THE ZOOLOGICAL SOCIETY OF LONDON

ANNUAL REPORT 1989 - 1990

This Report covers the period from 1 April 1989 to 31 March 1990. Animals in the Collection, however, will continue to be recorded on a calendar year basis.

The Society's three main areas of activity, the animal collections, The Institute of Zoology and the Learned Society, remain indivisible. Within this Annual Report, references to London Zoo and Whipsnade Wild Animal Park may therefore encompass activities which involve the resources both of the Society and of Zoo Operations Limited.

Published by

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THE ZOOLOGICAL SOCIETY OF LONDON

The Zoological Society of London was founded in 1826 by Sir Stamford Raffles, Sir Humphry Davy (President of the Royal Society) and other eminent naturalists. It was incorporated by Royal Charter in 1829 for the advancement of Zoology and Animal Physiology and the introduction of new and curious subjects of the Animal Kingdom. A new Charter was granted to the Society in 1963.

The Society was formed as a scientific society and this remains its prime purpose. Its aims are:

To increase zoological knowledge through research, applying the results to animal management, conservation and comparative medicine.

Throughout its existence members of the Society's staff, as well as many other eminent zoologists and visiting scientists, have studied material derived from the Collection and have made important contributions to knowledge in various fields of zoological science.

The Wellcome Institute of Comparative Physiology and the Nuffield Institute of Comparative Medicine were founded by the Society during the 1960's. These well-equipped laboratories, with the Veterinary Hospital and the Curators' research units, were joined in 1977 to form The Institute of Zoology. The wide range of research undertaken by the Institute is directed towards the conservation of rare and threatened species and the highest standards of animal husbandry and care.

To increase public knowledge and appreciation of animals.

The Society's Gardens in Regents Park – now universally known as London Zoo – were opened in 1828. A hundred years later the Society acquired Whipsnade Park, which was opened in 1931. The Park, an area of some 500 acres of farm and downland, is a splendid setting for animals that are able to roam in large paddocks. Whipsnade Wild Animal Park and the London Zoo are complementary and together house one of the finest and most comprehensive collections of wild animals in the world.

The Society's Education Department plays a vital part in the provision of knowledge to the public. There is an extensive programme for schools and many other courses and events are arranged at London Zoo and Whipsnade Wild Animal Park.

To encourage the spread of knowledge by arranging discussion meetings, by publishing the results of research and by maintaining a library.

Scientific Meetings, at which the results of new research are communicated and discussed, are held on eight occasions during the year. Symposia on special subjects of international interest are also arranged and generally occupy two days of contributions and discussions.

The Society's publications include:

The *Journal of Zoology*, which publishes research in all fields of zoology, and is issued in monthly parts.

The *Symposia* series of books, each of which contains the papers presented at a Symposium and thus covers a particular topic in depth.

The *International Zoo Yearbook*, a work of reference as well as an authoritative record of developments in the zoo world.

The *Zoological Record*, a comprehensive annual bibliography of zoological literature with subject and systematic indexes; the *Record* is published in conjunction with BIOSIS, Philadelphia.

The *Nomenclator Zoologicus*, published at intervals to provide bibliographical details for all generic and subgeneric names in zoology.

The Library was established soon after the Society's foundation and is now one of the major zoological libraries in the world. It provides a full library service to members of the Society and to its staff.

ILLUSTRATIONS

Cover: Moustached Lizard by Samuel Tickell (died 1875). From the Society's Library

Photographs: Michael Lyster

EDITORIAL: Marcia A. Edwards and Peter H. Denton

REPORT OF THE COUNCIL

The Council has pleasure in presenting its 161st Annual Report to the Annual General Meeting of the Society to be held on 25th September 1990 at 3.00 pm in the Society's Meeting Room at Regent's Park.

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PATRON: HER MAJESTY THE QUEEN

COUNCIL 1989–1990

President: Professor N A Mitchison, DPhil, FRS
Treasurer: The Rt Hon Lord Peyton of Yeovil
Secretary: Sir Barry Cross, CBE, MA, PhD, ScD, MRCVS, FIBiol, FRS
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Professor R J Berry, MA, PhD, DSc, FRSE, FIBiol, FLS, *Vice-President*
Professor B B Boycott, FIBiol, FRS
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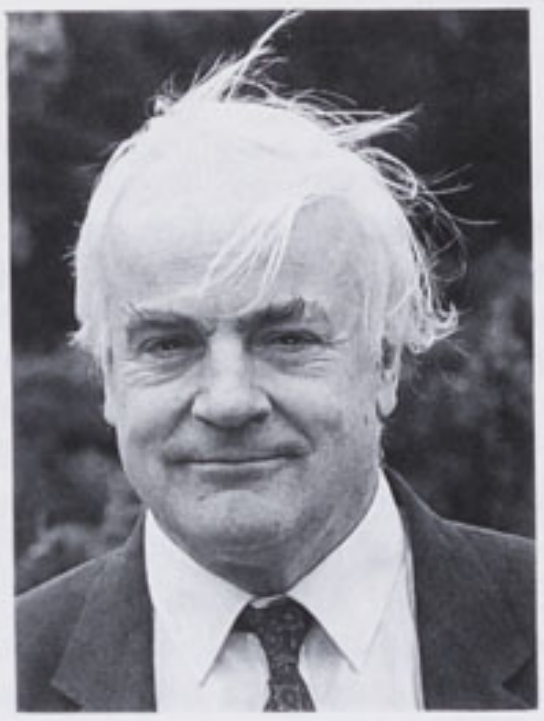
Professor R L Gardner, MA, PhD, FRS
Mrs Philippa Herbert, *Vice-President*
J M Knowles, *Vice-President*
Sir William McAlpine
C J S Marler
B C Owens, FLS
The Rt Hon Sir Geoffrey Pattie, MA, MP
A J Stevens, MA, BVSc, MRCVS, DipBact, *Vice-President*
Professor A J Zuckerman, MD, DSc, DipBact, FRCP

HONORARY FELLOWS

Date of Election

1977 HRH The Prince Philip, Duke of Edinburgh, KG, KT
1952 Professor Sven Otto Hörstadius
Zoologiska Institutionen, Uppsala, Sweden
1974 Dr Roger Tory Peterson
Route 4, Box 131, Neck Road, Old Lyme, Connecticut, USA
1975 Professor Jean Anthony
Muséum National d'Histoire Naturelle, 55 rue de Buffon, Paris 53, France
1975 Professor L D Brongersma
Rijksmuseum van Natuurlijke Historie, Leiden, Holland
1975 Professor Jean Dorst
Muséum National d'Histoire Naturelle (Mammifères et Oiseaux), 55 rue de Buffon, Paris 53, France
1978 Professor José Carvalho
Museu Nacional, Quinta da Boa Vista, Rio de Janeiro, Brazil 20940
1984 Professor George Evelyn Hutchinson
Dept of Biology, Osborn Memorial Laboratories, Yale University, POB 6666, New Haven, Connecticut, USA
1984 Professor Ernst Mayr
Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
1984 Professor Lord Zuckerman, OM, KCB, FRS
University of East Anglia, Earlham Hall, Norwich
1988 Professor Dr Milton Thiago de Mello
Instituto de Ciencias Biologicas, Universidad de Brasilia, Brasilia, Brazil DF70.910
1990 Professor Knut Schmidt-Nielsen,
Department of Zoology, Duke University, Durham, NC 27706, USA
1990 Professor John Z Young,
Emeritus Professor of Anatomy, University College London, Gower Street, London WC1

INTRODUCTION BY PROFESSOR AVRION MITCHISON, FRS, PRESIDENT



Avrion Mitchison, FRS

This year marks the end of a decade that has seen considerable advancement in the work of our Society. In a jointly agreed strategy for the future, the Society and Government identified certain priorities, the chief of which was the establishment of a wholly owned subsidiary company, Zoo Operations Limited, to operate both Zoos. The visitor orientated aspects of management were contracted out to the Grant Leisure Group which has been responsible for much of the new approach now evident.

Barclay Court now provides a focal point for the Regent's Park site and due to sustained staff efforts, standards of catering and shopping facilities continue to improve, while the cleanliness and general appearance of the Gardens attract much favourable comment. The Society's rôle in conservation and research is now more prominently and attractively displayed by means of a comprehensive programme of graphical interpretation.

For all this the Society is deeply indebted to many people: to the staff of curators, keepers, scientists, veterinarians, maintenance workers, gardeners, managers and administrators, to the volunteers, the members of Council and committees, and in particular to benefactors who have made possible many of the improvements in the two Zoos and in the scientific work.

Not all of this has been accomplished without much debate with Government, with our neighbours and among ourselves. Prominent amongst these discussions and of particular interest to the media, was the unfortunate misunderstanding of plans for the Regent's Park extension, referred to elsewhere in this Report. In these difficulties, the most reassuring feature has been the continuing and substantial public support for our varied activities evidenced by the visitors to both London Zoo and Whipsnade Wild Animal Park.

What can we hope for from the next decade? More stimulus to the intellect brought about by better presentation of the animals and of information about them. A visit will become something that expands the imagination whilst retaining the essential character of the zoos. Conservation and the ecology of animals and man will receive far greater priority and may well mean that increasing emphasis will be placed on Whipsnade. The study of genetics will become even more important as it brings a deeper scientific basis to our breeding programmes which will entail the need to broaden still further, the arrangements to share and exchange animals with other collections.

Under the leadership over the years of Len Goodwin, John Hearn and now of Tony Flint, our programme of research has achieved a new strength and unity of purpose. This places us in an excellent position to exploit the vast possibilities opened up by progress in molecular genetics, as is well illustrated by the remarkable discoveries, made this year by the Society's staff, concerning cytokines in early embryos, and proteins on the surface of spermatozoa. These have wide implications, not least as part of the world-wide response to the human population explosion. But their real importance, I believe, is as tokens of discoveries to come.

During this, the first year of my term of office, I have been impressed particularly with the determination and dedication shown by those responsible for the varying yet interlinked components of the Society; animal management and display, research, and the work of the learned Society through its publications, library and series of scientific meetings. To my fellow officers and to members of Council, I express my thanks for their unfailing advice and support.

Avrion Mitchison

PRESIDENT

REPORT BY THE RT HON LORD PEYTON OF YEOVIL

TREASURER OF THE ZOOLOGICAL SOCIETY OF LONDON, AND CHAIRMAN OF ZOO OPERATIONS LIMITED

The Rt Hon Lord Peyton of Yeovil

While much has been achieved since the Government's rescue of the Society in 1988, the loss for the year of £2,026,600 in 1989/90 was a deep disappointment. More particularly, the results, at both London Zoo and Whipsnade Wild Animal Park, of the first half year, April to September, which are our best months, were disturbing: income from operations at London Zoo at £5,075,000 was down by 3.4% on the previous year and by 16% on budget. At Whipsnade, income for the same period, at £1,646,000 though slightly up on the previous year, was 17% down on budget. Such results, if they were repeated, would bring back the shadow of closure over one or both of the Zoos. The fact that our reverses were in part due to a summer which was too hot, the effect of the Education Act on school parties and to rail and tube strikes, is neither here nor there. What they have brought home to us is that we remain exceedingly vulnerable to weather and other factors beyond our control. In the circumstances, it is a relief to be able to report that the results for the earlier months of this year are substantially better than the same months last year and marginally better than budget.

The Society's basic problems remain. First, while there is widespread public support for its aims and, I believe, some awareness of the progress which has been made, we lack the financial resources and muscle, which are required before any strategic plan, no matter how imaginative, can carry conviction. Secondly, Regent's Park for all its attractions is not an easy place in which to operate. Planning restrictions; as many as nine listed buildings in thirty-six acres; building costs at such a level in central London that it is hard to get value for money, even if we could raise it; little or no opportunity to expand; these things put a question mark over the wisdom of embarking on massive new projects in Regent's Park. Thirdly, for half the year at least there is no chance of viability; only San Diego with the benefit of a favourable climate round the year pays its way. Fourthly, there is little awareness, and this in some measure must be our fault, both of the importance and excellence of the scientific work carried out by the Society. The conservation of endangered species, so much talked about, demands knowledge and understanding of the problems involved. Were the Society and its unique knowledge base to be dissipated or lost, our understanding of the natural world would be diminished; so too would be our capacity to save what is endangered. If that is to be avoided, we are going to need the resources which will make possible intelligent and imaginative planning and without which we will not be able to continue to afford the good management, which we have in place today. I do urge all Fellows to have the Society's needs in mind and do whatever they can to ensure that they are widely known.

While I am concerned as to the ways and means of surmounting the problems which confront us, it would be exceedingly unjust if I were not to acknowledge the dedication of our staff, whose efforts in our struggle to survive are all important. I should also congratulate our management team on what they have achieved and even add a word of thanks to the non-executive members of the Board of Zoo Operations Limited for their support and help for which they receive no reward.

Peyton of Yeovil

TREASURER

REVIEW OF THE YEAR

Last year's report gave extensive coverage to the consultants' recommendations on the future of the Society and how Council, with the support of Government, was proposing to implement them.

The arrangement whereby the core funding for the Institute of Zoology would be paid through the University of London started on the 1 April 1989. The Institute's own committee was reconstituted to meet public accountability requirements: The University nominating four members, the Society three, with senior officers from both institutions ex-officio. The Society welcomes the closer bond with the University. The smooth operation of the first year's regime augurs well for the future and has justified the care and attention paid by all parties in drafting the financial memorandum. HRH The Princess Royal, as Chancellor of London University, visited the Institute Animal Hospital and Nuffield laboratories in October.

Zoo Operations Limited, established to introduce a more commercial approach to the management of both London Zoo and Whipsnade Wild Animal Park, experienced difficult trading conditions for most the year, as did most other tourist attractions. A combination of intermittent public transport strikes, extremely hot weather, and the adverse effects of the 1986 Education Act, all combined to reduce overall visitor numbers to 1,543,000. Some fifteen per cent below target. The single most important cause, however, was the economic situation with high interest rates reducing disposable, discretionary income. Nevertheless, and in anticipation of better things to come, considerable resources have been put into attacking the arrears of backlog maintenance and making the Zoos altogether better places to visit. A new fountain and piazza, made possible through a most generous donation from Mr David and Mr Frederick Barclay, was commissioned in September. To complement 'Barclay Court' a new retail shop was opened in the old Pavilion Building. The old shop has been converted into two separate units, a new First-Aid and Lost Children Centre, and a small (70-seater) film theatre where visitors can see an audio-visual presentation covering the history and conservation projects of the Society.

The quarantine area of the Sobell Pavilions was given an Australian theme in order to house two Koalas. Kookaburras and Wallabies were shown in adjacent enclosures. For the first time in the Zoo, a video camera was installed next to the Koala den to illustrate more fully the lifestyles of inhabitants. The Bird Incubation Centre, located within the listed Lubetkin North Gate Complex was opened, and the Sealion Pool was drained to allow essential maintenance work demanded by ever stricter Health & Safety stipulations.

In May 1989 Sir Gordon White, the Chairman of the Development Trust, announced to a large and enthusiastic press conference plans to launch an appeal, the proceeds of which will go towards financing a complete refurbishment of the Mappin Terraces and the Aquarium; a new ecological biosphere on the site of the Stork and Ostrich House, whose main inhabitants would be Gorillas, and a new Invertebrate House, located perhaps in the currently disused Parrot House. Associated with the above schemes, although only sketched out in the most general of terms, was a whole new Children's Zoo to be sited on three of the ten acres the Society would acquire as one of the results of the Government endowment of 1988. No one could have foreseen the hostility such expansionist plans would create amongst the Zoo's neighbours in Primrose Hill. Despite assurances that fears of a Disney-style attraction were wholly untrue, which in turn led to further speculation that the Zoo was to be opened late at night, every night, again a rumour totally without foundation, the media seized on the issue and, through their interest escalated an already delicate situation. A three-year moratorium on such boundary plans was self-imposed by the Society in December in order to allow a 'take stock' exercise, and show the public that their concerns and apprehensions were taken very seriously. An initiative utilising the Regent's Park canal involving a floating son-et-lumière, was similarly dropped.

HRH The Princess Royal with Drs Holt and Moore (left) during her visit to the Institute of Zoology

Meanwhile, at Whipsnade, the first four months of the year had been spent in intense and detailed discussion with a potential joint venture partner. However, when, at a joint meeting in August of the Council and the Board, a firm proposal was discussed, it was decided, unanimously, that the out and out commercial approach to running the Park which of necessity would have to be adopted by a partner in order to seek a commercial return on his investment, was incompatible with the Society's own objectives. An immediate consequence of this decision was that a programme of short-term improvements to the Park was instituted under the direct supervision of Zoo Operations executives. The Society remains hopeful of securing substantial investment in the Park in order to sustain progress made in the last eight months.

The changes which Council approved for the management of the Collections, income generation and research priorities have been fundamental and far reaching. But they all combine to achieve a common purpose: To equip the Society to meet the challenge of the future. We remain confident that with the continuing support of the Fellowship, the Government, and perhaps most of all, the staff, the Society will be able to take full advantage of the greater world-wide awareness of conservation issues.

View of Barclay Court

ANNUAL GENERAL MEETING

The Annual General Meeting was held on 27 September 1989 with the President, Sir William Henderson, in the Chair.

The President, Sir William Henderson, retired from office. In accordance with Article 10 of the Charter and Byelaw 25, the following Fellows retired as Ordinary Members of the Council: The Rt Hon Michael Heseltine and The Hon Sir Ronald Waterhouse (Ordinary Fellows); Mr D C Evered, Professor P A Jewell and Dr Anne L McLaren (Scientific Fellows). H G The Duke of Wellington (Ordinary Fellow) also retired from Council.

In accordance with Articles 11 and 12 of the Charter and Byelaw 26, Professor N A Mitchison was elected President and the following Fellows were elected Members of Council: Mr J Barrington-Johnson, Sir William McAlpine and The Rt Hon Sir Geoffrey Pattie (Ordinary Fellows); Professor R L Gardner, Professor P P G Bateson, Professor A J Zuckerman and Professor B B Boycott (Scientific Fellows).

The President presented the following awards for contributions to zoology:

The Prince Philip Prize (awarded for an account of practical work involving some aspect of animal biology, by a pupil under 19 years of age of a school in the United Kingdom) to *Mr Ian R Sheldon*, of The Ward Freman School, Buntingford, for his essay 'A study into the effects of different food types on the larvae of the Emperor moth (*Saturnia pavonia*)'.

The Thomas Henry Huxley Award (for original work submitted as a doctoral thesis) to *Dr Stephen J Torr*, Imperial College, University of London, for his thesis 'The host-orientated behaviour of tsetse flies (Diptera: Glossinidae)'.

The Stamford Raffles Award (awarded to an amateur zoologist for distinguished contributions to zoology) to *Mr W F H Ansell*, for distinguished contributions to knowledge of the taxonomy and distribution of African mammals.

The Scientific Medal (awarded to persons under 40 years of age for distinguished work in zoology) to *Dr D J Patterson*, Department of Zoology, University of Bristol, for his broad contributions to protozoology, in particular to knowledge of the evolution and systematics of the Protozoa; and to *Dr R M Sibly*, Department of Pure & Applied Zoology, University of Reading, for his applications of optimality theory to the study of both animal behaviour and life history strategies.

The Silver Medal (awarded for contributions to the understanding and appreciation of zoology) to *Dr Richard Dawkins*, Department of Zoology, University of Oxford, for his contribution to public understanding of evolutionary theory.

The President also announced the award of **The Zoological Society of London Frink Medal for British Zoologists** (for significant and original contributions by professional zoologists to the development of zoology in its wider implications) to *Professor A J Cain, FRS,* Department of Zoology, University of Liverpool, for contributions to the genetics of *Cepaea* and to the theory of evolution and taxonomy.

OBITUARIES

The Council records with deep regret the deaths of Mr Harold Coolidge and Dr Rudolph Bigalke, Corresponding Members; Sir Peter Scott, Life Fellow since 1915, artist, conservationist and former member of Council; Dr John Gordon Sheals, Scientific Fellow, former Keeper of Zoology at the British Museum (Natural History) and former member of the Zoological Record Committee; The Rt Hon Lord Rothschild, Scientific Fellow; Lord Richard Percy, Scientific Fellow; Mrs Wilma Crowther (née George), Scientific Fellow; Mrs Frances Van Brunt, Ordinary Fellow.

MEMBERSHIP

At the end of the subscription year (31 December 1989) there were 2,252 Fellows and 2,915 Associates, including 184 Student Associates.

Professor Knut Schmidt-Nielsen, J B Duke Professor of Physiology, Duke University, Durham, North Carolina, and Professor John Zachary Young, Emeritus Professor of Anatomy in the University of London, were elected Honorary Fellows.

STAFF

At 31 March 1990 there were 90 full-time staff employed by the Society and 329 by Zoo Operations Limited.

General

For employees of Zoo Operations Limited further progress was made towards the goal of single status conditions with pay increases, for the first time, being awarded on a company-wide basis rather than by reference to outside analogues for different groups. This latter arrangement, however, still remains in force for Society staff.

Considerable time and effort was given by a Joint Working Party to preparations for a job evaluated grading structure and for job appraisal and we are grateful to Mr Bernard Ashwell for his expert help in these endeavours.

Staff throughout the Society and the Company were kept informed of developments by means of monthly team briefings, personal copies of a management information sheet known as Zewsflash, by regular meetings of the Joint Consultative Committee and via departmental meetings.

Some additional staff were engaged in London to meet the demands of an increased activity programme. At Whipsnade a start to reorganisation and streamlining was accomplished by some voluntary redundancy and early retirement in animal and operational sections while the marketing and public relations function was strengthened.

