, 107  
*Somateria mollissima*, **24/25**, 22  
*Sorex araneus*, **24/25**, 159: **26**, 227  
*Sorex minutus*, **26**, 227  
*Sparus macrocephalus*, **26**, 29  
*Speothos venaticus*, **22**, 276, 284(PI)  
*Speotyto cunicularia*, **23**, 19  
*Spheniscus demersus*, **26**, 127, 154, 203  
   exhibit, Berlin Tierpark, **26**, 140–142  
   exhibit, San Francisco Aqu, **26**, 136–139(PI)  
*Spheniscus humboldti*, **26**, 104, 116, 143, 146, 148,  
   152, 154  
   breeding biology, sexing techniques, **26**, 198–204  
   exhibit, Berlin Tierpark, **26**, 140–142  
*Spheniscus magellanicus*, **26**, 105, 204  
*Spheniscus mendiculus*, **26**, 203  
*Sphenodon punctatus*,  
   breeding, Auckland, **26**, 183–186(PI)  
*Sphyræna barracuda*, **26**, 15, 16  
*Sphyrna lewini*, **26**, 59  
*Sphyrna tiburo*, **26**, 15, 16  
*Spirula*, **26**, 48  
*Spizaetus alboniger*, **24/25**, 9  
*Spizaetus ornatus*, **23**, 105: **24/25**, 9  
 Spoonbills,  
   breeding endangered, review, **24/25**, 25–39  
*Spreo superbus*, **26**, 206  
*Squalus acanthias*, **26**, 51  
*Stearnornis caripensis*, **22**, 39  
*Stegostoma fasciatum*, **26**, 27  
 Steinhart Aquarium, see San Francisco Aquarium  
*Stenella*, **22**, 228, 231  
*Steno bredanensis*, **22**, 228  
*Stephanoaetus coronatus*, fostering in wild, **23**,  
   62–64  
*Stereolepis gigas*, **26**, 51  
*Sterna vittata*, **26**, 105  
 Storks,  
   breeding endangered, review, **24/25**, 25–39(PI)  
*Strix aluco*, **23**, 19, 29, 53, 72, 73, 94, 105, 119  
*Strix aluco aluco*, **23**, 101, 102  
*Strix hylophila*, **23**, 105, 110  
*Strix nebulosa*, **23**, 101, 105  
*Strix uralensis*, **23**, 101, 105  
*Strombus gigas*, **24/25**, 75  
*Strongylocentrotus franciscus*, **26**, 108  
*Strongyloides stercoralis*, control of in Orang-utans,  
   **24/25**, 256–260  
*Struthio*, **26**, 195