Changes at senior level included the appointment in London as Acting Marketing Director of Miss Angela Horsman; of Mrs Yvonne Ubels as Retail Manager; of Mr T Miles as Gardens and Grounds Manager; at Whipsnade of Mr A Forbes as Chief Executive, Mr C Webster as Operations Manager, of Mr R Thomas as Marketing Manager and of Mr L Killorn as Food and Beverage Manager.

Awards

The completion of 25 years' continuous service was recognised by the presentation of gold watches or clocks to M Carman, R Charter, Miss P Ellis, Dr Christine Hawkey, A W James, G Nevill, B Nutkins, D Robinson, and F Smith.

In the examinations for the City and Guilds Certificate in Zoo Animal Management eight candidates were successful.

Departures and Retirements

Departures and retirements (years of service in brackets) included P Anscombe (40) Senior Keeper, London; J F Brown (30) Retail Manager; Mrs J Chapman (18) Payments Supervisor, Accounts; Mrs M Ellingham (17) Cashier/ Wages Clerk, Whipsnade; P Godin (18) Cashier, Accounts; D Gold (28) Gardener, London; C Mew (23) Senior Keeper, Whipsnade; C Smith (38) Gardener, Whipsnade; M Warner (44) Transport Foreman, Whipsnade.

Obituaries

We regret to record the deaths of the following pensioners: K Alliborne, A Cotterill, H Dean, L Flewin, Mrs E May, Miss R Pey, G Rose, and W Wicks.

ACKNOWLEDGEMENTS

Council expresses its thanks for the generous help and support received from so many organisations and individuals, and from those Fellows who give their time to serve on the advisory committees. The work of the Society is immeasurably aided thereby.

THE LONDON ZOO

Visitors during the year: 1,122,915

GENERAL

The long-term plans referred to in the last Annual Report have developed into more detailed proposals for the individual sites, and some of the necessary work is being costed at present. The second part of the Incubation Unit for birds, on the North Bank of the canal, is nearing completion; construction work on the new Eastern Aviary has begun, and a major grant from the Clore Foundation will enable the exhibition areas of the Clore Pavilion to be extensively renovated. Considerable resources were expended on improving the layout, landscaping and re-equipping of most of the aviaries during the year and a start has also been made on refurbishing many of the mammal exhibits of the Sobell Pavilions and New Lion Terraces.

The Development Trust has initiated a major fund-raising campaign details of which are given later in this Report.

THE COLLECTION

Mammals

'Chia Chia', the London Zoo Giant Panda, continues to flourish in his new home in Mexico City. In March 1989 he failed to mate successfully with the then seven-year-old female, 'Tohui'. In February 1990, there was considerably more sexual activity between them. Staff from the Institute of Zoology then went to Mexico, at very short notice, to inseminate artificially but the oestrus period (usually lasting only a few days) appeared to have finished. However, since 'Chia Chia' and 'Tohui' mated naturally on several occasions, it is hoped that a pregnancy may have resulted.

Koala at London Zoo

For the first time in many years, London Zoo has been home to Koalas. A pair of females from the San Diego Zoo were exhibited all through the summer of 1989, and they continue to do well. Koalas feed only from the tenderest tips of freshly-cut *Eucalyptus* shoots, and providing this browse for them has been a challenge, successfully met. The majority comes twice weekly from Devon (where it is grown commercially for the floral trade), and is an important factor in the successful husbandry of these animals. With the addition of a male in the near future, it is hoped that the animals will breed.

The female hand-reared Chimpanzee, 'Neusi', who for two years has delighted audiences at Meet the Animals sessions during the summer, has been sent to the Welsh Mountain Zoo in Colwyn Bay. Hand-reared animals can often present management problems in later life; 'Neusi' was brought up with two other young hand-reared Chimps, and has always seen, heard, and smelt the Chimpanzee colony at London Zoo. This may well have been the reason for her rapid and trouble-free integration into the Chimpanzee social group at the Welsh Mountain Zoo.

A group of Sulawesi Crested Macaques came from Hong Kong in August 1989, and were introduced into a completely renovated indoor and outdoor enclosure that had previously held the Pig-tailed Macaques. Over the next year or so, it is proposed to refurbish the indoor show dens in the Sobell Pavilions and to landscape the outdoor enclosures. Construction of an extensive wood and rope climbing frame for the Orangs' outdoor enclosure has been started, with the help of a group of Artificer Apprentices from HMS *Daedalus*.

London was the first zoo outside Australia to breed the recently-rediscovered and endangered small marsupial, Leadbeater's Possum, and the animals are housed in the Clore Pavilion. Breeding success has continued over the last twelve months, and individuals will soon be moved to other collections in Europe and to zoos in Australia. Extensive planning has continued for the complete refurbishment of the Clore Pavilion, following a generous gift of £1,000,000 from the Clore Foundation. Off-show breeding facilities, lacking at present, will be provided, and animals on exhibit will be grouped into themed areas, such as 'Characteristics of Small Mammals', 'British Mammals', 'Tamarin and Marmoset Conservation', 'What's Special about

Nocturnal Mammals?', 'Australian Small Mammals', 'The Tropical Forest at Night' and 'Rodents of the World'. The animal exhibits will be accompanied by state-of-the-art interpretive material, including video screens, inter-active devices, and high-quality graphics.

On the Cotton Terraces, there have been, as usual, notable births and arrivals. Baby Gaur, Hartmann's Mountain Zebra, and Giraffe all arrived during the year, and several breeding animals came and went as part of co-operative breeding schemes with other zoos, including Bongo transfers to and from Howletts Zoo Park.

On the New Lion Terraces, the Ocelots bred successfully, and the kitten has been sent on breeding loan as part of the co-operative breeding agreement for this species. Sadly, during the year, the male Sumatran Tiger, 'Jon', died. The female, 'Suzie', also died, but was non-reproductive as the result of blocked fallopian tubes. The staff of the Institute of Zoology are developing techniques of embryo transfer for this rare sub-species of Tiger, and, with fresh stock, it is intended to continue to concentrate on this subspecies, in co-operation with other zoos in the UK and Europe.

At Christmas, the Children's Zoo staff played an important part in the special promotion involving animals from the Christmas story. Meet the Animals sessions over Christmas featured Sheep, Goats, a Donkey, and a Reindeer in a specially-made red and green bell-bedecked harness, pulling a sleigh.

In the Elephant House, 'Rosie', the Black Rhino, continues to flourish, and male Black Rhinos were recently exchanged with Port Lympne Zoo Park in an attempt to stimulate breeding in two previously non-breeding males. The four young female Asian Elephants continue to delight the visitors by walking round the Zoo, giving logging demonstrations, and having their afternoon bath and 'weighing-in' sessions.

Birds

One of the most unexpected events of the year was the hatching and rearing of a Spectacled Owl, a species which last bred in this collection in 1971. The parents were thought to be an almost incompatible pair, barely tolerating each other. The female was exceptionally tame when she arrived here in 1981, after her owner who had kept her as a pet, died. At first she considered any other owl as something to be avoided, much preferring the company of people. Gradually by careful management she was introduced to her prospective mate, and over many months she became more tolerant. Eventually they could be left together in the same aviary, though they were rarely seen on the same perch. The advent of an egg and then chick was therefore a surprise. Sadly, a few days after the chick hatched the male died. Fortunately the female proved to be a most conscientious parent and successfully reared her offspring.

Owls have for many years been one of the most successful breeding groups in the collection, and 1989 was no exception. Seven species bred, including Barn, White-faced Scops, Great Horned Eagle, Turkmenian Eagle, Kenyan Eagle, Boobook, and the Spectacled Owl already mentioned. The White-faced Scops Owl reared two clutches of four and two chicks, bringing their total to 24 chicks reared since they first bred in 1986.

Other species of note successfully reared by parents included: Cattle Egrets (three individuals introduced to the small colony in

Sulawesi Crested Macaque and young

Leadbeater's Possum, bred in the Clore Pavilion

the Snowdon Aviary subsequently helped form three new pairs which produced six young); a Demoiselle Crane; Abdim's Storks, whose enclosure was enlarged and more nestboxes were provided; a Rock Peplar.

The new Incubation and Rearing Unit on the North Bank came into use in April and though there were some minor problems, mainly associated with the use of new equipment and inexperienced staff, the season's results were encouraging. Species which were artificially incubated and/or hand-reared included Crowned Crane, Abdim's Stork, Stone Curlew, Kookaburra, White-cheeked Turaco, Vulturine Guineafowl, and many pheasants, including the rare Congo Peafowl.

Building began on new outdoor rearing pens adjacent to the Incubation and Rearing Unit, and these will provide holding areas for the final stage of rearing when chicks have fledged and can be kept outside.

A number of Black-footed Penguins were hand-reared and were on view in the Penguin Nursery which was opened in 1988. The excellent viewing facilities and graphics have proved to be extremely popular with the public. In the late spring when there were no Black-footed Penguin eggs, two Humboldt's Penguin chicks were brought down from Whipsnade to be hand-reared in the nursery. Once they were reared they were returned to the thriving colony at Whipsnade.

Because of the continued breeding success, the number of penguins in the Lubetkin Penguin Pool has risen over the last few years. A new colony has therefore been established in the small pool next to the Nursery.

Over 80 birds were brought into the collection, mainly as potential mates for individuals already here. The majority were captive-bred, were in exchange, on breeding loan or were presented. Those species of special interest included: African Spoonbill, Crested Guan, Black Francolin, Satyr Tragopan, Koklass Pheasant, Bornean Crested Fireback, White Eared Pheasant, Elliot's Pheasant, Hume's Bar-tailed Pheasant, Palawan Peacock Pheasant, Lapwing, Night Heron, Pintailed and Double-banded Sandgrouse, Barraband Parrakeet, Golden-headed Quetzal, Yellow-billed Hornbill, Saffron Toucanet, Short-eared Owl, and a number of passerines, mainly finches.

A pair of captive-bred Burrowing Owls were presented, and are on view in a relandscaped, arid, semi-desert aviary on the North Bank.

Two pairs of Rodrigues Fody were received on breeding loan from Jersey Wildlife Preservation Trust. These insectivorous, weaver-like birds, endemic to the island of Rodrigues in the Indian Ocean, remain the property of the Mauritius government. There are estimated to be less than 200 left in the wild, and these are considered to be ex-

Young Spectacled Owl

tremely vulnerable to the effects of cyclones, habitat destruction and drought. The aim of the cooperative management project is to establish a self-sustaining captive population, with the possibility of future re-introduction to another island.

Work began on restoring and refurbishing the Eastern Aviary, which has been a prominent feature of the Zoo since it was completed in 1864. This aviary is the last construction left in the Zoo which Anthony Salvin, junior, designed. He was the official architect of the Zoo from 1860 until 1880, and was responsible for a number of important buildings mostly neo-classical or gothic revival in style: the Monkey House 1864–1920, the Elephant House 1868–1938, the Lion House 1876–1975. The restoration will keep the essential character and style of Salvin's building, but will incorporate modern techniques to bring the aviaries up to present-day standards. The general theme will be birds of Africa, with an emphasis on birds of prey, all in suitably landscaped areas.

A Bird Department Open Evening took place on 17 August and provided a chance for visitors to see and hear of some of our wide-ranging activities.

Reptiles

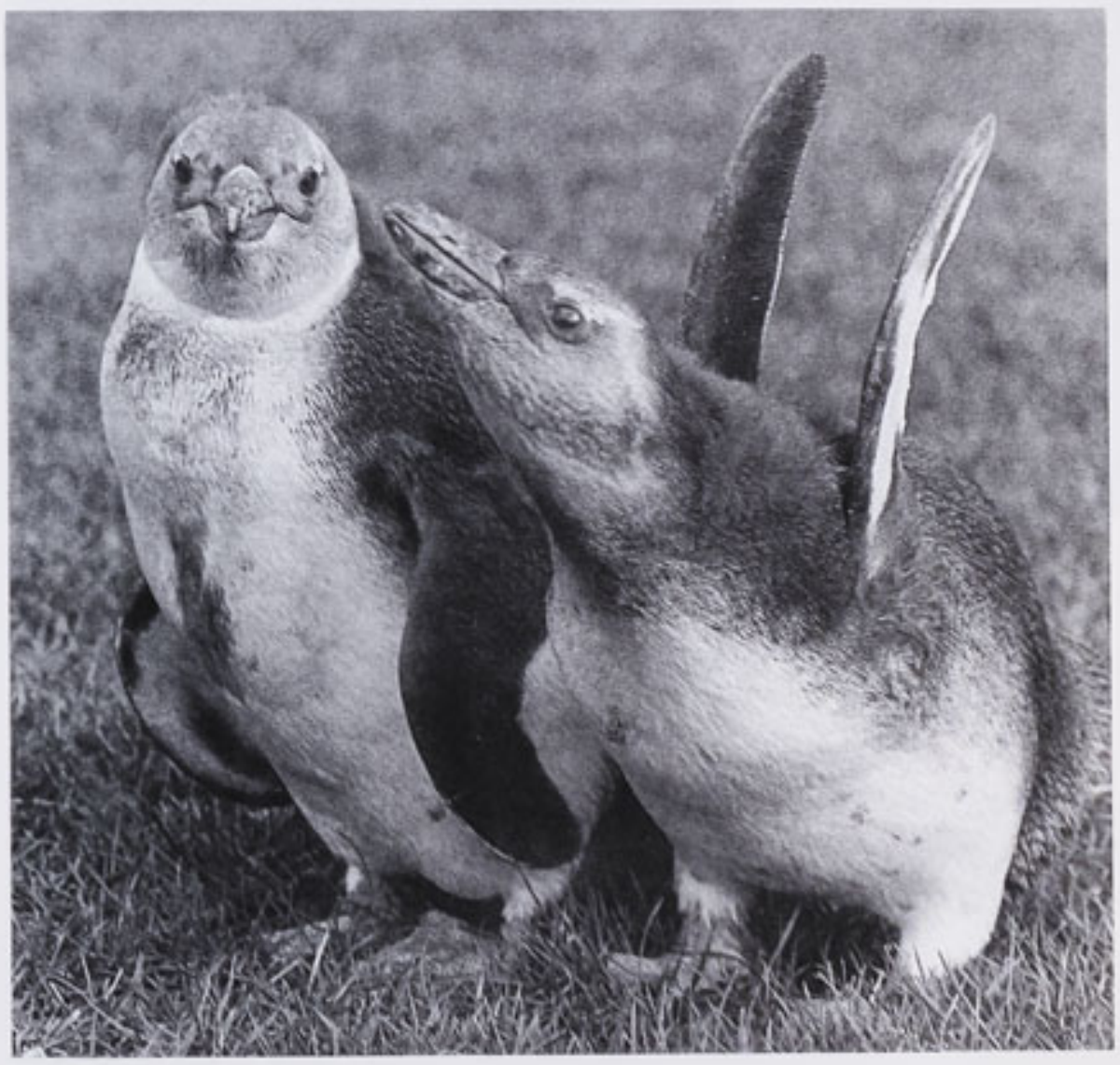
During 1989, 16 species and 131 individuals were successfully bred. Three species bred for the first time at London Zoo were the Inland Bearded Dragon, the Mangrove Pit Viper (the first breeding record in the UK), and two Gila Monsters which hatched after 130 and 136 days in the incubator. The eggs were incubated in vermiculite using four parts to one part of water by weight and the temperature was maintained between 28° and 30°C. The long incubation period required strict monitoring of the condition of the eggs and fine adjustments had to be made to the temperature, moisture and ventilation. The young are doing well and are now on exhibition, the first time this species has been reared in the UK, since although an egg was hatched here three years ago, the offspring only survived for 10 days.

Notable acquisitions included a Sungazer Lizard and a Mono-cellate Cobra to augment existing breeding groups.

A number of reptiles were obtained for the themed exhibits and include two Pancake Tortoises. These remarkable animals have a very flattened and rather pliable shell when compared with other more typical species. As a defensive measure, this tortoise is able to clamber between rocks and then wedge itself by inflating its lungs, which prevents predators from dislodging it.

Other additions include two Western Hog-nosed Snakes, which are able to sham death by turning themselves on to their backs. Two Black Mambas, two Green Mambas and two Boomslangs were received from the National Museum of Kenya. These snakes had been on order for more than a year and are key specimens in the Venomous Snakes Exhibit.

Four Coral Snakes were presented by the Bronx Zoo, New York. These strikingly-patterned, venomous snakes are exhibited next to harmless King Snakes which, with their similar colouration, provide an example of a harmless snake mimicking a venomous one in order to keep predators at bay. During the Reptile Handling event in the summer, the two snakes will be exhibited in a secure perspex tank enabling visitors to take a closer look at these handsome animals.



Black-footed Penguin chicks, hand-reared in the Penguin Nursery

For some time the Asian Saw-scaled Viper and the Malaysia Pit Viper have been bred here to obtain venom for research purposes. Two East African and two West African Saw-scaled Vipers have been received recently and will be bred for the same purpose. Snakebite is a major health hazard in

Burrowing Owl

many parts of the world and the Saw-scaled Viper probably causes more deaths and disabling injuries than any other snake, with the possible exception of the Indian Cobra. The venom is used in medical research aimed at counteracting the effects of snakebite.

Peking Zoo is holding a male and two female Chinese Alligators for the Society but it has now been agreed that these animals should be sent to the Bronx Zoo where there is a breeding programme for this species. In return, the Bronx will send four captive-bred juveniles to London Zoo.

This year more than one third of our acquisitions have come from HM Customs & Excise seizures. Because of the increase in smuggling reptiles, it has been decided to mount an exhibit on the subject, augmented by graphics and photographs, showing some of the animals detained by HM Customs.

The staff are continuing to refurbish many exhibits and are assisting the Design and Information Unit with the preparation of new themed graphic information. This has meant that many of the reptiles have had to be moved to other enclosures to match the graphic themes.

The new Reptile Encounter area provides an exciting experience for visitors. In addition to the 'Touch Table' where they can handle hides and skulls supervised by the Volunteers, there will be a 'Zoo Lab' section with museum specimens, models and graphics, where children can discover interesting facts about reptiles. In display cabinets around the wall a variety of subjects will be dealt with, such as Conservation, Snakebite, Handling, Feeding and one on 'Why reptiles do not make good pets!'

New off-show cages have been acquired and another animal room made ready to accommodate the additional reptiles required for Reptile Encounters and demonstrations.

The First World Congress on Herpetology was held last September at the University of Kent. The Congress President was Professor Angus d'A Bellairs, the Society's Honorary Herpetologist, and delegates came from all over the world. Many of them visited the Reptile House, and as a result, a number of animal exchanges and breeding loans are planned with foreign zoos.

Aquarium and Insect House

The development of plans for the renovation of the Aquarium and the new Invertebrate Exhibition has involved staff at all levels from both houses. A number of displays in the existing Aquarium and Insect House have been improved to illustrate the types of exhibits which it is now possible to create. In the Aquarium the coral reef exhibit and the extensively renovated Piranha pool have attracted a great deal of attention. In the Insect House the new Caribbean Jellyfish, improved Cave Cricket and Cockroach exhibits and the small walk-through tropical forest area have had a similar effect. A number of the small amphibian tanks in the Aquarium have been replaced with larger vivaria, and more reliable temperature control systems installed.

Breeding successes include the tropical marine Anemone Fish, Spotted Dogfish, Medicinal Leeches, and Mexican Red-kneed Spiders, the latter producing several hundred

Gila Monster, just hatched in the incubator

spiderlings, some of which have now been placed with other collections.

Throughout the summer the Animal Encounters in both houses, and the public feeding sessions of the Piranha and the Sharks in the Aquarium, have proved popular. Various exhibits in both houses, as well as stock and staff, have featured in numerous television programmes and film productions, with a gratifying increase in the use of the Aquarium and Insect House for late-night catering functions and parties, all of which bring in additional income.

Co-operation with universities and some higher education colleges has facilitated several projects, including a study of nitrification in the main filter system of the Seawater Hall of the Aquarium, and the rearing of live food for Coral Fish fry. Exchange of information with the British Museum (Natural History) on various invertebrates has also been particularly useful, especially with regard to Robber Crabs and freshwater Crayfish.

Staff in both houses have participated at many meetings including an international symposium in Holland on the captive maintenance of insects; a Royal Entomological Society symposium on insect conservation, and an International Limnological Society symposium on the management of the African great lakes. Discussions on the ornamental fish trade and the captive breeding of the Moorean Tree Snails were held at Regent's Park. 'Aquarium Day' and the Insect House 'Open Night' were both very well attended. Following a request from the British Council, advice was provided to the Government of Bahrain on the establishment of a National Aquarium as part of the new museum complex there.

Mexican Red-kneed Spider hatchlings

OPERATIONS DEPARTMENT

The Operations Department at London Zoo encompasses a series of disciplines that are not directly related to either the Animal, Marketing or Finance departments, but they are fundamental to the visitors' perception of 'a good day out'. Retail, Visitor Operations, Food Service, Works, Purchase and Transport, Grounds and Visitor Activity Programmes all fall within this category.

Pancake Tortoise

Although considerable preparatory work was undertaken in 1988/89 to form these individual departments into a cohesive team, the true benefit was really noticed in 1989/90. In January 1990, the Information and Design Unit joined the Operations Department.