- Struthio camelus*, **23**, 175: **24/25**, 195: **26**, 316, 317(PI)
- Studbooks,  
use in breeding programmes, **24/25**, 162–167
- Studbooks/World registers, rare animal, **22**, 474–479: **23**, 375–380: **24/25**, 623–630: **26**, 547–554
- Sturnus melanopterus*, **22**, 168
- Sturnus vulgaris*, **24/25**, 200
- Stuttgart,  
breeding, foureyed fish, **26**, 64–70(PI)
- Sufflamen bursa*, **26**, 22, 23
- Suncus etruscus*, **26**, 227
- Suncus murinus*, **26**, 227
- Surinam, primates, status and conservation, **22**, 59–68
- Sus scrofa*, **24/25**, 159, 203
- Sydney,  
breeding, Rhinoceros iguana, **23**, 144–148(PI)  
exhibit, management, pinnipeds, **26**, 171–179
- Synceros caffer*, **24/25**, 195
- Synceros caffer nanus*, **24/25**, 90
- Synchiropus splendidus*, **26**, 4
- Syrnaticus ellioti*, **24/25**, 43
- Syrnaticus humiae*, **24/25**, 43
- Syrnaticus mikado*, **24/25**, 43
- T**
- Tachyeres pterneres*, **26**, 109
- Tachyglossus*, **22**, 250
- Tachyglossus aculeatus*, **23**, 209
- Tachyglossus aculeatus acanthion*, **22**, 251
- Taipan, see *Oxyuranus scutellatus*
- Tamandua mexicana*,  
hand-rearing, Tuxtla, **26**, 255–260(PI)
- Tamandua tetradactyla*, **26**, 255
- Tamarin, Lion, see *Leontopithecus*
- Tanakia tanago*,  
breeding, using artificial mussel, **26**, 62–64
- Tapir, Malayan, see *Tapirus indicus*
- Tapirus indicus*, **22**, 242  
breeding, management, St Louis, **24/25**, 294–297
- Tapirus terrestris*, **22**, 247
- Tarsius*, **24/25**, 108
- Tarsius bancanus borneanus*, **24/25**, 109
- Tarsius spectrum*, **24/25**, 109
- Tarsius syrichta*, **24/25**, 103, 109
- Taurotragus derbianus*, **24/25**, 81, 90
- Taurotragus eurycerus*, **23**, 222, see also *Tragelaphus*
- Taurotragus oryx*, **22**, 198, 243: **23**, 244: **24/25**, 133, 195: **26**, 295
- Tautoglabrus adpersus*, **26**, 38
- Tayassu, **22**, 10
- Tayassu tajacu, **24/25**, 318
- Tel Aviv Univ,  
hand-rearing wild-bred Lappet-faced vulture, **23**, 47–51(PI)
- Terathopius ecaudatus*, **23**, 114, 115: **24/25**, 7, 13
- Terrapene carolina*, **24/25**, 341
- Terrapene coahuila*, **24/25**, 54  
breeding, Dallas, **23**, 135–137(PI)
- Testudo marginata*, **24/25**, 54, 55
- Thalarctos maritimus*, **22**, 229: **24/25**, 317: **26**, 130, 146, 147(PI), 148, 152
- Thalassoma duperreyi*, **26**, 23