Zoo Hospitality

Food service at London Zoo was operated by Compass Services (UK) under the title 'Zoo Restaurants Limited', but after the formation of Zoo Operations Limited, it was decided that a unified identity for the food service was required. Compass Services continue to operate all facilities, but the title 'Zoo Hospitality' was created to give a better sense of corporate involvement. The Garden Café has become The Pizza and Potato Shop; the South Gate Kiosk is now The Hamburger Café, and the Sealion Kiosk has become The Sealion Bakery. These units offer a varied range of products for visitors' enjoyment, which has

been reflected in revenue received, and also in the appreciative response.

The Tavern Room within the Regency building has been transformed into the Raffles Restaurant and a section of seating between the Coffee Shop and Raffles was completely refurbished to create an attractive bar. This project was made possible through the financial assistance of Messrs Charringtons, the brewers, for which we are most grateful.

Zoo Hospitality has generated turnover of £2,143,800, producing a surplus of which half (£211,800) accrues to the Society.

Zoo Retail
Zoo Enterprises Limited has now become Zoo Retail and remains within the framework of Zoo Operations Limited.

in the Camel House; it was open during the high season, and it is hoped to continue this in future years.

Zoo Retail has generated turnover of £1,232,800, producing a surplus of £265,800. To this must be added valuable sponsorship of £20,000 from Kodak Limited.

Visitor Operations
Previously known as the Public Services Department, Visitor Operations is responsible for all visitor services including first aid, security, ticketing, cleaning services and special event management. It is also responsible for Health and Safety matters within the zoo, which, with the introduction of new regulations, are becoming more demanding. The department has now taken over the operation

Piranha Fish

The Pavilion Building, previously used as an occasional bar, was converted into a new shop providing extra space for better quality merchandise, and additional warehousing facilities. The shop faces onto Barclay Court, and has proved very popular with visitors, who have commented favourably on the improved range of goods for sale. The Penguin Café building was altered to house a small Discovery Centre and another new shop.

A successful venture, operated on a trial basis, was a video camera hire shop, located of the Gloucester Slips car park, and this has provided income of £140,400. 50,868 cars and 2,457 coaches have used this valuable facility during the year. Far greater emphasis has been placed on the cleanliness of the Zoo, with the introduction of new vehicles and extra rubbish processing facilities.

Activity Programme
1989 saw the implementation of a co-ordinated activity programme for visitors at London Zoo. A series of events was presented

where Keepers introduce the animals for which they are responsible, imparting information and answering questions. These events were linked to the Meet the Animals sessions, Animal Encounters, and to the already successful Riding and Feeding schedules. Additional activities were also provided to coincide with school half-term holidays during the winter, and over Christmas. 1990 is the Chinese Year of the Horse and the King's Troop Royal Horse Artillery kindly loaned 'Wanda' to mark the occasion. This delightful and calm horse, more used to pulling gun carriages on ceremonial occasions, has become a firm favourite with visitors and staff alike.

Grounds

Considerable work has taken place in and around the Zoo. Several borders on the perimeter have been completely replanted improving the external appearance, and a number of areas within the grounds have been landscaped in accordance with an overall policy. A new large flower and plant bed by the main entrance, planted with exotic species, makes the reception area far more inviting and softens the appearance of what had been a large expanse of tarmac. The sunken garden in the Sobell Pavilions, and other areas within that complex have been replanted. With the transfer to the Society of the Gloucester Slips car park, the department also took on responsibility for management of the adjoining grassed areas. These have been well maintained in accordance with the improving standards of horticulture within the Zoo.

Information and Design Unit

Implementing the corporate identity throughout the full range of the Society's stationery and signage has been a major task for the year. All public information signs have been replaced in the approved colour and typeface, and four banners have been erected at the Main Gate. A new system of directional signs was introduced which provides visitors with a recommended route around the Zoo taking them past all the major exhibits. In addition the scheme provides the larger sections with entrance features where details of breeding successes and other important events can be announced. It also incorporates timetables, maps and acknowledgements of major benefactors. As part of the same programme badges have been designed and manufactured for all uniformed staff.

Work for the Development Trust included preparing a large exhibition of the development proposals, highlights from which are now permanently displayed around the Zoo. The Unit also designed the appeals brochure.

A scheme to provide the Zoo with a complete system of animal information panels has been prepared. This allows the flexibility for changing panels when individual animals change or for adding 'Lifewatch' details about the conservation and research work of the Zoo. Materials and techniques have been chosen to permit the use of attractive, coloured panels in exposed, outside locations.

New exhibit work has included the Bird Incubation and Rearing Centre, where backlit panels were used more extensively than before, and the Koala and Sulawesi Crested Macaque exhibits. The last two have also involved the painting of the inside enclosures to represent more natural settings for the animals. A short video presentation was shown with the Koalas and others have been prepared for the Piranhas and reptiles.

The Unit has also produced material to support the work of Lifewatch and for the Education Department. It is anticipated that during the coming year the Unit will be concentrating upon implementing the new scheme for information graphics and on preparing a number of educational and interactive centres.

BUILDING AND SERVICES

The successful tidying up operation continued throughout the 1989/1990 Season. The repainting programme was maintained; major areas included two of the enclosures in the Sobell Pavilions, the west side of the Parrot House (facing Barclay Court) and the Amphitheatre. One of the larger maintenance items was the underpinning of the east wall of the Garage, which had been badly damaged by tree roots.

Several new projects were completed or started during the season. These included the completion of the new Zoo Shop on the ground floor of the Pavilion Building, together with the refurbishment of the Catering Stores in the basement, the installation of new lavatories on the Canteen floor, and the construction of Barclay Court, which links the various catering and retail facilities, and provides a new focal point. Other works completed were the new rearing pens attached to the Bird Incubation Unit, the work around the Main Gate Area, including the conversion of the West Tower, the refurbishment of the Staff Lodge and the east wing of the Reptile House, the work in connection with the various catering kiosks, and the conversion of the Old Zoo Shop into the Lifewatch Centre and First Aid Unit.

The Works Department successfully prepared two temporary exhibits to house the Koalas, the second of which, in the old Ape Breeding Colony, remains open to the public. New work to be completed in 1990 includes the total refurbishment of the Eastern Aviary which is being transformed into an African Birds Exhibit, with a natural, landscaped background.

Concepts and priorities in the development plan, 'The Way Ahead', are being reviewed and will, where necessary, be revised to reflect the current situation.

WHIPSNADE WILD ANIMAL PARK

Visitors during the year: 372,330
Cars brought into the Park: 52,950

GENERAL

The year has been one of transition for Whipsnade Wild Animal Park. 'The Way Ahead' published in 1988 by Zoo Operations Limited, on behalf of the Society, advocated a radical option of a joint venture partner as the best means of reducing the financial drain on the Society due to the operating costs of the Park. After prolonged and detailed negotiations with potential partners, the idea was abandoned. It was decided to retain management control of Whipsnade, and develop its identity as a separate facility within the framework of Zoo Operations Limited, the aim being to increase attendances whilst maintaining its reputation as one of the world's leading zoological collections and conservation centres.

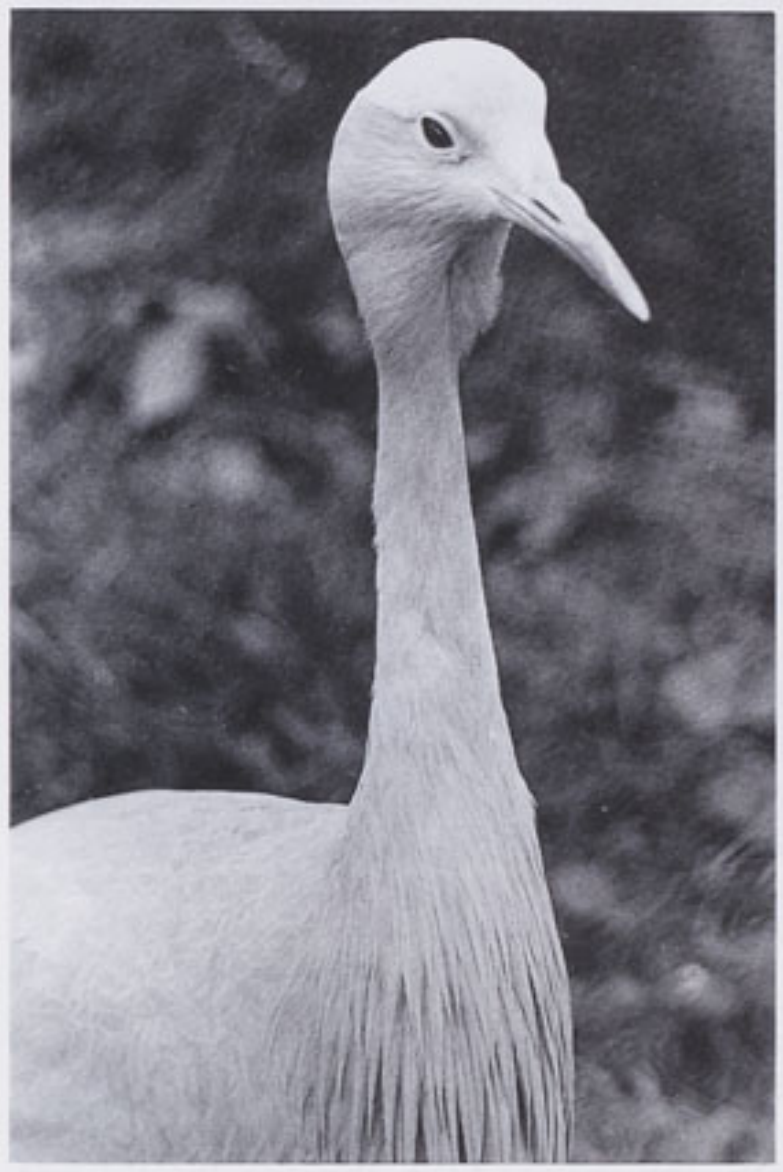
Discussions with regard to the long term funding of Whipsnade continue, but steps have already been taken to restructure the management team. New personnel have been recruited to the Administration, Operations and Marketing Departments, and Messrs Allied Lyons, who have operated the catering franchise at Whipsnade for almost three years, agreed to terminate the contract prematurely, on terms advantageous to the Society.

Extensive market research revealed both a low public awareness of the Park and a lack of incentive to visit. Marketing strategy now aims to increase visitor numbers by providing new attractions.

New facilities are planned and will be introduced in time for the summer season. These include the 'Run Wild Play Centre' for children, a traditional farmyard largely to replace the existing Children's Zoo, and the Lifewatch Centre promoting the conservation work of the Society. The wood near the main gate, which has been maintained as a private bird sanctuary for some years, has been opened to visitors, and pathways and sitting areas included in it. Two amphitheatres are being constructed to give visitors a better view of the Birds of Prey display, and also for them to see the training sessions being carried out with the young Burmese Elephants.

An activity programme, similar to that organised at London, was introduced and proved to be very popular with visitors. Opportunities to talk to the Keepers and to get closer to some of the animals were provided by the regular 'Animal Encounters' and 'Meet the Animals' events.

Advertising concentrated on Central Television, local radio, new promotional literature, appearances at exhibitions within the area and other public relations activities.



One of the three Stanley Cranes bred at Whipsnade

In-ground parking facilities have been greatly increased and improved and the principal access routes have been extensively signed within a 20 mile radius of the Park.

Dwarf Mongoose

A young Yak sent with other animals to Kirghiz refugees in Turkey

THE COLLECTION

Significant changes were initiated in the animal collection and staffing at Whipsnade this year. The species kept, their enclosures and the organization of the Animal Department were reviewed. Where possible old, inappropriate exhibits were removed and alternative and more flexible systems of management for the main hoofstock groups were implemented. This involved the creation of larger paddocks and a greater degree of mixing of different compatible species, which further enhanced the degree of freedom and space which is so essential for welfare, and encourages the correct perception of the animals by visitors. The zoo geographic regions of Asia, Africa, Europe and the core area are becoming better defined. All animal encounter activities are now co-ordinated to provide a more enjoyable means for the visitors to learn about the animals and conservation at Whipsnade.

The old multi-sectional arrangement of staff was changed to form three teams of Keepers each headed by a Regional Overseer. A greater dependence on mechanisation enabled more flexible and efficient work practices to be introduced.

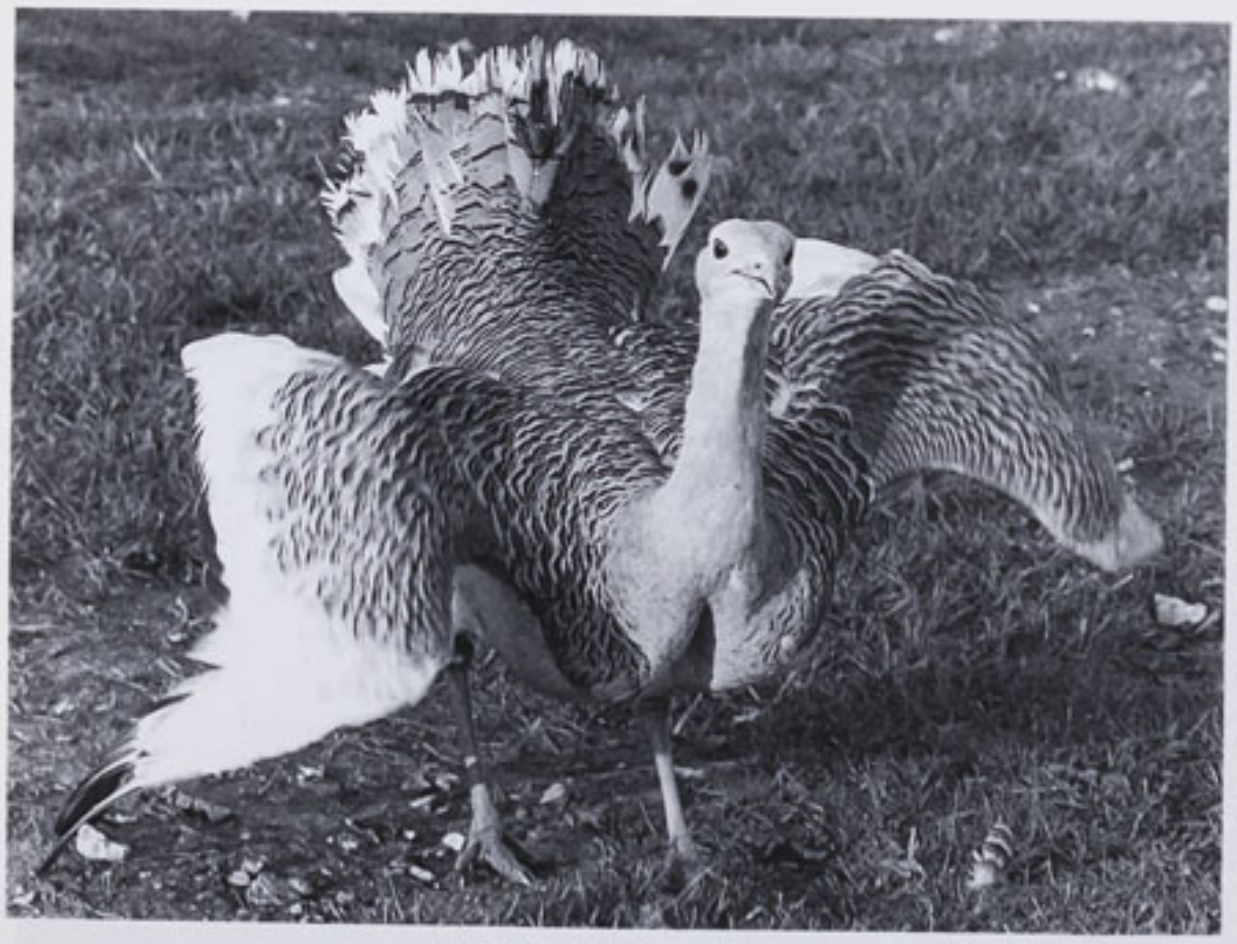
A number of new animals were introduced to the Collection including Dwarf Mongooses, Bongo, Kudu, Reticulated Giraffe and three Burmese Elephants. The Society's herd of Blackbuck was transferred from London and this greatly enhances the Asian region's stock. For the Bird Collection two new species of Owl (Ural and Scops) were introduced and the precious collection of Great Bustards, owned by the Great Bustard Trust, was moved from Porton Down to Whipsnade in order to take advantage of a more scientific approach to their conservation and breeding programme.

Amongst the more notable births were Cheetah, after a lapse of over 12 months, another Indian Rhino and a trio of Stanley Cranes, the first for over 20 years.

Amongst departures the Society was pleased to participate in a scheme whereby some Yaks were sent to re-establish a herd for a tribe of Kirghiz refugees in Turkey, who had fled from Northern Afghanistan. These people had lost their herd during their flight and had appealed for help. The Yak had been at the core of their social and cultural activities for centuries. An Arabian Oryx was sent to the Saudi Arabia research centre which the Society runs, to support the reintroduction projects for the species. As part of our joint management of the species, two Przewalski's Horses were sent to Oberwil in Switzerland together with others from Chester.

Unfortunately, during the year a number of valuable Psittacines were stolen including Scarlet Macaws, a Leadbeater's Cockatoo and a large number of Roseate Cockatoos. This highlights the detrimental effect that the high prices in the trade (legal or illegal) in these species is having on their conservation whether in the wild or captivity.

To reduce the deleterious effects of inbreeding in a number of animal groups at Whipsnade, new males were brought in for Scimitar-horned Oryx, Reindeer, Nilgai, European Bison and Gemsbok herds.



Great Bustard, one of several owned by The Great Bustard Trust

THE DEVELOPMENT TRUST

A fund raising dinner was held in April 1989. In late January 1990, a new brochure describing some of the new major projects at London Zoo was produced. Projects include the redevelopment and landscaping of the Mappin Terraces, the refurbishment of the Aquarium and the Invertebrate House to use modern technology to exciting advantage, and the creation of a new Conservation and Breeding Centre in Whipsnade Wild Animal Park. Thanks to support in terms of advertising from many of those who serve the Society professionally (Sir Robert McAlpine & Co, contractors, the Bonnington Partnership, architects, Gardiner and Theobald, quantity surveyors, The Royal Bank of Scotland, and Esso), a 'Times Special Report' on the Society and its work and needs appeared on 7 May.

The Trustees have opened and are opening many doors. In the past year donations of over £1.4 million have been promised, the greater part from The Clore Foundation, for further development of the Clore Pavilion for Small Mammals. The Trust is now beginning a period of great activity: we hope it will produce dividends.

Lady Park of Monmouth joined the Trust as part time Director in November 1989 after an interregnum when the Trust was fortunate to have the Hon Rupert Fairfax, on secondment from Hanson PLC, to fill the breach as Acting Director. Miss Sita White joined the staff in June as research Officer. With great regret the Trust accepted the resignation of Mr Patrick Sheehy, a generous donor. Mr Robert Reid, Chairman of the British Railways Board and former Chairman of Shell UK, who also raised some generous benefactions from the oil companies, stepped down as a Trustee in accordance with the original terms of the Trust Deed, but is returning in October. Two new Trustees, Mrs Sylvia Leigh and Mrs Shirley Young have joined the Trust.

FINANCE

The Society's consolidated operating deficit for the year is £5.0 million compared with the operating deficit for the previous year of £2.2 million.

A Government Grant for the year totalled £1.3 million, being the annual revenue grant towards the costs of the Institute of Zoology.

After accounting for investment income, exceptional and extraordinary items, the excess of expenditure over income is £1.15 million. Transactions relating to individual funds are transferred to the appropriate fund, leaving a deficit on the General Fund only of £0.5 million. The General Fund balance brought forward at 31 March 1989 of £1.0 million has been decreased to £0.5 million.

The total number of visitors to both Zoos is down by 18.5% over the corresponding year, of which approximately 3.3% is due to the absence of an Easter weekend in the 1989/90 year. Nevertheless, the fall was not as much as that experienced by other London attractions. Both Zoos were affected by the present tighter economic climate and by the effects on school visits of the Education Act, whilst London felt the impact of the public transport strikes. With high fixed costs at both Zoos, a fall in the number of visitors has a major effect on the operating deficit.

DONATIONS, GRANTS AND GIFTS

Council wishes to express its thanks to all those who contributed to the general funds of the Society and its subsidiary, Zoo Operations Limited. South Bedfordshire District Council again allowed 50% discretionary relief of rates for the year in the sum of £31,068. Dunstable Town Council gave a further welcome donation of £3,300 and the Kweller Charitable Trust another £500.

Gold Fields Trust generously donated £25,000 making £45,000 in all towards the work of the rare birds incubation unit.

Legacies were received from the executors of the late Miss Maria Clayton for £4,512.99 and from the executors of the late Mrs Mary Patchett, £2,500 for the use of the Bird department.

A grant of £1,315,000 was received from the University of London under funding arrangements for the Institute of Zoology which were set up last year and a further £793,000 was received or receivable from various research bodies to support specific projects carried out by the Institute.

MARKETING

LONDON ZOO

The Public Affairs Office, formerly the Public Relations Department, continued to gain wide media coverage for the Society. The press highlighted various animal breeding exchange arrangements involving among them the Giant Panda 'Chia-Chia', cockatoos, parrots and rhinos. 'Rosie' Rhino continued to be popular in the media and celebrated her first birthday at a well supported photocall.

Animal births, always newsworthy, included Giraffes named after sporting stars Gary Lineker and Annabel Croft. Penguin chicks proved particularly attractive to TV and a competition on TV-AM to name two chicks resulted in three television pieces. These programmes also promoted the Adopt an Animal scheme, as did an item on ITV's 'This Morning' which produced a flood of Christmas adoptions. A joint promotion with Harrods for the adoption scheme gave excellent publicity and brought in an extra £5,000 as well as many visitors to the Zoo. Celebrity adopters in 1989 included Anthony Hopkins (Penguin), Lady Gabriella (Senegal Bushbaby) and Lord Frederick Windsor (Douroucouli), Rolf Harris (Koala) and Australian Dried Fruits (Koala).