- Thalassoma fuscum*, **26**, 23
- Thalassoma lucasanum*, **26**, 23
- Thaumatibis gigantea*, **24/25**, 35
- Theristicus caudatus*, **26**, 109
- Theropithecus gelada*, **24/25**, 108, 113, 114, 317, 320
- Tidepool exhibit, Baltimore Aquarium, **26**, 34–41
- Toxus erythrorhynchus*, **26**, 206
- Tokyo, Ueno,  
breeding, Tokyo bitterling, **26**, 62–64  
goitre in sharks, **26**, 59–61
- Tolypeutes*, **22**, 193
- Tolypeutes matacus*, **22**, 129, 186, 192
- Tolypeutes tricinctus*, **22**, 186
- Tomistoma schlegelii*, **24/25**, 329
- Torgos tracheliotus*, **23**, 59, 104: **24/25**, 7
- Torgos tracheliotus negevensis*,  
decline, conservation attempts, Israel, **23**, 41–46  
hand-rearing for captive breeding stock, Tel Aviv, **23**, 47–51(PI)
- Torgos tracheliotus nubicus*, **23**, 42, 47
- Torgos tracheliotus tracheliotus*, **23**, 42, 50
- Toronto,  
breeding, African elephant, **22**, 215–217  
African fur seal, **22**, 207–215  
Renauld's ground cuckoo, **22**, 168–171  
hand-rearing, Nubian ibex, **23**, 248–253
- Tortoise, Burmese brown/Six-footed, see *Geochelone emys*; Pancake, see *Malacocheirus tornieri*
- Touch tank, Himeji Aqu, **22**, 271–276(PI)
- Toxotes*, **26**, 56
- Trachinotus falcatus*, **26**, 16
- Trachinotus goddei*, **26**, 16
- Trachyphonus vaillanti*, **26**, 206
- Tragelaphus angasi*, **22**, 234: **24/25**, 81, 89, 213, 215, 316
- Tragelaphus euryceros*, **22**, 234, 246, 247, 248: **23**, 196, 222: **24/25**, 81, 89, 133, 134, 159  
breeding, behaviour, Los Angeles, **23**, 237–242  
embryo transfer, birth to Eland surrogate, Cincinnati, **24/25**, 138–141(PI)
- Tragelaphus eurycerus isaaci*, **23**, 237
- Tragelaphus imberbis*, **22**, 243: **24/25**, 90
- Tragelaphus oryx*, **24/25**, 139, 140(PI), see also *Taurotragus oryx*
- Tragelaphus scriptus*, **24/25**, 89, 198: **26**, 296
- Tragelaphus spekei*, **24/25**, 89, 316
- Tragelaphus strepsiceros*, **22**, 243: **23**, 244: **24/25**, 195, 198, 318  
hand-rearing, reintegration, **22**, 269–270
- Tragopan blythi*, **24/25**, 42, 43
- Tragopan caboti*, **24/25**, 42, 43
- Tragopan melanocephalus*, **24/25**, 42, 43
- Tragopan satyra*, **24/25**, 42, 145
- Tragopan temmincki*, **24/25**, 42, 145
- Tragulus javanicus*, **24/25**, 78, 80, **26**, 295
- Tragulus meminna*, **24/25**, 78
- Tragulus napu*, **24/25**, 78, 80