'Lifewatch', the new membership scheme for London and Whipsnade, was launched to the press and public on 5 December 1989. It replaces the Friends of the Zoo scheme, and offers participation in, and information on, Society activities, to a wider membership. The scheme has different levels of membership with varying benefits, plus two categories for younger members – Junior and Senior Explorers. In February we were delighted to welcome HRH Prince William of Wales, HRH Prince Henry of Wales and Master Peter and Miss Zara Phillips as Honorary Explorers.

A new magazine 'Lifewatch' has replaced 'Zoo News' and concentrates on wildlife conservation and research issues. Stories from the magazine picked up by the media have included a programme for breeding Dormice and a major initiative on the satellite tracking of Elephants in Kenya.

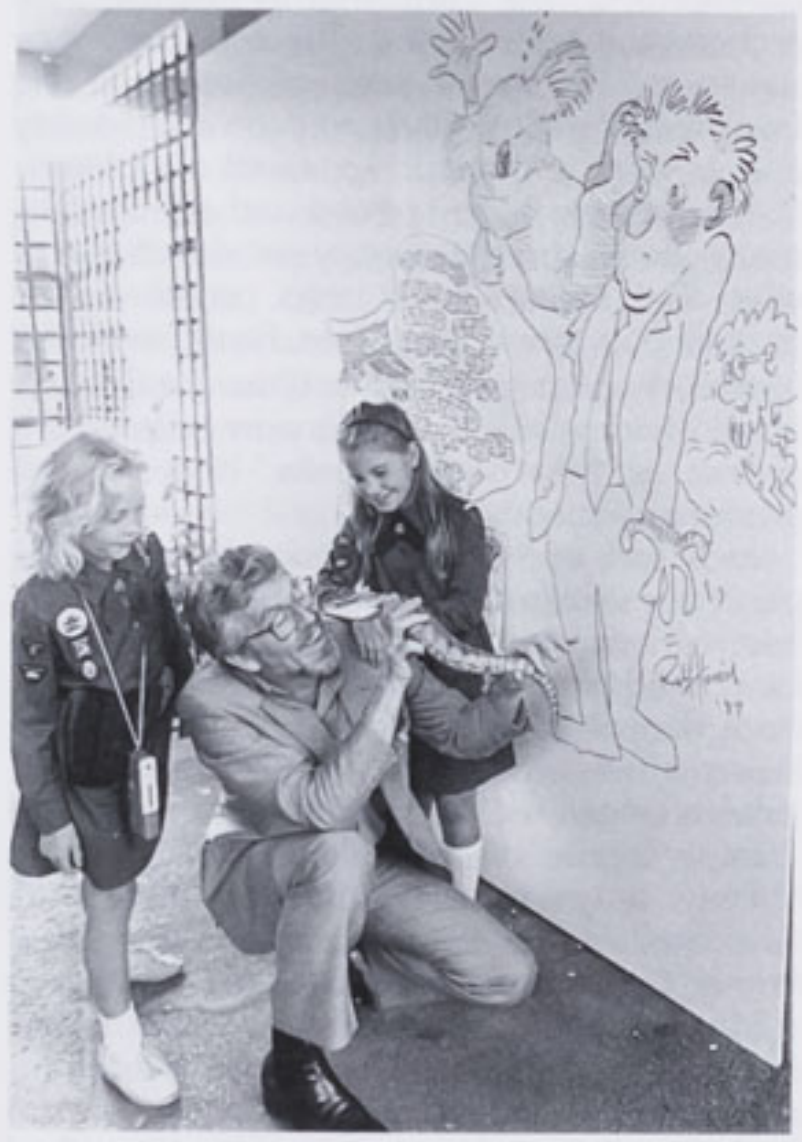
Themed evening events and Animal Open Houses were organised for Members, Friends, Lifewatch and Adopters and were well supported. Lunchtime Lectures continue their popularity.

The new centre for Lifewatch, including a special visual presentation of the work of the Society, is due to be inaugurated by HM The Queen in May 1990. A five hour TV series on the Society is in preparation, and will concentrate on work 'behind the scenes'.

Easter eggs abounded at the Zoo in a joint promotion with Thorntons, the confectioners. They generously gave thousands of eggs, staff to ice them and a life size chocolate model of 'Rosie' Rhino. The media and the public were equally delighted.

Summer school holidays were celebrated by 'Aussie August', supported by Austravel who gave a holiday in Queensland as first prize in our competition based on the newly arrived Koalas.

Suzuki also sponsored 'Rosie' Rhino and, with 10 zoos throughout the country, organised numerous fund-raising events to produce £50,000 for the Society's Rhino field work in Kenya. They also donated 10 Suzuki vehicles as part of the nationwide competition.



Rolf Harris and friends celebrating "Aussie August"

An art exhibition, opened by Sir Hugh Casson, was staged in the Elephant House, by the Royal College of Art.

Joint charitable events included the Society working with Chris Serle and the World Wide Fund for Nature, Andrew Sachs and the Variety Club, the Children's Society, the 'Really Wild Show', Bill Oddie and 'Watch' (Royal Society for Nature Conservation).

The use of the Zoo as a filming location resulted in items for 'May to December' (BBC) and advertisements for Pampers, Premium Bread, Bradford & Bingley Building Society and Indesit Washing Machines.

Marketing activities at Whipsnade are described earlier in this Report in the Section on Whipsnade Wild Animal Park.

EDUCATION

PROGRAMMES FOR SCHOOLS AND COLLEGES

A wide variety of programmes has once again been offered at London Zoo and Whipsnade. At London Zoo two new themed tours were introduced together with an audio-visual programme for the very young, 'E is for Elephant'. A summary of these programmes is given in the table below.

A great many 'one-off' talks were given during the Spring and Autumn terms. These reflect the great variety of work being undertaken by schools and are now a major feature of the work of this department. Special programmes have also been provided for tertiary groups. Oxford University, London University and chiropody students have continued to visit in addition to other groups, notably from polytechnics, teacher training colleges and colleges of art and design. At Whipsnade students from Manshead School, Dunstable, provided an exhibition of art and design work undertaken at the Park. This has resulted in sweatshirts designed by pupils being retailed at both London and Whipsnade with profits going to the World Wide Fund for Nature.

By far the most significant event for the department this year was the introduction of the Education Reform Act. The new charging restrictions imposed have badly affected visits from state schools throughout the country. At London Zoo bookings have fallen by 35.7% over the year and by 18.6% at Whipsnade. Independent schools now provide the greater part of the department's income at London Zoo, 51% of schools being from this sector.

The year has also seen the introduction of the National Curriculum which has provided the department with clear guidelines on which to base future programmes. INSET courses linked to this have been offered to primary teachers at both London and Whipsnade in conjunction with the ILEA Centre for Life Studies and the Bedfordshire Primary Science and Technology Centre. These were filled to capacity and additional courses had to be offered to cope with numbers. The National Curriculum has been taken into account in the attractive new-style education brochures – the relevance of programmes being clearly indicated.

In an attempt to counter the effects of the charging restrictions a scheme offering a further discount on repeat visits was introduced and direct mailing of brochures was used for the first time.

One notable success has been the increased number of sixth form groups attending lecture tours. Such groups are, however, often small and hence less cost-effective than others.

At Whipsnade Park a joint venture with the Natural History Museum, Tring, is showing promise.

VOLUNTEER ACTIVITIES

Volunteers continued to play an important rôle, both at London Zoo and Whipsnade, by

Programmes for schools and colleges

		London Zoo	Whipsnade
For Juniors	STORYTIME AND HANDS ON eg Rosie the Rhino, Come and touch	9	4
	ILLUSTRATED TALKS eg Rainforests, Minibeasts	11	—
	ZOO TALKS eg Nocturnal Animals, On the Hoof	4	—
	AUDIO-VISUAL PROGRAMMES eg African Animals, Apes & Monkeys	6	5
	THEMED TOURS eg Austrian Animals, Contrasts	5	3
For Secondary Schools	HANDS ON eg Touching and Learning	1	1
	AUDIO-VISUAL PROGRAMMES AND LECTURE TOURS eg Classification, The Zoo	7	6
	GCSE PACKAGES eg Animal Diversity, Conservation Matters	2	1
	'A' LEVEL LECTURE TOURS eg Adaptive Radiation, Homeostasis	6	3

Numbers of pupils taught by the Education Department during 1989–90

	London Zoo	Whipsnade
Summer Term	18,031	9,283
Autumn Term	7,620	1,995
Spring Term	9,814	1,258
	35,465	12,537
Total		48,002

Percentage breakdown by type of schools visiting London Zoo

	Independent	State
Primary	15	23
Middle	35	20
Secondary	—	6
Total	51	49

providing an educational service to the zoo visitor. At London Volunteers staffed the Information Bureau, Art Cart, nine Touch Trolleys and the Brass Rubbing and Mask Making Centre, whilst teaching auxiliaries assisted in an enhanced tour programme for primary schools. Volunteers also produced Zoo Information leaflets in five languages.

Invaluable assistance was also provided on Explorers days and for promotional events at Easter, Christmas and on the Cub Scouts Day in March. At Whipsnade, Volunteer numbers have been increased enabling more activities to be introduced. The 'Green Machine', a milk float donated by Dairy Crest, was converted by Volunteers to act as a mobile activity and conservation station. This entered service in March, together with the new Information Bureau on the Main Gate concourse. Mr Graham Lucas (Headkeeper Animal Activities) is now helping the Education Officer by providing day to day supervision of Volunteer activities.

At London, the Volunteers' Steering Group under the chairmanship of Mr J Barrington-Johnson, co-ordinated all Volunteer activities until the appointment in January of Helen Loynes as the Zoo's first full-time Volunteer Organiser. At Whipsnade, Team Leaders took on a similar rôle for the summer until Miss Williams took office in September.

RESEARCH

THE INSTITUTE OF ZOOLOGY

The Institute represents the research activities of the Zoological Society of London, including the Veterinary Hospital and the Curators' Research Units. This report contains brief descriptions of the main activities of the four research groups; further details of the research projects carried out by the Society, and others not included here due to limitations of space, can be obtained by reference to the list of publications contained in Appendix 3.

An important development during the year under review has been the establishment of the Conservation Biology Research Group, under the leadership of Dr Georgina Mace, which includes a Molecular Genetics Unit. It is intended that this Group should contribute not only to the detailed analysis of genetic relationships between animals in captive breeding groups and reintroduction projects, but also to a more general understanding of gene flows in small populations.

The Institute acknowledges with gratitude the generous support it receives from numerous funding agencies, and the materials and advice received from many individuals.

COMPARATIVE PHYSIOLOGY

Developmental Biology

In primates the cellular composition of the corpus luteum greatly influences its function. The luteal cells of the Marmoset Monkey, unlike those of many other primate species, did not fall into two types distinguishable by size and morphology; most of them probably originated from granulosa cells in the pre-ovulatory follicle.

Progesterone production by Marmoset luteal cells is very responsive to the luteolytic action of a prostaglandin $F_{2\alpha}$ analogue, cloprostenol. *In-vivo* studies showed that an antagonist of LHRH (luteinizing hormone releasing hormone) had a similar luteolytic effect. Cloprostenol, however, may act by blocking the luteotrophic action of LH at the corpus luteum. *In-vitro* studies of second messenger systems indicated that cloprostenol can act at pre- and post-cyclic AMP sites to block the stimulation of progesterone production by LH.

In addition to progesterone, the marmoset corpus luteum secreted inhibin, concentrations of which increased in the peripheral circulation during the luteal phase of the oestrous cycle. In cycles during which conception occurred, inhibin concentrations increased still further, suggesting that the conceptus influenced the secretion of this substance.

Studies on the material recognition of pregnancy in ungulates led to the cloning of (1) a cDNA encoding bovine trophoblast interferon from a Day 18 cow blastocyst, and (2) a gene, isolated from a bovine genomic library by probing with the cDNA. The nucleotide sequences were identical. Upstream sequences characteristic of viral response elements in other α-interferon genes were identified in the genomic sequence, suggesting that trophoblast interferon may be responsive to viral induction. The *in-vitro* expression of these genomic and cDNA sequences is now being studied with transformed eukaryotic cells in tissue culture.

The assay of interferon by means of its ability to inhibit the cytopathic effect of Semliki Forest virus on bovine kidney cells showed that this substance was present in high concentrations in uterine flushings from ewes in early pregnancy. It could not be demonstrated, however, in Roe Deer; but in these animals the endometrium contained greatly increased concentrations of oxytocin receptor at the time of embryo implantation following the winter solstice. Because α-interferon – in those ungulates in which it is produced by the blastocyst – inhibits the expression of the endometrial oxytocin receptor (EOR), it appears possible that the high concentration of EOR in the Roe Deer uterus at the time of implantation resulted from the absence of blastocyst interferon production. When conception fails the Roe Deer undergoes a pseudopregnancy lasting from the time of ovulation to that of implantation; it is possible therefore that interferon production by the blastocyst is unnecessary for the establishment of pregnancy in this species.

Gamete Biology

In a collaborative project, artificial breeding techniques for Sumatran Tigers are being developed to help in the genetic management and reproduction of this species. By means of laparoscopy techniques, mature follicular oocytes were recovered from females in oestrus and successfully fertilized *in vitro*. The next stage will be the return of embryos to a surrogate female for implantation and pregnancy. Studies of the cryopreservation of mammalian semen continued with a systematic examination of freezing techniques, efficacy being assessed by means of the cryomicroscope and computerized image analysis of sperm motility. Sperm antigens that play a role in mammalian fertilization were identified with monoclonal antibodies. By screening a human testis cDNA library an

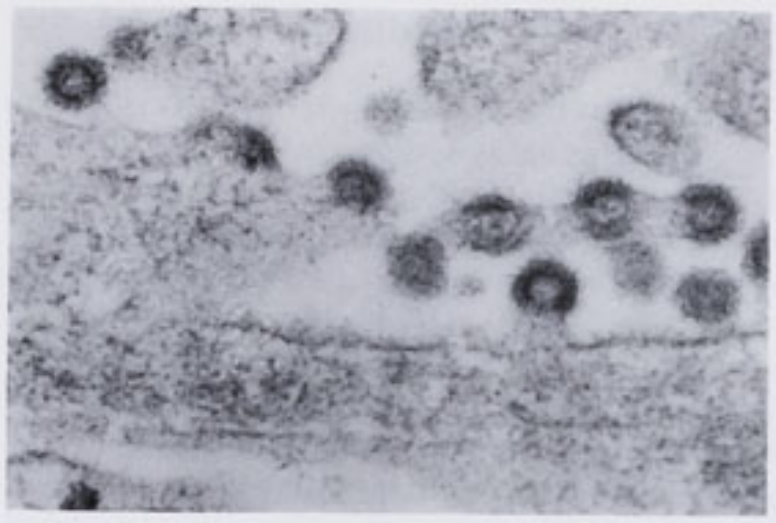


Fig. 1 C-type retrovirus budding from the syncytiotrophoblast of a 16-day-old Marmoset embryo. This endogenous virus is expressed by normal embryos at implantation

acrosomal inhibitory component that interfered with human sperm-egg binding was characterized. The long term aim is to use these and related findings to develop an immunocontraceptive vaccine.

The mechanism by which the developing embryo becomes attached to the uterine endometrium is being investigated in the Marmoset and Guinea-pig by *in vitro* co-culture methods. A novel finding was the abundant expression of C-type endogenous retrovirus by the syncytiotrophoblast at the time of implantation (Fig. 1). The significance of these viral particles is the subject of current research.

Behavioural Physiology

Pheromones from dominant females play a key role in the social suppression of ovulation in subordinate female Marmoset Monkeys. Females entering social groups and becoming subordinate did not stop ovulating if they had previously been rendered anosmic. The main olfactory epithelium may therefore play a part in mediating the pheromonal effect. Endogenous opioid peptides may act as the neuroendocrine initiators of female reproductive suppression, but an as yet unidentified neurotransmitter system may be responsible for maintaining the suppression. *In-vitro* studies suggested that in the testis of subordinate males the activity of the enzyme 3β-hydroxysteroid dehydrogenase was reduced, thereby possibly impairing testosterone production. These studies are of interest in relation to infertility in other mammals including Man.

In male Naked Mole-Rats testosterone production is suppressed by the breeding 'queen', except during her transient periods of oestrus (Fig. 2). Breeding 'queens' can also distinguish by scent their breeding male from the rest of the colony. Pheromones seem, however, to pay a less crucial role than in marmosets in suppressing reproduction in their subordinates.

Collaborative studies of the endangered Tamarin Monkey and Goeldi's Monkey continued, in relation to the improvement of breeding in captivity.

Physiological Ecology

Studies on the effect of photoperiod and melatonin on the development of rhythms of growth and on the timing of puberty in Deer continued. The hormonal mechanisms of seasonal reproductive and growth cycles were elucidated and seasonal cyclicity was shown to persist in animals maintained under fixed daylength from birth, thus demonstrating that seasonal rhythms are endogenous, with changes in daylength maintaining seasonal synchrony (Fig. 3). The seasonal regulation of pulsatile gonadotrophin secretion in Red Deer and Père David's Deer was investigated and practical methods were developed for the induction of ovulation. Collaborative work on Deer included studies of artificial insemination, *in-vitro* fertilization, embryo transfer, fertility, pregnancy and the mechanism that determines the termination of the breeding season. Work on Bennett's Wallaby included studies of seasonal rhythms of reproductive quiescence, the role of seasonal changes in early life, and mechanisms of ovarian control.

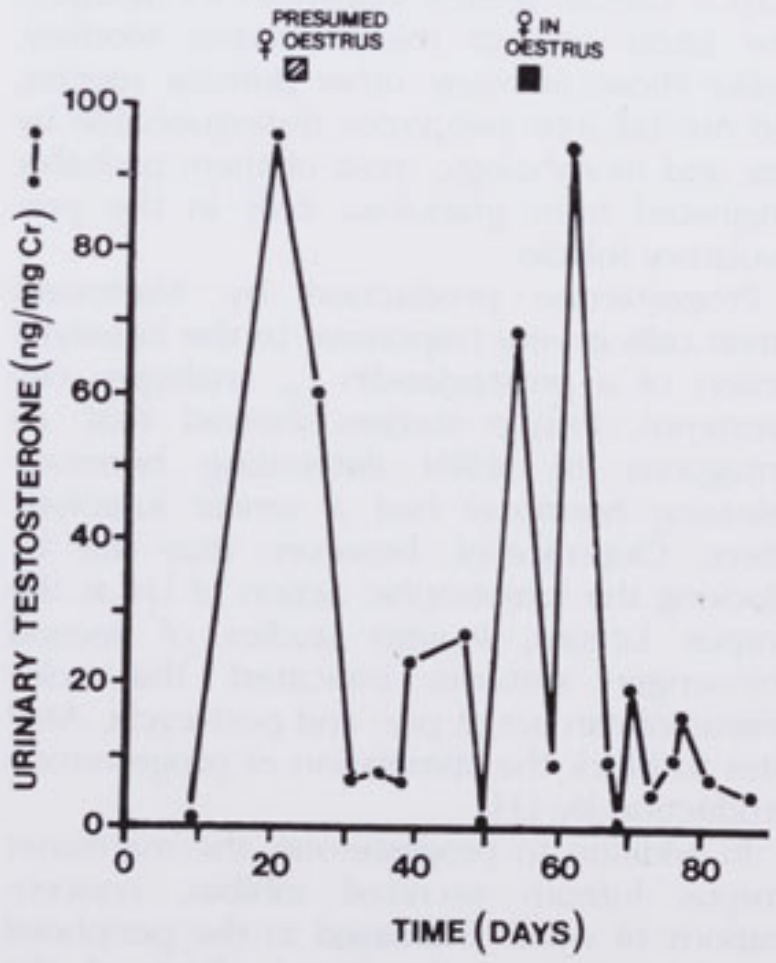


Fig. 2 Testosterone in a breeding male Naked Mole-rat was elevated only when the "queen" was in oestrus (■: mating observed; ▨: mating not observed during oestrus)

Endocrinology

Studies on ovarian function in Marmoset Monkeys continued. Ovarian cell cultures were used to assess the role of growth factors in regulating the development of the ovulatory follicle. Recent work showed that Insulin-like Growth Factor I (IGF-I) exerted an effect on granulosa cells obtained from mature (ovulatory), but not immature, follicles. The factors responsible for bringing about this developmental change in granulosa cell responsiveness to IGF-I are currently being investigated. Such information is important for improving the techniques used to induce ovulation and for the treatment of infertility in exotic animals and human beings.

Advances were made in monitoring ovarian cycles in a number of endangered species. The major urinary progesterone metabolites of the African species of Rhinoceros were identified as 20α-dihydroprogesterone. A microtitre immunoassay was developed to monitor changes in the concentration of this metabolite in the urine of Black and White Rhinoceros in order to assess reproductive status and to assist breeding in captivity. Similar non-invasive methods for monitoring reproductive activity in African and Asian Elephants are also being investigated.

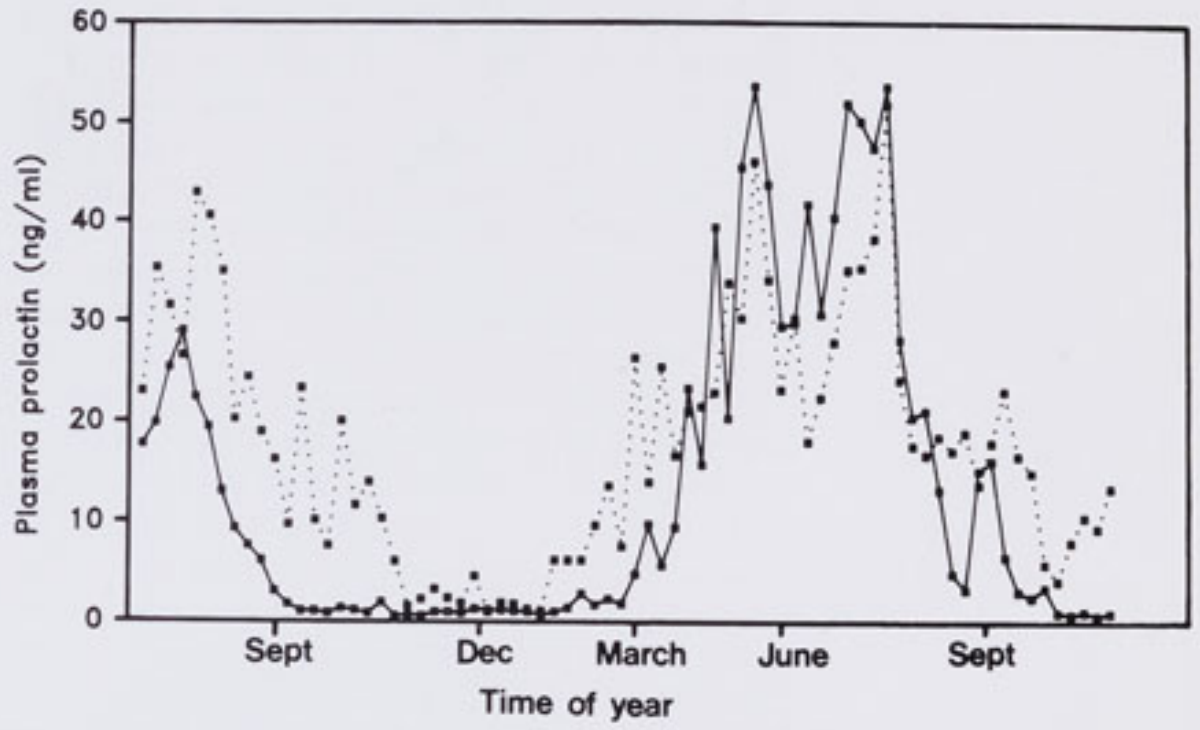


Fig. 3 Changes in the pattern of secretion of the hormone prolactin in two groups of hand-reared female Red Deer calves from birth to puberty in the second year of life. Animals were kept on natural photoperiod (solid line) or on fixed summer daylengths from birth (dotted line). Note that exposure to a constant photoperiodic signal did not block the expression of an endogenous seasonal rhythm.

COMPARATIVE MEDICINE

Applied Immunology

Infectious diseases are major causes of illness and death in Man and in all species of animals. Improved diagnosis can lead to earlier recognition of such diseases with reduction in morbidity and mortality. The Applied Immunology Unit has, as its main objective, the development of simple diagnostic tests. During the year plans were made to devise novel test methods for malaria and other tropical diseases. This programme will receive substantial support from the Overseas Development Administration. It is hoped that easily used field methods will result, based on modern immunological techniques and molecular biology. Such methods will be applicable to the diseases of Man and domestic and wild animals.

Microbiology

Necrobacillosis – a disease of wild and domestic animals – is caused by infection with *Fusobacterium necrophorum*, the source of which is assumed to be faeces. In laboratory experiments the organism's high minimum infective dose ($>10^6$ organisms) was reduced more than 1000 times by suspending the fusobacterial cells in a small volume of 5% faecal homogenate. Moreover, the site of low grade infection produced in Mice by the subcutaneous injection of faecal suspension eight days earlier was susceptible to superinfection by doses of *F. necrophorum* far below those required to infect normal tissue. These experiments throw further light on the natural infection process. Extreme methods of vaccination failed to give a useful degree of protection against a minute fusobacterial inoculum suspended in a harmless dose of *Escherichia coli* culture to enhance infectivity. Current work is concerned with factors that influence the faecal excretion of *F. necrophorum* and its survival outside the body.

Studies on botulism included the diagnosis of a serious outbreak in Hamadryas Baboons in a safari park and an outbreak in cattle on pastures fertilized with poultry litter containing chicken carrion; and the demonstration of the avian botulism organism in refuse tips.

Nutritional Biochemistry

The degree of *in-vitro* haemolysis of erythrocytes from a group of captive Marmoset Monkeys was strikingly high (>50%; norm <5%) as a result of a change in erythrocyte membrane composition caused by a diet containing fish products rich in long chain n-3 fatty acids. A formulation that excluded fish products and whole milk ameliorated the disorder and corrected a skin and coat abnormality often seen in captive marmosets. These findings were consistent with the suggestion that marmosets are prone to nutritional stress, often subclinical.

An analysis of 10 African plants commonly eaten by the Black Rhinoceros suggested that

the amount of vitamin E given to captive animals was adequate. Despite this, the plasma vitamin E concentrations were low and could not be corrected by increased supplementation, probably because of incomplete emulsification. The wild plants contained comparatively high concentrations of selenium and zinc. A combined deficiency of selenium, zinc, alpha-linolenic acid, beta-carotene and vitamin E may be of significance in haemolytic anaemia of captive Rhinoceros (see below).

A study of the metabolism of wild Macaroni and Gentoo Penguins showed that the utilization of macro- and micro-nutrients was affected by species and by physiological factors associated with incubation and moulting. This may help to explain the infertility, low hatchability, and high mortality rate of chicks and adult penguins observed in captivity.

VETERINARY SCIENCE

Clinical Studies

The year has seen further development of preventive medicine programmes, research, and advisory work on captive and free-living wild animals – from Red Kites in England to Arabian Oryx in Jordan (Fig. 4). Among the clinical cases treated was an adult female Gorilla referred from another zoo for treatment of rectal prolapse. With the help of staff from St Mark's Hospital, this was successfully repaired by means of an intra-abdominal approach. Collaborative work led to the successful treatment of many dental cases. In the field of nutrition, an exciting finding was the immediate and dramatic increase in plasma vitamin E concentration of the Black Rhinoceros 'Jasper' following oral supplementation with a novel vitamin E preparation containing an emulsifying agent. At Whipsnade the sedative medetomidine, used in conjunction with ketamine, proved useful in a variety of species, and a novel alpha-2 receptor antagonist was found useful for reversing sedation with xylazine. The plasma half-life of the antibiotic gentamicin was influenced by both bodyweight and species. These findings are relevant to the prediction of drug dosage regimes for wild animals.

Research into the cell kinetics of limb bone growth in birds and the use of ultrasonography in wild animal medicine continued.

Fig. 4 An Arabian Oryx herd at Shaumari in Jordan.

Pathology

An epizootic of acute disseminated toxoplasmosis caused the death of 14 Squirrel Monkeys, representing *c.* 30% of the colony at Regent's Park. This severe outbreak reflected the high susceptibility of these animals to toxoplasma infection.

A spongiform encephalopathy caused the deaths of an Arabian Oryx and a Greater Kudu. It seems likely that these two cases were linked to the current epizootic of bovine spongiform encephalopathy in the national cattle herd, both animals having probably been infected by eating contaminated pelleted food.

The larval stage of the South American form of *Ortleppascaria alata* – a parasitic nematode of Crocodilians – was recently discovered during *post-mortem* examination of a Surinam Toad and a Caecilian from the aquarium. Amphibians represent a significant dietary item of the Caiman, and the finding may therefore be of epidemiological significance.

Our colony of endangered Olympian Ground Beetles was depleted by a mycotic infection. Two pathogenic fungi were isolated: *Verticillium lecanii* and *Beauveria bassiana*. Individual treatment of the beetles with antifungal drugs gave good results.

Haematology

The Unit continued to provide a diagnostic service. The haematological changes that occur in avian tuberculosis were made use of in collaborative screening programmes. The diagnostic implications of thrombocytosis in mammals and birds were investigated. Studies of the physiological properties of erythrocyte membranes revealed interesting phylogenetic differences.

The Unit's database now covers normal and abnormal haematological and biochemical values for more than 600 species. This inform-

ation is being used to examine the influence of phylogenetic, physiological and ecological variables on the composition of normal blood. Relationships were found between various blood parameters and habitat altitude, natural diet and group size. Guidelines are being devised for the interpretation of haematological and plasma biochemical findings in the many species for which reference values are not yet available. To make the database more accessible, a personal computer-based package is being developed.

CONSERVATION BIOLOGY

Population Genetics

Previous work on the biological principles for long-term management of captive populations provided insight into some key genetic and demographic characters that may increase extinction risks in wild populations. In collaboration with the International Union for the Conservation of Nature and Natural Resources (IUCN) Species Survival Commission (SSC) new definitions for Red Data Book categories (Endangered, Vulnerable, Rare, etc.) were proposed and are now being considered by the SSC.

Population analyses of capitive and reintroduced populations continued with the development of new methods for genetic management and with the application of demographic techniques incorporating random factors that may be especially significant for small populations. Species studied, and for which management recommendations for captive and reintroduced populations were made, included the Golden-headed Lion Tamarin, the Arabian and Scimitar-horned Oryx, Rothschild's Mynah and the White-winged Wood Duck.

Molecular Genetics

Genetic variation within small animal populations is essential for species survival and the techniques used to analyse genetic diversity at the DNA level are currently being established in this Unit. Analysis of protein heterogeneity can be highly informative, but the likelihood of detecting individual variation is increased by 'fingerprinting' DNA. This technique provides data on both pedigree and on genetic variability within and between animal groups and will facilitate current approaches to the genetic management of rare and endangered species. We are exploiting the most recent advances in molecular biology in our approach to conservation problems. For example, the polymerase chain reaction, which amplifies the amount of DNA in a sample, can be used to characterize genetically an individual from a single hair root. This technique can be applied to samples obtained from captive and wild animals, or from museum specimens. In preliminary studies, samples from a wide range of species in the Collection were used to test different storage and analytical methods.

The facilities and techniques available in the Unit will also allow many of the problems of reproductive biology (above) to be addressed at the level of gene expression.

Behavioural Enrichment

Jointly funded by the Society and the Universities Federation for Animal Welfare, with an equipment and travel grant from the Royal Society for the Prevention of Cruelty to Animals, this project continued to use behavioural research methods to assess the welfare of animals in the Collection. Where appropriate, behavioural enrichment techniques were employed and assessed as a practical means of increasing the range and patterns of natural behaviour and reducing or eliminating the frequency of abnormal (eg stereotypic) behaviour.

These techniques included attempts to increase the temporal and spatial complexity of

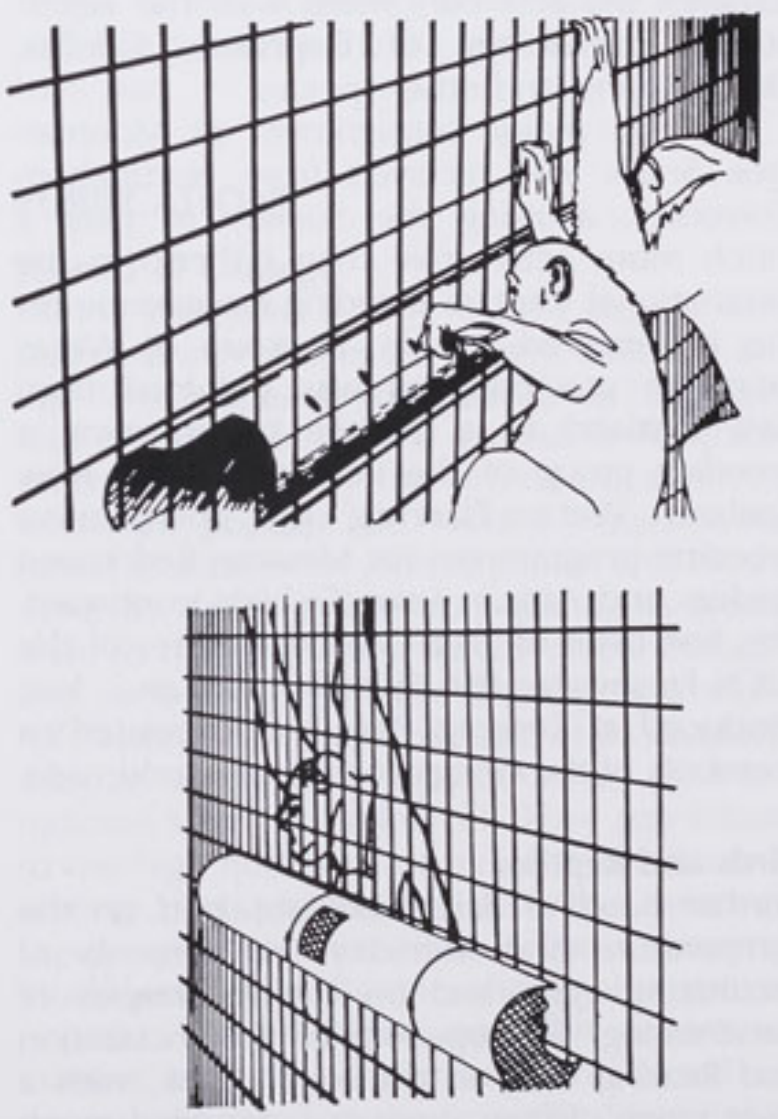


Fig. 5 Chimpanzees using a feeding device designed for Great Apes. The animals can obtain food items placed by the Keeper in the centre of the tube by manipulating them to the ends of the pipe with tools made from wooden sticks

the environment by providing (1) olfactory stimulation, (2) opportunities for intra-species communication, and (3) food in ways that encourage natural foraging behaviour, such as scattering on naturalistic substrates and the use of 'puzzle' feeders for Apes (Fig. 5).

A study of the influence of environmental factors such as the presence of visitors, weather, and enclosure design on the behaviour of zoo animals is providing information useful for the future provision of enclosures that maximize animal welfare.

Mammals, Fish and Invertebrates

Emphasis continued to be placed on the scientific management of captive populations, through the use of national and international studbooks and in collaboration with population geneticists, both within the Society and outside. Members of the Mammals Department continued to contribute to studbook management (international and national) for Giant Pandas, Short-clawed Otters, South American Small Cats, Douroucouli, Slow Loris, Sulawesi Macaques, and Gibbons. A captive-breeding action plan for the rodents is in course of preparation for the Captive Breeding Specialist Group of IUCN/SSC.

The Department is also collaborating on research projects concerned with the reproductive physiology of Elephants, Gorillas, Orang Utans, and other species.

The first major consignment of Moorean Tree Snails was received from Nottingham University, allowing the Society to play a much more active rôle than hitherto in the International Captive Breeding Programme for this endangered species. A group of Wetas (primitive grasshoppers) was obtained from New Zealand as a prelude to obtaining a breeding group of the very rare Giant New Zealand Weta. Planning for co-operative breeding programmes for Mexican Red-kneed Spiders and African Lake Cichlids continued. The first issue of *Fish* – the newsletter of the IUCN Freshwater Fish Specialist Group – was produced at Regent's Park and circulated to members of the Group and others world-wide.

Birds and Reptiles

Further baseline data were obtained on the temperature and humidity requirements of incubating eggs, and on the techniques of handrearing. The opening of the Incubation and Rearing Unit on the North Bank, with a wide range of new apparatus, provided much improved working conditions.

Behavioural studies on free-ranging Red Junglefowl at Whipsnade continued in collaboration with Dr Marian Stamp Dawkins of the Animal Behaviour Research Group at Oxford, and with Matthew Sullivan, a post-graduate student.

Drs Marion Petrie and Tim Halliday of the Open University continued with their project at Whipsnade on sexual selection in Peafowl. The results from the first year of study on mating behaviour support Darwin's hypothesis that the Peacock's train evolved, at least in part, as a result of a female preference.

Assistance was given in a collaborative study of the hemipenis region of the tail of snakes by ultrasound scanning for the purpose of sexing. A second study dealt with the normal ultrasonograph appearance of the abdominal organs of Monitor Lizards.

Eggs of Eyed Lizards were sent to Professor M Ferguson, Manchester University, for investigations into temperature controlled sex determination.

Director of Zoos' Overseas Projects

The Society manages the King Khalid Wildlife Research Centre near Riyadh for the Saudi Arabian National Commission for Wildlife Conservation and Development. The work concentrates on Gazelles, with studies in capture techniques, disease, nutrition, water metabolism and reproductive physiology. Other responsibilities include assessing Gazelle populations in the wild and advising on the reintroduction of Arabian and Goitred Gazelles.

Studies on the Black Rhinoceros population resident on the Ol Ari Nyiro ranch in Kenya were completed, and Dr R A Brett was seconded to the Kenya Wildlife Service for Rhinoceros conservation work. In collaboration with the Kenya Wildlife Service and the Gallmann Memorial Foundation, a study of Elephants on the Laikipia Plateau began, with particular emphasis on patterns of movement, population dynamics and areas of potential competition with human activity.

A study on the feasibility of reintroducing Addax and Scimitar-horned Oryx to Niger was completed. The choice of a precise location for the Scimitar-horned Oryx has still to be made but an Addax reintroduction programme for the Air-Tenere Reserve could probably be started as soon as funds are available.

Other projects include the management of reintroduced Arabian Oryx in Jordan and Oman; the conservation of endangered species in Ethiopia; and the conservation of Philippine endemic mammals such as the Tamaraw, Philippine Spotted Deer and Cloud Rat.

National Federation of Zoological Gardens of Great Britain and Ireland

Studies supported by the National Federation focussed on (1) co-ordinated breeding programmes in zoos, particularly for threatened species such as the Hyacinthine Macaw and the Moluccan Cockatoo, and (2) the genetic and demographic risks to small zoo populations of species such as Grevy's Zebra Cheetah, Cotton-topped Tamarin and Spectacled Bear.

SCIENTIFIC MEETINGS, SYMPOSIA AND SEMINARS

During the year eight Scientific Meetings were held, open to Members of the Society and of Lifewatch, and to their guests and visitors. In addition to brief reports on additions to the collections and on some aspect of current research in the Institute of Zoology, each meeting included contributions from two or three speakers on a central theme.

In April 1989 this theme was 'Declining seabird populations' – were they in fact declining, and what could be deduced from population fluctuations? 'Colonizing new worlds', in May, looked at some species that are in the course of evolving to colonize entirely different habitats, and the physical adaptations this entails. The June meeting, 'Not on display', presented some of the research that goes on behind the scenes at the Zoo to improve animal breeding and husbandry.

The autumn session started in October with 'Exploring evolution in higher vertebrates – some alternative views' regarding the dependence of human brain evolution on the food chain, and the exact relationship between mammals and birds. 'The 1988 seal epizootic' in November summarized the results of the intensive investigations carried out into this widely reported outbreak of disease. The December meeting was on 'Pigs, peccaries and babirusas'. It provided a well-illustrated survey of all the species in this group, discussing some aspects of their distribution and systematics and, in particular, the highly endangered status of many of the species.

The first meeting of 1990, in February, discussed 'Biodiversity', illustrating what a minute proportion of species are as yet known to science and the difficulties of extrapolating from these to arrive at an estimate of the total of extant species so as to understand the implications of habitat change or destruction. Finally, the March meeting opened 'A can of worms' that have a devastating effect on human populations, with a survey of the interactions of schistosome species with each other and with their various hosts.

In a period when scientific societies are reporting declining attendance at meetings, it was encouraging to see that attendance at the Scientific Meetings has remained steady for at least the last three years at an average between 60 and 70 per meeting. The Council warmly thanks all the speakers who contributed to the success of the 1989–90 programme.

One symposium, organized by Dr J H W Gipps, was held in the period. This was a joint meeting with The Mammal Society and The Primate Society of Great Britain entitled 'Beyond captive breeding: re-introducing endangered species to the wild', held on 24 and 25 November 1989. The meeting rooms were filled to capacity, attesting the interest aroused by one of the first international meetings to be devoted exclusively to this increasingly important aspect of conservation, its speakers drawn from leading conservation biologists throughout the world. The proceedings will be published in the series *Symposia of the Zoological Society of London*.

Weekly seminars, held during the academic terms, were organized by the Institute of Zoology for members of staff and guests. The topics were in general chosen for their relevance to the scientific aims of the Institute and the Society's thanks are due to all who took part.

PUBLICATIONS

Journal of Zoology

During the year, a total of 153 papers were pubished in Volumes 217 Part 4, 218, 219 and 220 Parts 1–3; each volume runs to 700 pages. The broad scope of the *Journal* is illustrated on the one hand by the several occasions on which the popular *BBC Wildlife* magazine has based its articles on *Journal* papers and on the other by the response from zoologists worldwide to the continuing survey of contributors and users: 'the *Journal of Zoology* is *wonderful*', 'always of interest because of its diversity', 'has an impeccable reputation as an international scientific periodical'. They pay tribute to the high quality of papers, the standards of editing and production and the relatively rapid publication time. The recently-introduced *Brief Reviews* have also proved popular. These reviews are short reports on current research and many are based on papers presented at the Scientific Meetings of the Society.

Recognition of these merits leads to an ever-increasing number of papers submitted, adding to the burden of the referees whose

assistance contributes so greatly to the reputation of the *Journal*. The Council is extremely grateful for their help to the Editor in the assessment of papers.