- Transport containers,  
 developing eggs, **24/25**, 306–310(PI)  
 Puffins, **23**, 207–209(PI)  
 Sea otters, **23**, 223–224(PI)
- Tremarctos ornatus*, **22**, 51: **24/25**, 207, 317
- Treron calva*, **26**, 206
- Triacodon obesus*, **26**, 59
- Triakis scyllium*, **26**, 59
- Triakis semifasciata*, **26**, 51
- Trichechus inunguis*, **22**, 229: **26**, 82  
 hand-rearing, feeding techniques, **22**, 263–267
- Trichechus manatus*, **22**, 229, 230, 266
- Tricholimnas sylvestris*, **24/25**, 47, 214
- Trichosurus*, **22**, 176: **26**, 212
- Trionocephus occipitalis*, **23**, 104
- Tuatara, see *Sphenodon punctatus*
- Tucson, Reid Park (formerly Gene Reid Zool. Park), breeding, Ringtail or Cacomistle, **26**, 276–280
- Turdoides bicolor*, **26**, 206
- Turdus merula*, **24/25**, 251
- Tursiops truncatus*, **22**, 227, 228, 231  
 breeding, Kolmarden Dolphinarium, **24/25**, 263–271(PI)
- Turtle, Aquatic box, see *Terrapene coahuila*; New Guinea side-necked, see *Emydura australis albertisii*
- Turtles, marine, rearing, artificial sea water, **26**, 90–94
- Tuxtla,  
 hand-rearing, Mexican anteater, **26**, 255–260(PI)
- Typhlomolge rathbuni*, **24/25**, 61–62(PI)
- Tyto alba*, **23**, 19, 29, 72, 73, 100  
 breeding, reintroduction to wild, BOBARS, **23**, 88–95(PI)
- Tyto alba affinis*, **23**, 105
- Tyto alba alba*, **23**, 105
- Tyto alba guttata*, **23**, 72, 73, 105
- U**
- Uca*, **26**, 54
- Ungulates,  
 breeding in zoos, review, **24/25**, 77–99
- Unio*, **26**, 62
- Upupa epops*, **26**, 206
- Uranoscodon superciliosa*, **23**, 157
- Uria aalge*, **26**, 107, 134
- Uromastix aegyptius*, **23**, 46, 49
- Ursus arctos*, **24/25**, 317
- Ursus (Euarctos) americanus*,  
 fostering, interspecific, **22**, 262–263
- Ursus arctos middendorffi*, **24/25**, 317
- V**
- Valecia hispanica*, **24/25**, 69
- Vancouver Aqu,  
 Amazon Gallery, **26**, 81–90(PI)  
 breeding, Wolf-eels, **26**, 70–81(PI)  
 transport containers, Puffins, **23**, 207–209(PI)  
 Sea otters, **23**, 223–224(PI)
- Varanus dumerili*, **24/25**, 312
- Varanus gilleni*, **23**, 164
- Varanus komodoensis*, **23**, 169: **24/25**, 312, 315, 329
- Varanus salvator*, **23**, 169
- Venezuela, primates, status and conservation, **22**, 52–59
- Vidua regia*, **24/25**, 333, 337
- Vitamin E, levels in plasma, zoo animals, **24/25**, 316–321
- Volunteers, collection of behavioural data, **22**, 244–249
- Vombatus ursinus*, **24/25**, 317: **26**, 213
- Vulpes (Fennecus) zerda*, **24/25**, 287
- Vulpes macrotis*, **26**, 276
- Vulpes rueppellii*, **23**, 45
- Vulpes vulpes*, **23**, 45: **24/25**, 202
- Vulpes vulpes fulva*, **24/25**, 159
- Vultur gryphus*, **23**, 4, 46, 50, 104, 109: **24/25**, 4, 5, 6  
 breeding, hand-rearing, Berlin W, **23**, 14–16  
 London ZSL, **23**, 7–11  
 NY Bronx, **23**, 11–14
- Vulture, Bearded, see *Gypaetus barbatus*; Lappet-faced, see *Torgos tracheliotus*
- W**
- Walrus, Pacific, see *Odobenus rosmarus divergens*
- Walsrode,  
 breeding, Secretary bird, **23**, 64–66(PI)
- Washington, NZP,  
 behavioural data recording, **22**, 244–249  
 breeding history, Dorcas gazelle, **23**, 195–203  
 growth, development, Orang-utan twins, **22**, 256–261
- HERPlab, family learning centre, **24/25**, 340–343
- husbandry, breeding, Large hairy armadillo, **22**, 185–194(PI)
- Yellow-backed duiker, **22**, 232–240(PI)
- management, biology, Prehensile-tailed porcupine, **26**, 265–275(PI)
- management, White-tailed deer, Conservation & Research Center, **23**, 234–236
- one-way screen, viewing Rufous elephant-shrews, **23**, 218–219
- Water shrew, Eurasian, see *Neomys fodiens*
- Waterfowl,  
 breeding programmes, Wildfowl Trust, **24/25**, 21–25
- Wave cove exhibit, Hong Kong OP, **26**, 154–157(PI)
- Wave crash/intertidal exhibits, Monterey Bay Aquarium, **26**, 30–34
- Whipsnade,  
 activity cycles, White rhinoceros, **24/25**, 297–303
- Wolf-eel, see *Anarrhichthys ocellatus*
- Wolf, Maned, see *Chrysocyon brachyurus*
- Woolly monkey, Yellow-tailed, see *Lagothrix flavicauda*
- Wyulda*, **22**, 176
- X**
- Xanthichthys mento*, **26**, 23
- Xenophorus captivus*, **24/25**, 70
- Xiphophorus couchianus*, **24/25**, 70

*Xiphophorus gordonii*, **24/25**, 70  
*Xyrauchen texanus*, **24/25**, 71

## Z

*Zaedyus*, **22**, 193, 194

*Zaedyus pichiy*, **22**, 185, 186, 192

*Zaglossus bruijini*,

behaviour, Dallas, **23**, 209–215

hand-rearing, Mount Hagen, **22**, 250–252

*Zalophus californianus*, **22**, 227, 228, 231, 265: **26**,  
80, 148, 152, 154, 167

*Zalophus californianus californianus*,

hand-rearing, reintegration, NY Bronx, **24/25**,  
279–285(Pl)

Zebra, Grevy's see *Equus grevyi*

*Zebrasoma flavescens*, **26**, 23

*Zebrasoma veliferum*, **26**, 23