Zoological Record

Volume 125 (1988–1989), was published in December 1989 and marked 135 years of continuous service to the zoological community.

This anniversary was celebrated at a ceremony in October when members of the Zoological Record Advisory Committee and the BIOSIS Board of Trustees met at Garforth House, the offices of BIOSIS UK, in York. Mr Michael Dadd, General Manager of BIOSIS, UK, paid tribute to all those who had contributed to the success of the *Zoological Record* over so many years. Dr Marcia Edwards, Editor of the *Zoological Record*, and Dr Mark Cathey, Chairman of the BIOSIS Board, briefly traced the history of the *Record* from its foundation in 1864, the partnership agreement in 1980 between BIOSIS and the Society, and through to the present day. On behalf of the Council of the Zoological Society, Dr Edwards presented a certificate to Dr H Edward Kennedy, President, BIOSIS, to commemorate the occasion.

ZR Online, the machine-readable version of the *Zoological Record*, now holds detailed entries for over 800,000 published papers which have been indexed for the *Record* over the past 10 years. A revised and expanded edition of the *Zoological Record Search Guide*, a reference manual designed to help and inform users of both the printed and online versions of the *Record*, has been produced, and the current volume of *Zoological Record Serial Sources* giving details of more than 5,000 serials monitored for the *Record*, is also available.

Council is particularly indebted to the Director General of the Document Supply Centre, Boston Spa, and to the Director of the British Museum (Natural History), for the continuing help and support given to the staff of the *Zoological Record*.

Symposia

One volume was published in the series *Symposia of the Zoological Society of London*: No. 61, 'The biology of large African mammals in their environment', edited by Professor P A Jewell and Professor G M O Maloiy, and published for the Society by Clarendon Press of Oxford University Press.

International Zoo Yearbook

Volume 28 of the *International Zoo Yearbook* officially published in 1989 was not available for distribution until March 1990 because of problems with final printing and binding. The theme of Section 1 was 'Reptiles and amphibians' and with 40 papers contributed by leading herpetologists from Australia, Israel, Japan, Germany, the Netherlands, South Africa, Sweden, the UK, the USSR and the USA, this volume is of particular interest not only to zoo personnel but also to anyone interested in the popular field of herpetology.

Section 1 of Volume 29, currently in preparation, covers horticulture in zoos and includes papers from the Ninth Conference of the International Association of Zoological Horticulture held in October 1989 in Paignton. The papers provide an interesting overview of the work of horticulturists in zoos. The emphasis is on the rôle of zoos as *zoological gardens*, especially important where there are aesthetically pleasing habitat-type displays and there is an active participation in the conservation of plants as well as of animals.

Section 2, New developments in the zoo world, includes papers on invertebrates, reptiles, birds and mammals. Papers have been received from the People's Republic of China and Cuba, as well as the USA and Europe, and include a number of exceptionally interesting topics.

The reference section includes the annual lists of vertebrates bred and the census of rare species in captivity, and the summary of international studbooks and world registers.

The number of regional and international studbooks continues to grow and the work of the editor of the *Yearbook* as International Studbook Co-ordinator is of great importance to the smooth running of this important aspect of international co-operation.

LIBRARY

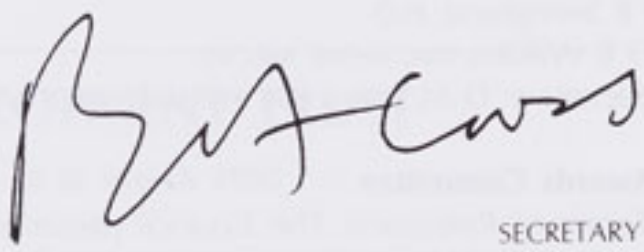
The Library continues to provide a full service to Fellows and Associates of the Society and to the staff of the Institute of Zoology, Zoo Operations Limited and the Zoological Society of London. The number of members of the public applying for a Reference Ticket to use the Library continues to grow. In the past year 170 people have applied for and obtained these tickets. Their requirements range widely, from those studying in preparation for 'A' level examinations to professional artists, architects and film makers as well as authors and publishers of books. The present cost of a ticket is £5.75.

The greater number of Reference Ticket holders and the growing demand by the staff of the Institute of Zoology and of Zoo Operations Limited have all contributed to the marked increase in the use of the Library

during the year. In the past year 760 references were obtained for the staff of the Institute and 9,013 photocopies were supplied to them. A similar service was provided to the staff of Zoo Operations Limited.

In 1989 conservation work on the Sharpe paintings, funded by a grant from the British Library, was completed. This valuable collection which was in real danger of deteriorating beyond repair has now been saved. The collection contains about 1,000 fine watercolours of birds. It is hoped to produce prints from these pictures so that they may become more widely known.

The Library has continued to benefit from the generosity of many of its readers. Those who donated books to the Library during the past year include: Dr M L Bierbrier, Mr D Bird, Mr D Bruce, Lord Buxton, Miss R Cachemaille-Day, Professor S B Day, Mr M Clark, Professor J L Cloudsley-Thompson, Mr B Coleman, Professor M Crawford, Dr H Fox, Dr C Hawkey, Mr D M Lank, Dr R I G Morrison, Mr P J Olney, Dr M Stanley Price, Miss J R Wilson, Mr G L Wood, British Museum (Natural History), Imperial Household of Japan, Salamander Books, Société zoologique de Québec.



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ANIMALS IN THE COLLECTIONS

column 1 Number of animals in the Collection at 1st January 1989.

column 2 Number of animals received in 1989 by presentation, exchange, purchase, or transfer between the Society's two Collections. The figures in brackets indicate animals which have been so transferred.

column 3 Number of animals born or hatched during 1989.

column 4 Number of animals which died in 1989 within 30 days of birth or hatching. The figures in brackets indicate animals born or hatched during December 1988 and which died during January 1989. Stillbirths are not included.

column 5 Number of animals which died from natural causes during 1989 apart from those included in column 4.

column 6 Number of animals disposed of in 1989 by presentation, exchange, deposit, sale, or transfer between the Society's two Collections, as well as culled animals and those killed by vermin or vandals. The figures in brackets indicate animals which have been transferred between the two Collections.

column 7 Number of animals in the Collection at 31st December 1989 showing sexes where these are known, e.g. 1/3/1 indicates 1 male, 3 female, 1 sex unknown.

Key

G Genus new to the Collection
S Species new to the Collection
SS Sub-species new to the Collection

*Species subject to the Agreement with the Marwell Preservation Trust on joint ownership and management.

LONDON ZOO

		1	2	3	4	5	6	7
MAMMALS								
Monotremata								
Tachyglossus aculeatus	Australian Echidna	1	—	—	—	—	—	1/0
Zaglossus bruijni	Bruijn's Echidna	4	—	—	—	1	—	1/2
Marsupialia								
Monodelphis domestica	Grey Short-tailed Opossum	9	—	—	—	2	1	4/2
Phalanger gymnotis	Grey Ground Cuscus	3	—	1	—	—	—	1/2/1
Gymnobelideus leadbeateri	Leadbeater's Possum	5	1	8	—	1	—	5/5/3
Petaurus breviceps	Sugar Glider	3	—	—	—	1	—	2/0
Dasyuroides byrnei	Byrne's Pouched Mouse	3	—	—	—	2	—	0/1
Phascolarctos cinereus	Koala	—	2	—	—	—	—	0/2
Vombatus ursinus	Common Wombat	1	—	—	—	1	—	—
Bettongia penicillata	Brush-tailed Bettong	8	—	2	1	1	—	5/3
Macropus rufogriseus	Red-necked Wallaby	3	5(3)	2	—	1	4	2/2/1
Macropus parma	White-throated Wallaby	1	—	—	—	—	1	—
Dendrolagus goodfellowi	Goodfellow's Tree Kangaroo	1	—	—	—	—	—	0/1
Insectivora								
Erinaceus europaeus	European Hedgehog	3	—	—	—	1	—	0/0/2
Chiroptera								
Pteropus giganteus	Indian Fruit Bat	18	—	5	3	2	2	4/11/1
Carollia perspicillata	Seba's Short-tailed Bat	49	—	17	4	6	—	0/0/56
Scandentia								
Tupaia glis	Common Tree Shrew	6	—	—	—	2	2	1/1
Tupaia tana	Large Tree Shrew	1	—	—	—	—	—	0/1
Primates								
Lemur catta	Ring-tailed Lemur	5	—	—	—	—	—	1/4
Lemur fulvus	Brown Lemur	10	—	2	2	—	—	3/7
Lemur mongoz	Mongoose Lemur	2	—	—	—	—	—	1/1
Varecia variegatus	Ruffed Lemur	6	—	3	—	—	7	1/1
Cheirogaleus medius	Fat-tailed Dwarf Lemur	6	—	—	—	—	—	3/3
Microcebus murinus	Grey Mouse Lemur	6	—	—	—	—	—	5/1
Loris tardigradus	Slender Loris	5	—	—	—	—	1	2/2

		1	2	3	4	5	6	7
Nycticebus coucang	Slow Loris	7	1	1	1	—	2	2/4
Galago senegalensis	Senegal Bushbaby	6	—	3	—	—	2	4/3
Aotus trivirgatus	Douroucouli	7	1	1	—	1	1	4/3
Pithecia pithecia	White-faced Saki Monkey	7	—	2	—	—	3	3/3
Saimiri sciureus	Squirrel Monkey (Olive-capped form)	18	1	2	—	8	4	1/6/2
Ateles geoffroyi	Black-handed Spider Monkey	2	—	—	—	—	—	1/1
Callithrix jacchus	Common Marmoset	11	1	9	3	1	17	—
Cebuella pygmaea	Pygmy Marmoset	6	—	—	—	2	—	2/2
Saguinus oedipus	Cotton-headed Tamarin	4	7	5	3	—	3	4/4/2
Saguinus illigeri	Red-mantled Tamarin	10	2	—	—	2	10	—
Saguinus imperator	Emperor Tamarin	4	—	—	—	—	—	2/2
Leontopithecus rosalia	Golden Lion Tamarin	5	—	—	—	—	—	2/3
Callimico goeldii	Goeldi's Marmoset	5	—	—	—	1	1	1/2
Macaca nemestrina	Pig-tailed Macaque	26	—	3	3	1	25	—
Macaca nigra	Sulawesi Crested Macaque	—	7	1	—	—	—	4/4
Mandrillus sphinx	Mandrill	11	—	4	4(1)	1	2	5/3
Cercopithecus diana	Diana Monkey	5	—	—	—	—	—	2/3
Cercopithecus hamlyni	Owl-faced Monkey	4	—	—	—	—	2	1/1
Colobus polykomos	Western Black & White Colobus Monkey	4	—	—	—	—	2	1/1
Hylobates lar	Lar Gibbon	3	1	—	—	1	1	1/1
Pongo pygmaeus	Orang Utan	10	—	2	1	—	—	5/6
Pan trogolodytes	Chimpanzee	12	—	—	—	—	—	6/6
Gorilla gorilla	Gorilla	5	—	—	—	—	—	1/4
Edentata								
Choloepus didactylus	Two-toed Sloth	2	—	—	—	—	—	1/1
Chaetophractus villosus	Hairy Armadillo	2	—	—	—	—	—	1/1
Rodentia								
Sciurus vulgaris	Red Squirrel	3	—	—	—	—	3	—
Callosciurus prevosti	Prevost's Squirrel	2	—	—	—	—	—	1/1
Cynomys ludovicianus	Prairie Marmot	6	—	—	—	—	—	0/1/5
Tamias townsendi	Townsend's Chipmunk	6	—	—	—	—	—	1/1/4
Glaucomys sabrinus	Northern Flying Squirrel	8	—	—	—	—	—	3/5
Castor canadensis	American Beaver	2	—	—	—	—	—	1/1
Pedetes capensis	Springhaas	9	—	4	3	—	—	6/4
Peromyscus polionotus	Oldfield Mouse	37	—	9	—	8	16	0/0/22
Sigmodon hispidus	Cotton Rat	12	—	22	—	6	8	0/0/20
Phodopus sungorus	Dwarf Hamster	18	19	133	4	15	82	0/0/69
Cricetulus barabensis	Chinese Hamster	18	—	61	—	9	—	0/0/70
Gerbillus perpallidus	Pallid Gerbil	46	—	—	—	1	5	0/0/40
Meriones unguiculatus	Clawed Jird	13	—	—	—	5	2	0/0/6
Meriones shawi	Shaw's Jird	26	—	—	—	3	6	10/7
Dicrostonyx torquatus	Collared Lemming	16	1	14	5	15	3	0/0/8
Clethrionomys glareolus	Bank Vole	26	—	2	1	11	12	1/3
Microtus arvalis	Common Vole (Orkney form)	4	—	3	—	3	4	—
Microtus agrestis	Field Vole	4	—	—	—	3	—	0/0/1
Apodemus sylvaticus	Field Mouse	47	—	—	—	7	15	0/0/25
Micromys minutus	Harvest Mouse	19	12	—	—	11	3	0/0/17
Acomys cahirinus	Arabian Spiny Mouse	83	—	252	18	37	206	0/0/74
Acomys russatus	Golden Spiny Mouse (Black form)	47	—	73	13	17	42	0/0/48
Arvicanthis niloticus	Nile Rat	3	—	—	—	3	—	—
Rattus rattus	Black Rat	80	—	108	—	—	108	0/0/80
Rattus norvegicus	Brown Rat	—	5	45	—	—	—	0/0/50
Muscardinus avellanarius	Common Dormouse	10	6	—	—	1	6	0/0/9
Jaculus jaculus	Arabian Jerboa	4	—	—	—	—	—	2/2
Hystrix indica × *H. cristata*	Hybrid Indian × Crested Porcupine	2	—	—	—	—	—	1/1
Atherurus africanus	African Brush-tailed Porcupine	6	—	2	1	1	—	3/2/1
Kerodon rupestris	Rock Cavy	14	—	15	2	7	6	4/9/1
Dolichotis patagonum	Mara	3	—	—	—	—	—	3/0
Dasyprocta aguti	Orange-rumped Agouti	9	1	9	7	2	—	3/6/1
Myoprocta pratti	Green Acouchi	6	—	—	—	1	—	4/1
Chinchilla laniger	Chinchilla	16	1	7	3	2	12(5)	3/4
Octodon degus	Degu	17	1	7	5	3	5	0/0/12
Carnivora								
Canis lupus	Grey Wolf	6	—	—	—	—	—	1/5
Fennecus zerda	Fennec Fox	2	1(1)	—	—	—	—	1/2
Ailurus fulgens	Red Panda	1	—	—	—	—	—	—
Potos flavus	Kinkajou	3	—	1	—	—	—	2/2

			1	2	3	4	5	6	7
Mustela nivalus	Weasel		1	—	—	—	—	—	1/0
Mustela furo	Ferret		4	—	—	—	—	—	2/2
Aonyx cinerea	Oriental Small-clawed Otter		2	—	—	—	—	—	1/1
Genetta tigrina	Blotched Genet		2	—	—	—	—	—	2/0
Arctogalidia trivirgata	Small-toothed Palm Civet		2	—	—	—	1	—	0/1
Suricata suricatta	Suricate Meerkat		8	—	—	—	—	1	4/3
Helogale parvula	Dwarf Mongoose		16	—	11	2	1	8(8)	5/3/8
Cynictis penicillata	Yellow Mongoose		3	—	—	—	1	—	1/1
Felis caracal	Caracal Lynx		3	—	—	—	—	—	1/2
Felis pardalis	Ocelot		2	1	1	—	—	2	1/1
Felis serval	Serval		2	—	—	—	—	1	1/0
Felis wiedi	Margay		2	—	—	—	—	—	1/1
Panthera leo	Lion		3	—	—	—	1	—	1/1
Panthera tigris	Tiger (Sumatran form)		4	—	—	—	1	—	0/3
Panthera onca	Jaguar		2	—	—	—	—	—	1/1
Panthera pardus	Leopard		2	—	—	—	—	2	—
Panthera pardus saxicolor	Persian Leopard		2	—	—	—	—	—	1/1
Neofelis nebulosa nebulosa	Clouded Leopard		4	—	—	—	1	—	2/1
Pinnipedia									
Zalophus californianus	Californian Sealion		5	—	1	—	—	1	2/3
Tubulidentata									
Orycteropus afer	Aardvark		3	—	—	—	1	—	0/2
Proboscidea									
Elephas maximus	Asian Elephant		3	1(1)	—	—	—	—	0/4
Hyracoidea									
Heterohyrax brucei	Bush Hyrax		2	—	—	—	1	—	1/0
Perissodactyla									
Equus zebra hartmannı	Hartmann's Mountain Zebra		3	—	1	—	—	—	2/2
Tapirus terrestris	Brazilian Tapir		3	—	—	—	—	1	1/1
Diceros bicornis	Black Rhinoceros		4	—	—	—	—	1	1/2
Artiodactyla									
*Lama glama**	Llama		5	—	—	—	—	—	5/0
*Lama guanicoe**	Guanaco		1	—	—	—	—	—	1/0
Vicugna vicugna	Vicuna		5	—	—	(1)	—	1	1/2
*Camelus bactrianus**	Bactrian Camel		5	2(2)	—	—	—	—	0/7
*Pudu pudu**	Pudu		6	—	2	—	1	1	3/3
Rangifer tarandus	Reindeer		3	4(4)	1	1	—	1(1)	0/6
Okapia johnstoni	Okapi		3	1	—	—	—	1	1/2
*Giraffa camelopardalis**	Giraffe		6	—	3	—	—	2(1)	3/4
*Tragelaphus eurycerus**	Bongo		5	1	—	—	—	1	2/3
*Tragelaphus strepsiceros**	Greater Kudu		5	1(1)	1	—	1	—	3/3
*Bubalus depressicornis**	Anoa		2	—	—	—	—	—	1/1
*Bos gaurus**	Gaur		4	—	—	—	1	—	1/2
Bison bison	American Bison		3	—	—	—	1	—	1/1
*Hippotragus niger**	Sable Antelope		3	—	—	—	—	—	1/2
*Oryx leucoryx**	Arabian Oryx		6	—	—	—	1	2	1/2
*Antilope cervicapra**	Blackbuck		20	—	—	—	3	17(17)	—
Ovis canadensis	Bighorn Sheep		15	—	6	—	1	—	7/13
Domestic									
	Pig:	Gloucester Old Spot	2	2	27	5	—	26	—
		Miniature	3	—	—	—	—	—	1/2
	Cattle:	Friesian	2	1	—	—	1	—	0/2
	Goat:	Common	7	—	—	—	1	—	0/6
		Windsor White	1	1(1)	—	—	—	1(1)	1/0
		Nubian	1	—	—	—	—	—	0/1
	Sheep:	Dorset Down	10	—	—	—	—	3	0/7
		Black Welsh Mountain	1	—	—	—	—	—	1/0
		Jacob's	1	—	—	—	—	—	1/0
	Rabbit		31	4	21	—	7	40	2/7
	Guineapig		22	6	12	—	3	25	0/0/12
	Donkey		1	1	—	—	—	1	0/1
	Pony:	Cream	4	—	—	—	—	2	2/0
		Shetland	3	1	—	—	—	—	0/4
		Dartmoor	—	1	—	—	—	—	0/1
Total Mammals:			**1242**	**105(13)**	**927**	**96(2)**	**239**	**780(33)**	**1159**

		1	2	3	4	5	6	7
BIRDS								
Casuariiformes								
Casuarius bennetti	Bennett's Cassowary	1	—	—	—	—	—	0/1
Dromaius novaehollandiae	Emu	4	—	—	—	—	2(2)	1/1
Apterygiformes								
Apteryx australis mantelli	North Island Brown Kiwi	2	—	—	—	1	—	1/0
Sphenisciformes								
Spheniscus demersus	Blackfooted (Jackass) Penguin	37	—	6	2	2	—	15/13/11
Spheniscus humboldti	Humboldt's Penguin	2	2(2)	—	—	—	2(2)	1/1
Pelecaniformes								
Pelecanus onocrotalus	Eastern White Pelican	6	—	—	—	1	—	0/2/3
Pelecanus crispus	Dalmatian Pelican	1	—	—	—	—	—	0/1
Pelecanus occidentalis	Brown Pelican	4	—	—	—	1	—	0/0/3
Morus bassanus	Gannet	4	—	—	—	—	—	1/0/3
Phalacrocorax carbo	Cormorant	6	—	—	—	—	—	1/5
Phalacrocorax aristotelis	Shag	3	—	—	—	—	—	2/1
Ciconiiformes								
Nycticorax nycticorax	Night Heron	3	—	—	—	1	—	0/0/2
Ardeola ibis	Cattle Egret	5	3	6	—	1	—	3/3/7
Butorides striatus	Striated Heron	1	—	—	—	1	—	—
Ardea cinerea	Grey Heron	4	—	—	—	—	—	0/0/4
Ciconia abdimii	Abdim's Stork	26	—	8	—	4	6	8/8/8
Ephippiorhynchus asiaticus	Black-necked Stork	1	—	—	—	—	1	—
Leptoptilos crumeniferus	Marabou Stork	2	—	—	—	—	—	1/1
Threskiornis aethiopicus	Sacred Ibis	35	—	11	8	3	2	14/14/5
Eudocimus ruber	Scarlet Ibis	5	—	—	—	—	—	3/2
Platalea alba	African Spoonbill	—	6	—	—	—	—	0/0/6
Phoenicopterus chilensis	Chilean Flamingo	39	—	—	—	—	—	1/1/37
Anseriformes								
Dendrocygna bicolor	Fulvous Whistling Duck	3	—	—	—	1	—	0/0/2
Dendrocygna viduata	White-faced Tree Duck	14	—	—	—	2	—	3/4/5
Dendrocygna arborea	Cuban Tree Duck	1	—	—	—	—	—	0/1
Branta sandvicensis	Hawaiian Goose	7	—	—	—	—	4	1/2
Branta bernicla orientalis	Brent Goose	7	—	—	—	2	—	3/2
Cereopsis novaehollandiae	Cape Barren Goose	2	—	—	—	—	—	1/1
Aix sponsa	Carolina Duck	5	—	—	—	—	—	3/2
Aix galericulata	Mandarin Duck	4	—	—	—	—	2	1/1
Callonetta leucophrys	Ringed Teal	17	—	4	3	4	—	7/7
Chenonetta jubata	Maned Goose	2	—	—	—	—	—	1/1
Anas penelope	Wigeon	4	—	—	—	—	1	1/2
Anas americana	American Wigeon	2	—	—	—	—	—	1/1
Anas sibilatrix	Chiloe Wigeon	10	1	—	—	—	2	2/2/5
Anas sibilatrix × *Aythya fuligula*	Chiloe Wigeon × Tufted Duck	2	—	—	—	—	—	1/1
Anas strepera	Gadwall	2	—	—	—	—	—	1/1
Anas crecca	Teal	4	—	—	—	—	—	2/2
Anas flavirostris oxyptera	Sharp-winged Teal	1	—	—	—	—	—	0/1
Anas platyrhynchus laysanensis	Laysan Teal	1	—	—	—	—	—	1/0
Anas acuta	Pintail	4	—	—	—	—	3	1/0
Anas bahamensis	Bahama Pintail	4	—	—	—	—	—	1/3
Anas versicolor puna	Puna Teal	4	—	—	—	—	—	2/2
Anas punctata	Hottentot Teal	2	—	—	—	—	—	1/1
Anas querquedula	Garganey	1	1	—	—	1	—	0/1
Anas platalea	Argentine Red Shoveler	2	—	—	—	1	—	1/0
Anas clypeata	Shoveler	4	—	—	—	—	2	1/1
Marmaronetta angustirostris	Marbled Teal	4	—	—	—	1	—	0/0/3
Netta rufina	Red-crested Pochard	3	3(3)	—	—	—	1	3/2
Aythya valisineria	Canvasback	4	—	—	—	—	—	2/2
Aythya ferina	European Pochard	3	—	—	—	—	—	1/2
Aythya fuligula	Tufted Duck	6	—	—	—	—	—	3/3
Somateria mollissima	Eider Duck	14	—	3	3	1	—	6/7
Bucephala clangula	Goldeneye	2	—	—	—	—	—	1/1
Mergus albellus	Smew	2	1	—	—	1	—	1/1
Mergus merganser	Goosander	5	—	2	2	—	—	1/4
Oxyura jamaicensis jamaicensis	North American Ruddy Duck	6	—	—	—	—	—	3/3
Falconiformes								
Milvus migrans parasitus	Black Kite (Yellow-billed race)	1	—	—	—	—	—	0/1
Milvus migrans migrans	Black Kite	1	—	—	—	—	—	1/0

		1	2	3	4	5	6	7
Haliastur indus	Brahminy Kite	1	—	—	—	—	—	1/0
Neophron percnopterus percnopterus	Egyptian Vulture	1	—	—	—	—	—	1/0
Terathopius ecaudatus	Bateleur Eagle	3	—	—	—	—	1	1/1
Polyboroides typus	Harrier Hawk	2	—	2	2	—	—	1/1
Butastur rufipennis	Grasshopper Buzzard	1	—	—	—	—	—	0/1
Heterospizias meridionalis	Savannah Hawk	1	—	—	—	—	—	1/0
Buteo buteo	Buzzard	1	—	—	—	—	—	0/1
Buteo regalis	Ferruginous Buzzard	2	—	—	—	—	—	1/1
Polyborus plancus plancus	Common Caracara	1	—	—	—	—	—	1/0
Polihierax semitorquatus	African Pygmy Falcon	2	—	1	1	—	—	1/1
Galliformes								
Penelope purpurascens	Crested Guan	2	1	—	—	1	—	1/1
Crax fasciolata	Bare-faced Curassow	2	—	—	—	—	—	1/1
Francolinus francolinus	Black Francolin	3	1	—	—	2	—	1/1
Francolinus pondicerianus	Indian Grey Francolin	10	—	—	—	—	6	1/3
Rollulus rouloul	Crested Wood Partridge	4	—	—	—	1	—	1/2
Bambusicola thoracica	Chinese Bamboo Partridge	2	—	—	—	—	—	1/1
Tragopan satyra	Satyr Tragopan	2	1	—	—	1	—	1/1
Pucrasia macrolophus	Koklass Pheasant	1	1	3	3	—	—	1/1
Lophophorus impeyanus	Impeyan Pheasant	2	—	4	2	—	2	1/1
Gallus sonneratii	Sonnerat's Jungle Fowl	2	—	—	—	1	—	1/0
Lophura leucomelana leucomelana	Nepal Kalij Pheasant	1	—	—	—	—	1	—
Lophura swinhoii	Swinhoe's Pheasant	2	—	7	—	—	6	2/1
Lophura ignita ignita	Bornean Crested Fireback	2	1	—	—	—	1	1/1
Lophura diardi	Siamese Fireback Pheasant	2	—	1	—	—	1	1/1
Crossoptilon crossoptilon	White Eared Pheasant	2	1	—	—	—	1	1/1
Crossoptilon auritum	Blue Eared Pheasant	2	—	—	—	—	—	1/1
Catreus wallichi	Cheer Pheasant	2	—	4	1	—	3	1/1
Syrmaticus ellioti	Elliot's Pheasant	1	1	—	—	—	—	1/1
Syrmaticus humiae	Hume's Bar-tailed Pheasant	2	1	7	1	1	6	1/1
Syrmaticus mikado	Mikado Pheasant	2	—	—	—	—	—	1/1
Syrmaticus soemmerringi scintillans	Scintillating Copper Pheasant	1	—	—	—	—	—	1/0
Syrmaticus reevesi	Reeves's Pheasant	2	—	1	1	—	—	1/1
Chrysolophus pictus	Golden Pheasant	2	—	3	3	—	—	1/1
Polyplectron bicalcaratum	Grey Peacock Pheasant	2	—	—	—	1	—	1/0
Polyplectron emphanum	Palawan Peacock Pheasant	—	2	—	—	—	—	2/0
Pavo cristatus	Common Peafowl	2	—	—	—	—	—	1/1
Afropavo congensis	Congo Peafowl	4	—	7	4	3	—	2/2
Acryllium vulturinum	Vulturine Guineafowl	11	—	3	—	2	—	4/5/3
Gruiformes								
Grus japonensis	Red-crowned Crane	2	—	—	—	—	—	1/1
Grus vipio	White-naped Crane	2	—	—	—	—	—	1/1
Grus antigone	Sarus Crane	2	—	—	—	—	—	1/1
Bugeranus carunculatus	Wattled Crane	2	—	—	—	—	2	—
Anthropoides virgo	Demoiselle Crane	5	—	1	—	—	—	2/3/1
Anthropoides paradisea	Stanley Crane	2	—	—	—	—	—	1/1
Balearica regulorum	South African Crowned Crane	6	—	3	—	—	—	3/3/3
Laterallus leucopyrrhus	White-breasted (Red and white) Crake	2	—	—	—	—	—	1/1
Lissotis melanogaster melanogaster	Black-bellied Bustard	1	—	—	—	—	—	1/0
Rallus aquaticus	Water Rail	2	—	—	—	—	1	1/0
Charadriiformes								
Haematopus ostralegus	Oystercatcher	4	—	—	—	1	—	2/1
Himantopus himantopus	Black-winged Stilt	1	—	—	—	—	—	0/0/1
Recurvirostra avosetta	Avocet	8	—	—	—	3	—	2/2/1
Burhinus oedicnemus	Stone Curlew	11	—	2	1	1	3	3/3/2
Vanellus vanellus	Lapwing	1	5	—	—	1	—	2/2/1
Glareola pratincola	Collared Pratincole	1	—	—	—	—	—	1/0
Charadrius hiaticula	Ringed Plover	1	—	—	—	1	—	—
Numenius arquata	Curlew	2	—	—	—	—	—	0/0/2
Tringa totanus	Redshank	2	—	—	—	—	—	0/0/2
Arenaria interpres	Turnstone	3	—	—	—	—	—	0/0/3
Philomachus pugnax	Ruff	2	—	—	—	1	—	0/1
Larus cirrocephalus poiocephalus	Grey-headed Gull	21	—	—	—	1	—	0/0/20
Larosterna inca	Inca Tern	4	—	—	—	—	1	1/1/1
Uria aalge	Guillemot (Murre)	1	1	—	—	—	—	0/0/2
Columbiformes								
Pterocles alchata	Pintailed Sandgrouse	8	—	—	—	3	—	4/1
Columba guinea	Speckled Pigeon	25	—	—	—	1	—	0/0/24
Columba picazuro	Picazuro Pigeon	1	—	—	—	1	—	—

		1	2	3	4	5	6	7
Streptopelia vinacea	Vinaceous Dove	2	—	—	—	—	—	1/1
Streptopelia tranquebarica humilis	Dwarf (Red) Turtle Dove	1	—	—	—	—	—	1/0
Streptopelia chinensis chinensis	Chinese Necklace Dove	2	—	—	—	1	—	0/0/1
Turtur tympanistria	Tambourine Dove	1	—	—	—	—	—	0/1
Phaps elegans	Brush Bronzewing	1	—	—	—	—	—	0/1
Ocyphaps lophotes	Crested Pigeon	6	—	—	—	—	—	0/0/6
Geopelia cuneata	Diamond Dove	1	—	—	—	—	—	1/0
Zenaida auriculata	Violet-eared Dove	2	—	—	—	1	—	0/1
Geotrygon versicolor	Mountain Witch Dove	1	—	—	—	—	—	0/0/1
Ducula badia cuprea	Jerdon's Imperial Pigeon	2	—	—	—	1	—	0/1
Ducula bicolor	Pied Imperial Pigeon	1	—	—	—	—	—	0/0/1
Psittaciformes								
Eolophus roseicapillus	Roseate Cockatoo (Galah)	2	—	—	—	—	—	1/1
Cacatua galerita	Greater Sulphur-crested Cockatoo	1	—	—	—	—	1(1)	—
Cacatua alba	White-crested Cockatoo	1	—	—	—	—	—	0/1
Cacatua tenuirostris pastinator	Western Slender-billed Cockatoo	2	—	2	2	—	—	1/1
Nymphicus hollandicus	Cockatiel	12	1	—	—	1	6	2/1/3
Nestor notabilis	Kea	2	—	—	—	—	—	1/1
Polytelis swainsoni	Barraband (Superb) Parrakeet	6	3	—	—	2	—	3/2/2
Polytelis anthopeplus	Rock Peplar (Regent Parrot)	12	2	1	—	3	—	5/3/4
Polytelis alexandrae	Princess of Wales' Parrakeet	5	—	—	—	1	—	1/1/2
Platycercus elegans	Pennant's Parrakeet (Crimson Rosella)	1	2	—	—	2	—	0/1
Platycercus eximius eximius	Eastern Rosella	1	—	—	—	—	—	1/0
Melopsittacus undulatus	Budgerigar	7	—	—	—	2	5	—
Psittacus erithacus	Grey Parrot	2	—	—	—	—	—	1/1
Poicephalus rueppellii	Ruppell's Parrot	2	—	—	—	—	—	1/1
Loriculus vernalis	Vernal Hanging Parrot	2	—	—	—	—	—	1/1
Psittacula krameri manillensis	Indian Ring-necked Parrakeet	8	—	—	—	—	5	2/1
Anodorhynchus hyacinthinus	Hyacinthine Macaw	2	—	—	—	—	—	1/1
Ara chloroptera	Green-winged Macaw	2	—	—	—	—	—	1/1
Aratinga solstitialis	Sun Conure	3	—	—	—	—	1	1/1
Cyanoliseus patagonus byroni	Greater Patagonian Conure	4	—	—	—	—	—	2/2
Myiopsitta monachus	Quaker (Monk) Parrakeet	—	6	—	—	—	—	3/3
Brotogeris versicolurus chiriri	Canary-winged Parrakeet	1	—	—	—	—	1	—
Brotogeris pyrrhopterus	Orange-flanked Parrakeet	2	1	—	—	1	—	1/1
Amazona ochrocephala	Yellow-fronted Amazon Parrot	1	—	—	—	—	—	1/0
Amazona amazonica	Orange-winged Amazon Parrot	1	—	—	—	—	1	—
Cuculiformes								
Tauraco erythrolophus	Red-crested Turaco	3	—	1	1	1	—	1/1
Tauraco hartlaubi	Hartlaub's Turaco	3	—	—	—	—	—	2/1
Tauraco leucotis	White-cheeked Turaco	7	—	1	—	—	—	0/0/8
Tauraco persa corythaix	Knysna Turaco	1	—	—	—	—	—	0/1
Tauraco persa livingstoni	Livingstone's Turaco	—	2	—	—	—	—	0/0/2
Eudynamys scolopacea chinensis	Chinese Koel	1	—	—	—	—	—	0/1
Strigiformes								
Tyto alba	Barn Owl	4	—	1	—	—	—	1/2/2
Otus bakkamoena	Collared Scops Owl	2	—	—	—	—	—	1/1
Otus leucotis	White-faced Scops Owl	13	—	6	—	1	6(2)	1/5/6
Bubo virginianus	Great Horned Eagle Owl	3	—	1	—	—	2	1/1
Bubo bubo bubo	European Eagle Owl	2	—	—	—	—	—	1/1
Bubo bubo bengalensis	Bengal Eagle Owl	1	—	—	—	—	—	1/0
Bubo bubo turcomanus	Turkmenian Eagle Owl	2	—	3	—	1	2	1/1
Bubo capensis mackinderi	Kenya Eagle Owl	2	—	2	—	—	2	1/1
Bubo africanus africanus	Spotted Eagle Owl	5	—	—	—	—	3	1/1
Bubo africanus cinerascens	Abyssinian Spotted Eagle Owl	2	—	—	—	—	—	1/1
Bubo vosseleri	Nduk Eagle Owl	2	—	—	—	—	—	2/0
Scotopelia bouvieri	Vermiculated Fishing Owl	1	—	—	—	—	—	1/0
Pulsatrix perspicillata	Spectacled Owl	2	—	1	—	1	—	0/1/1
Nyctea scandiaca	Snowy Owl	2	—	—	—	—	—	1/1
Ninox novaeseelandiae	Boobook Owl	2	—	2	—	—	2	1/1
Athene noctua	Little Owl	—	2(2)	—	—	—	—	1/1
Athene brama	Spotted Owlet	2	—	—	—	—	—	1/1
Speotyto cunicularia	Burrowing Owl	—	2	—	—	—	—	1/1
Strix hylophila	Rusty Barred Owl	1	—	—	—	—	—	0/1
Strix uralensis	Ural Owl	6	2	—	—	—	4(2)	2/2
Strix nebulosa	Great Grey Owl	2	—	—	—	—	—	1/1
Asio otus	Long-eared Owl	2	—	—	—	—	—	1/1
Asio flammeus	Short-eared Owl	1	—	—	—	—	—	1/0

		1	2	3	4	5	6	7
Trogoniformes								
Pharomachrus auriceps (Gould) S	Golden-headed Quetzal	—	2	—	—	—	—	1/1
Coraciiformes								
Dacelo novaeguineae	Kookaburra	7	—	4	3	—	1	2/4/1
Momotus momota	Blue-crowned Motmot	1	—	—	—	—	—	0/1
Coracia caudata	Lilac-breasted Roller	2	—	—	—	—	—	0/0/2
Tockus alboterminatus	Crowned Hornbill	1	—	—	—	—	—	0/1
Tockus erythrorhynchus	Red-billed Hornbill	3	—	—	—	—	—	2/1
Tockus flavirostris	Yellow-billed Hornbill	—	3	—	—	—	1	1/1
Penelopides panini	Tarictic Hornbill	6	—	1	1	1	—	1/4
Aceros undulatus	Wreathed Hornbill	1	—	—	—	—	—	0/1
Anthracoceros malayanus	Black Hornbill	1	—	—	—	—	1	—
Anthracoceros coronatus convexus	Southern Pied Hornbill	3	—	—	—	—	—	1/2
Bycanistes subcylindricus	Black and White Casqued Hornbill	2	—	—	—	—	—	1/1
Buceros bicornis	Great Indian Hornbill	1	—	—	—	—	—	0/1
Buceros hydrocorax	Rufous Hornbill	2	—	—	—	—	—	1/1
Piciformes								
Psilopogon pyrolophus	Fire-tufted Barbet	2	—	—	—	—	—	1/1
Megalaima virens	Giant Barbet	—	1	—	—	—	—	0/0/1
Tricholaema lacrymosum	Spotted-flanked Barbet	1	—	—	—	—	—	1/0
Trachyphonus darnaudii	D'Arnaud's Barbet	1	—	—	—	—	—	0/0/1
Pteroglossus aracari	Black-necked Aracari	2	—	—	—	—	—	1/1
Pteroglossus castanotis	Chestnut-eared Aracari	1	—	—	—	—	—	0/1
Baillonius bailloni	Saffron Toucanet	3	1	—	—	—	2	1/1
Ramphastos tucanus	Red-billed Toucan	2	—	—	—	—	—	1/1
Ramphastos swainsonii	Swainson's Toucan	1	—	—	—	—	—	0/1
Melanerpes candidus	White Woodpecker	2	—	—	—	1	—	0/1
Picoides major	Great Spotted Woodpecker	1	—	—	—	1	—	—
Passeriformes								
Procnias nudicollis	Naked-throated Bellbird	1	—	—	—	—	—	1/0
Pycnonotus cafer bengalensis	Red-vented Bulbul	2	—	—	—	—	—	0/0/2
Hypsipetes madagascariensis	Black Bulbul	1	—	—	—	1	—	—
Irena puella	Fairy Bluebird	1	—	—	—	—	—	0/1
Turdus olivaceus	African (Olive) Thrush	4	—	—	—	—	—	1/1/2
Turdoides caudatus	Common Babbler	—	1	—	—	—	—	0/0/1
Garrulax albogularis	White-throated Jay Thrush	1	—	—	—	—	—	0/0/1
Garrulax leucolophus	White-crested Laughing Thrush	3	—	—	—	1	—	1/1
Garrulax pectoralis	Necklaced Laughing Thrush	1	—	—	—	—	—	0/0/1
Garrulax chinensis	Black-throated Laughing Thrush	5	—	—	—	—	—	2/2/1
Garrulax cinerasceus	Moustached Laughing Thrush	1	—	—	—	1	—	—
Garrulax sannio	White-browed Laughing Thrush	2	—	—	—	—	—	0/0/2
Leiothrix lutea	Pekin Robin (Red-billed Leiothrix)	8	1	—	—	—	—	0/0/9
Zosterops sp.	White-eye	6	—	—	—	2	—	0/0/4
Zosterops flava	Javan White-eye	1	—	—	—	—	—	1/0
Zosterops simplex	Chinese White-eye	1	—	—	—	—	—	0/0/1
Melophus lathami	Black-crested Bunting	—	3	—	—	—	—	2/1
Emberiza rutila	Chestnut Bunting	1	—	—	—	1	—	—
Sicalis flaveola	Saffron Finch	8	—	—	—	4	—	1/1/2
Volatinia jacarini	Jacarini Finch (Blue-black Grassquit)	1	—	—	—	—	—	0/1
Sporophila torqueola	White-collared Seedeater	2	—	—	—	1	—	0/0/1
Sporophila luctuosa	Black & White Seedeater	2	—	—	—	—	—	1/1
Gubernatrix cristata	Green Cardinal	1	—	—	—	—	1	—
Paroaria coronata	Red-crested Cardinal	1	—	—	—	—	—	0/1
Ramphocelus carbo	Silver-beaked Tanager	2	—	—	—	—	—	1/1
Ramphocelus flammigerus icteronotus	Lemon-rumped Tanager	1	—	—	—	—	—	0/1
Thraupis episcopus	Blue Grey Tanager	1	—	—	—	—	—	0/0/1
Cyanerpes cyaneus	Red-legged Honeycreeper	1	—	—	—	—	—	0/1
Cacicus melanicterus	Mexican Cacique	1	—	—	—	—	—	0/1
Gnorimopsar chopi	Chopi Grackle	3	—	—	—	2	—	0/1
Molothrus bonariensis	Shiny Cowbird	2	—	—	—	1	—	1/0
Serinus mozambicus	Green Singing Finch (Yellow-fronted Canary)	5	—	—	—	1	—	2/2
Serinus flaviventris	St. Helena Seedeater (Yellow Canary)	1	—	—	—	1	—	—
Carduelis chloris	Greenfinch	—	7	—	—	3	—	0/0/4
Carpodacus mexicanus	Mexican Rose Finch (House Finch)	3	—	—	—	—	—	2/1
Pytilia phoenicoptera	Red-winged Pytilia	1	—	—	—	1	—	—

		1	2	3	4	5	6	7
Lagonosticta rufopicta	Bar-breasted Fire Finch	1	—	—	—	1	—	—
Estrilda melpoda	Orange-cheeked Waxbill	2	—	—	—	—	—	1/0/1
Estrilda troglodytes	Red-eared (Black-rumped) Waxbill	*4	—	—	—	1	—	0/2/1
Amandava amandava	Avadavat	1	—	—	—	—	—	1/0
Amandava amandava punicea	Strawberry Finch	2	—	—	—	1	—	0/1
Amandava formosa	Green Avadavat	2	—	—	—	—	—	1/1
Amandava subflava	Golden-breasted Waxbill	8	—	—	—	6	—	1/1
Neochima ruficauda	Star Finch	1	—	—	—	—	—	1/0
Poephila guttata	Zebra Finch	2	—	—	—	2	—	—
Poephila bichenovii	Bicheno's (Double-barred) Finch	1	—	—	—	—	—	0/1
Poephila acuticauda hecki	Heck's Grass Finch	5	—	—	—	1	—	1/2/1
Erythrura trichroa	Blue-faced Parrot Finch	2	—	—	—	—	—	1/1
Lonchura malabarica cantans	African Silverbill	1	—	—	—	—	—	1/0
Lonchura striata (domesticated)	Bengalese Finch	1	—	—	—	—	—	1/0
Lonchura molucca	Moluccan Mannikin	1	—	—	—	—	—	1/0
Lonchura maja	White-headed Mannikin (Munia)	1	—	—	—	1	—	—
Lonchura pallida	Pallid Finch	1	—	—	—	—	—	1/0
Padda oryzivora	Java Sparrow	3	—	—	—	1	—	1/1
Amadina fasciata	Cut-throat Finch	2	—	—	—	1	—	0/0/1
Ploceus cucullatus	Spotted-backed Weaver	1	1	—	—	2	—	—
Ploceus jacksoni	Golden-backed Weaver	—	1	—	—	—	—	1/0
Foudia flavicans	Rodriguez Fody	—	4	—	—	—	—	2/2
Quelea quelea	Red-beaked Weaver (Quelea)	2	—	—	—	—	—	1/0/1
Euplectes afer	Napoleon Weaver (Yellow-crowned Weaver)	1	—	—	—	—	—	1/0
Vidua chalybeata	Combassou (Green Indigo Bird)	3	—	—	—	1	—	1/1
Lamprotornis purpureus	Purple Glossy Starling	6	—	—	—	1	—	3/2
Lamprotornis chalybaeus	Green (Blue-eared) Glossy Starling	4	—	—	—	—	—	3/1
Spreo superbus	Superb Glossy Starling	5	2	1	1	2	—	3/2
Creatophora cinerea	Wattled Starling	4	—	—	—	—	—	3/1
Sturnus roseus	Rose-coloured Starling	4	—	—	—	1	—	2/1
Sturnus contra	Asian Pied Starling	1	—	—	—	—	—	1/0
Sturnus vulgaris	Common Starling	1	—	—	—	—	—	1/0
Leucopsar rothschildii	Rothschild's Grackle	9	—	—	—	1	—	4/4
Acridotheres cristatellus	Chinese Crested Mynah	3	—	—	—	—	—	2/1
Gracula religiosa religiosa	Javan Hill Mynah	2	—	—	—	1	—	0/1
Gracula religiosa intermedia	Nepal Hill Mynah	5	—	—	—	—	—	2/1/2
Cyanocorax cyanopogon	Pileated (White-naped) Jay Thrush	2	—	—	—	—	—	1/1
Corvus corax corax	Raven	2	—	—	—	—	—	1/1
Corvus albicollis	White-necked Raven	1	—	—	—	—	—	0/1
Domestic								
	Common Duck	3	—	—	—	1	—	1/1
	Old English Game Bantam	4	—	—	—	—	—	1/3
	Domestic Chicken	2	—	8	1	7	—	1/1
Total: Birds		**963**	**83(7)**	**124**	**46**	**129**	**111(9)**	**884**

REPTILES

Testudines								
Chelydra chelydra serpentina	Common Snapper	—	2	—	—	—	—	0/0/2
Sternotherus odoratus	Stinkpot	2	—	—	—	—	—	1/1
Kinosternon subrubrum	Eastern Mud Terrapin	1	—	—	—	—	—	0/0/1
Kinosternon scorpioides	Scorpion Mud Terrapin	2	—	—	—	—	—	1/1
Pseudemys scripta dorbignyi	South American Ornate Terrapin	2	—	—	—	—	—	0/2
Pseudemys scripta elegans	Red-eared Terrapin	5	1	—	—	—	—	1/3/2
Emys orbicularis	European Pond Tortoise	3	—	—	—	—	—	2/1
Terrapene carolina	Carolina Box Terrapin	1	—	—	—	—	—	0/1
Terrapene carolina triunguis	Three-toed Box Terrapin	2	—	—	—	—	—	1/1
Testudo graeca	Spur-thighed Tortoise	9	5	—	—	1	—	3/10
Testudo hermanni	Hermann's Tortoise	4	—	—	—	—	—	2/2
Malachocherus tornieri	Pancake Tortoise	—	2	—	—	—	—	0/0/2
Geochelone carbonaria	Red-footed Tortoise	1	—	—	—	—	—	1/0
Eretmochelys imbricata	Hawksbill Turtle	2	1	—	—	—	—	0/1/2
Chelus fimbriatus	Matamata	1	5	—	—	—	—	0/1/5
Chelodina longicollis	Long-necked Terrapin	6	—	—	—	—	—	2/4
Trionyx hurum	Peacock Soft-shelled Turtle	2	—	—	—	—	—	1/1

		1	2	3	4	5	6	7
Crocodylia								
Alligator mississippiensis	American Alligator	3	—	—	—	—	—	1/2
Alligator sinensis	Chinese Alligator	3	—	—	—	—	—	1/2
Sauria								
Sp. inc.	Gecko	1	—	—	—	—	—	0/0/1
Teratoscincus scincus	Frog-eyed Sand Gecko	—	2	—	—	—	—	1/1
Stenodactylus sthenodactylus	Elegant Gecko	11	—	—	—	3	—	0/0/8
Hemitheconyx caudicinctus	Fat-tailed Gecko	28	1	4	—	5	4	3/8/13
Chondrodactylus angulifer	Namib Sand Gecko	24	—	14	—	5	10	7/11/5
Cyrtodactylus pulchellus	Malayan Bent-toed Gecko	5	—	—	—	—	—	0/0/5
Gekko gecko	Tokay Gecko	2	—	—	—	—	—	1/1
Coleonyx variegatus	Western Banded Gecko	11	—	12	1	3	11	0/0/8
Eublepharis macularius[1]	Leopard Ground Gecko	21	—	5	—	2	5	6/11/2
Anolis richardi	Richard's Anole	2	—	—	—	—	—	0/0/2
Corythophanes cristatus	Abbess Lizard	2	—	—	—	—	—	0/0/2
Laemanctus longipes deborrei	Casque-headed Lizard	1	—	—	—	—	—	0/1
Basiliscus vittatus	Banded Basilisk	5	—	23	5	2	13	0/0/8
Basiliscus plumifrons	Plumed Basilisk	3	—	—	—	—	—	1/1/1
Cyclura cornuta	Rhinoceros Iguana	7	—	—	—	—	—	3/2/2
Iguana iguana	Common Iguana	—	1	—	—	—	—	0/0/1
Dipsosaurus dorsalis	Desert Iguana	5	—	—	—	5	—	—
Sauromalus obesus	Chuckwalla	12	—	—	—	3	—	0/0/9
Sceloporus orcutti	Granite Spiny Lizard	3	—	—	—	2	1	—
Sceloporus magister	Desert Spiny Lizard	4	—	—	—	4	—	—
Amphibolurus vitticeps	Inland Bearded Dragon	8	—	21	—	5	20	0/0/4
Physignathus lesueurii	Eastern Water Dragon	6	—	—	—	—	—	1/4/1
Uromastyx hardwickii	General Hardwick's Dabb Lizard	5	—	—	—	—	—	0/0/5
Chamaeleo dilepis	Flap-necked Chameleon	6	—	—	—	4	—	0/0/2
Egernia striolata	Australian Tree Skink	9	—	2	—	—	6	1/1/3
Sphenomorphus quoyii	Golden Water Skink	2	—	—	—	—	—	1/1
Trachydosaurus rugosus	Shingleback	3	—	—	—	—	—	1/2
Tiliqua scincoides scincoides	Eastern Blue-tongued Skink	1	—	—	—	—	—	1/0
Tiliqua scincoides intermedia	Northern Blue-tongued Skink	1	3	—	—	—	—	1/0/3
Tiliqua nigrolutea	Blotched Blue-tongued Skink	2	—	—	—	—	—	0/0/2
Mabuya brevicollis	Short-necked Skink	1	—	—	—	1	—	—
Leiolopisma telfairii	Round Island Skink	5	—	—	—	1	—	1/0/3
Chalcides ocellatus	Eyed Skink	3	—	—	—	—	—	1/1/1
Gerrhosaurus major	Greater Plated Lizard	4	1	—	—	—	2	2/1
Lacerta agilis	Sand Lizard	1	—	—	—	1	—	—
Lacerta lepida	Eyed Lizard	4	1	13	—	2	13	2/1
Lacerta vivipara	Common Lizard	1	—	—	—	1	—	—
Cnemidophorus tigris	Whip-tailed Lizard	7	—	—	—	3	4	—
Trogonophis wiegmanni	Wiegmann's Burrowing Lizard	1	—	—	—	—	—	0/0/1
Varanus griseus	Grey Monitor	1	—	—	—	—	—	0/0/1
Varanus exanthematicus exanthematicus	Bosc's Monitor	1	6	—	—	2	—	1/0/4
Heloderma suspectum suspectum	Reticulated Gila Monster	5	2	2	—	—	—	3/4/2
Heloderma suspectum cinctum SS Bogert & Campo	Banded Gila Monster	—	2	—	—	—	—	1/1
Gerrhonotus multicarinatus	Southern Alligator Lizard	6	—	—	—	—	6	—
Ophisaurus apodus	European Glass Snake	2	—	—	—	—	—	0/0/2
Anguis fragilis	Slow-worm	2	—	—	—	1	—	1/0
Cordylus giganteus	Sungazer	7	1	—	—	—	—	0/0/8
Cordylus warreni breyeri	Breyer's Girdled Lizard	1	—	—	—	—	—	1/0
Pseudocordylus microlepidotus	Small-scaled Girdled Lizard	1	—	—	—	—	—	0/1
Serpentes								
Liasis fuscus	Australian Water Python	5	—	—	—	—	—	2/3
Liasis boa	Bismark Ringed Python	1	—	—	—	—	—	1/0
Morelia spilotus spilotus	Diamond Python	1	—	—	—	—	—	1/0
Morelia spilotus variegatus	Carpet Python	2	—	—	—	1	1	—
Python reticulatus	Reticulated Python	—	1	—	—	—	1	—
Python molurus bivittatus	Burmese Rock Python	4	—	—	—	1	1	1/1
Python regius	Royal Python	3	3	—	—	—	—	1/0/5
Eunectes notaeus	Yellow Anaconda	3	—	—	—	—	—	1/2
Boa constrictor	Boa Constrictor	8	2	2	—	3	1	2/3/3
Lichanura trivirgata roseofusca	Coastal Rosy Boa	—	3	—	—	—	—	0/0/3
Lichanura trivirgata gracia SS Klauber	Desert Rosy Boa	—	3	—	—	—	—	0/0/3
Drymarchon corais couperi	Eastern Indigo Snake	1	—	—	—	—	—	0/0/1
Elaphe guttata	Corn Snake	2	—	5	—	—	7	—
Elaphe obsoleta obsoleta	Black Rat Snake	1	1	—	—	—	—	1/0/1
Elaphe obsoleta quadrivittata	Yellow Rat Snake	1	2	—	—	—	1	0/0/2
Elaphe obsoleta spiloides	Gray Rat Snake	2	—	—	—	—	2	—

		1	2	3	4	5	6	7
Elaphe radiata	Radiated Rat Snake	—	4	—	—	2	—	0/0/2
Elaphe shrenckii anomala S Boulenger	Chinese Rat Snake	—	2	—	—	—	—	1/1
Coluber najadum	Dahl's Whip Snake	1	—	—	—	—	—	1/0
Pituophis catenifer deserticola	Desert Gopher Snake	—	5	—	—	—	—	0/0/5
Pituophis melanoleucus melanoleucus	Northern Pine Snake	3	—	—	—	—	—	2/1
Pituophis melanoleucus sayi	Bull Snake	2	—	—	—	1	1	—
Hydrodynastes gigas	Boipevassu Snake	5	2	—	—	—	—	1/0/6
Heterodon nasicus	Western Hog-nosed Snake	—	2	—	—	—	—	0/0/2
Coronella austriaca	Smooth Snake	1	1	—	—	—	—	1/0/1
Lampropeltis getulus holbrooki	Speckled King Snake	2	—	—	—	—	2	—
Lampropeltis getulus californiae	Californian King Snake	2	1	4	—	—	2	1/1/3
Lampropeltis triangulum sinaloae	Sinaloan Milk Snake	4	—	—	—	1	—	2/1
Lampropeltis triangulum hondurensis	Honduras King Snake	4	—	2	—	1	3	0/0/2
Lampropeltis triangulum annulata	Mexican Milk Snake	3	—	—	—	1	—	1/1
Lampropeltis triangulum campbelli	Pueblan King Snake	3	—	—	—	1	—	1/1
Sibon nebulata nebulata	Clouded Snail-eating Snake	1	—	—	—	—	1	—
Psammophis subtaeniatus	Peter's Long-lined Snake	2	—	—	—	—	—	0/0/2
Dispholidus typus	Boomslang	—	2	—	—	—	—	0/0/2
Oxyuranus scutellatus	Taipan	3	—	—	—	—	—	1/2
Notechis scutatus	Tiger Snake	2	—	—	—	—	—	1/1
Bungarus fasciatus	Banded Krait	—	3	—	—	3	—	—
Walterinnesia aegyptia	Innes' Cobra	3	—	—	—	1	—	0/2
Naja melanoleuca	Black & White Cobra	1	2	—	—	—	—	1/0/2
Naja mossambica pallida	Mozambique Spitting Cobra	2	—	—	—	1	—	0/1
Naja naja kaouthia	Monocellate Cobra	2	1	—	—	1	—	1/0/1
Micrurus fulvius	Eastern Coral Snake	—	4	—	—	—	—	0/0/4
Dendroaspis viridis	Hallowell's Green Mamba	1	—	—	—	1	—	—
Dendroaspis angusticeps	Common Green Mamba	—	2	—	—	—	—	1/1
Dendroaspis polylepis	Black Mamba	—	2	—	—	—	—	0/0/2
Vipera berus	Adder	3	—	—	—	2	—	0/0/1
Vipera ammodytes ammodytes	Western Long-nosed Viper	—	5	—	—	—	1	3/1
Vipera ammodytes meridionalis	Eastern Long-nosed Viper	3	1	—	—	3	1	—
Vipera russelli siamensis	Russell's Viper	5	—	—	—	1	—	1/0/3
Bitis arietans	Puff Adder	1	1	—	—	—	—	0/1/1
Bitis gabonica gabonica	Gaboon Viper	4	—	—	—	—	2	1/1
Cerastes cerastes	Horned Cerastes Viper	—	1	—	—	—	—	0/1
Echis carinatus sochureki	Saw-scaled Viper	16	—	24	—	7	9	1/2/21
Echis carinatus ocellatus SS Stemmler	West African Saw-scaled Viper	—	2	—	—	—	—	1/1
Echis carinatus leakeyi SS Stemmler & Sochurek	East African Saw-scaled Viper	—	2	—	—	1	—	0/1
Agkistrodon contortrix mokeson	Northern Copperhead	—	2	—	—	—	—	0/0/2
Calloselasma rhodostoma	Malayan Pit Viper	30	—	22	—	8	11	1/2/30
Trimeresurus purpureomaculatus	Mangrove Pit Viper	5	—	6	5	—	—	0/0/6
Sistrurus catenatus tergeminus	Western Massasauga	2	—	—	—	—	—	1/1
Crotalus durissus culminatus	North Western Neotropical Rattlesnake	4	—	—	—	—	2	1/1
Crotalus atrox	Western Diamond-back Rattlesnake	2	1	—	—	—	—	0/0/3
Crotalus viridis helleri	Southern Pacific Rattlesnake	—	1	—	—	—	—	0/1
Crotalus viridis oreganus	Northern Pacific Rattlesnake	—	1	—	—	—	—	0/1
Crotalus mitchelli	Speckled Rattlesnake	—	1	—	—	—	—	0/0/1
Crotalus cerastes	Sidewinder	—	1	—	—	—	—	0/0/1
	Total: Reptiles	**448**	**103**	**161**	**11**	**97**	**144**	**460**
AMPHIBIANS								
Gymnophiona								
?Typhlonectes sp.	Caecilian	—	3	8	3	2	—	0/0/6
Caudata								
Ambystoma maculatus	American Spotted Salamander	2	5	—	—	—	—	0/0/7
Ambystoma mexicanum	Axolotl	27	21	—	—	23	8	0/0/17
Ambystoma tigrinum	Tiger Salamander	—	3	—	—	—	—	0/0/3
Andrias japonicus	Japanese Giant Salamander	1	—	—	—	1	—	—
Cynops pyrrhogaster	Japanese Newt	2	—	—	—	—	2	—
Pleurodeles waltl	Spanish Ribbed Newt	4	1	50	25	—	14	0/0/16
Salamandra salamandra	Fire Salamander	20	—	15	8	—	—	0/0/27
Taricha granulosa	Rough-skinned Newt	2	10	—	—	—	—	0/0/12
Triturus alpestris	Alpine Newt	1	—	—	—	1	—	—
Triturus cristatus	Crested Newt	7	—	—	—	2	2	0/0/3
Triturus wolterstorfii	Dog-faced Newt	25	2	—	—	3	15	0/0/9
Tylototriton verrucosus	Chinese Salamander	4	2	—	—	1	—	0/0/5

		1	2	3	4	5	6	7
Anura								
Bombina orientalis	Oriental Fire-belly Toad	9	3	—	—	6	—	0/0/6
Bombina variegata	Yellow-bellied Toad	—	6	—	—	—	—	0/0/6
Bufo bufo	Common Toad	6	—	—	—	3	—	0/0/3
Bufo calamita	Natterjack Toad	2	—	—	—	—	—	2/0
Bufo marinus	Cane Toad	5	—	—	—	1	—	1/0/3
Bufo punctatus	Red-spotted Toad	2	—	—	—	—	—	0/0/2
Bufo sp.	Running Toad	1	—	—	—	1	—	—
Bufo terrestris	Southern Toad	1	—	—	—	1	—	—
Bufo viridis	Green Toad	5	—	—	—	2	—	1/1/1
Ceratophrys cranwelli	Horned Frog	—	2	—	—	—	—	0/0/2
Dendrobates auratus	Poison Arrow Frog	1	9	—	—	7	—	0/0/3
Dyscophus sp.	Tomato Frog	—	20	—	—	4	5	0/0/11
Hyla avivoca	Bird-voiced Tree Frog	2	—	—	—	2	—	—
Hyla cinerea	American Green Tree Frog	3	—	—	—	3	—	—
Hyla rubra	Daudin's Banana Frog	6	—	—	—	—	3	0/0/3
Hyla septentrionalis	Cuban Tree Frog	1	3	—	—	—	—	0/0/4
Hyla sp.	Tropical Tree Frog	4	1	—	—	3	—	0/0/2
Hymenochirus boettgeri	Dwarf Clawed Frog	10	—	—	—	2	—	0/0/8
Hyperolius sp.	Reed Frog	—	4	—	—	3	—	0/0/1
Kaloula pulchra	Malayan Bullfrog	1	—	—	—	1	—	—
Kaloula sp.	Malayan Bullfrog	1	—	—	—	—	1	—
Litoria caerula	White's Tree Frog	3	11	—	—	2	5	0/0/7
Litoria infrafrenata	Giant Tree Frog	—	2	—	—	1	—	0/0/1
Mantella aurantiaca	Golden Mantella	3	—	—	—	3	—	—
Pipa pipa	Surinam Toad	3	—	—	—	2	—	0/0/1
Pseudis paradoxa	Shrinking Frog	—	3	—	—	2	—	0/0/1
Pyxicephalus adspersa	African Bullfrog	—	1	—	—	—	—	0/0/1
Rana catesbeiana	American Bullfrog	4	6	—	—	2	3	0/0/5
Rana clamitans	Bronze Frog	—	2	—	—	1	—	0/0/1
Rana pipiens	Leopard Frog	2	—	—	—	—	—	0/0/2
Rana ridibunda	Marsh Frog	7	—	—	—	5	—	0/0/2
Rana temporaria	Common Frog	8	—	—	—	5	—	0/1/2
Polypedates dennysi	Bamboo Tree Frog	—	7	—	—	4	—	0/0/3
Polypedates leucomystax	Asian Tree Frog	—	2	—	—	1	—	0/0/1
Xenopus laevis	Clawed Frog	5	—	—	—	—	2	0/0/3
Xenopus tropicalis	Clawed Frog	9	—	—	—	1	2	0/0/6
	Total: Amphibians	**199**	**129**	**73**	**36**	**101**	**62**	**202**

WHIPSNADE WILD ANIMAL PARK

MAMMALS

Marsupialia								
Macropus rufogriseus	Red-necked Wallaby	518	—	119	—	30	161(3)	8/14/424
Primates								
Saimiri sciureus	Squirrel Monkey (Black-capped form)	16	—	4	1	—	1	2/7/9
Callithrix jacchus	Common Marmoset	6	—	—	—	—	—	2/1/3
Pan troglodytes	Chimpanzee	9	—	—	—	—	—	4/5
Rodentia								
Cynomys ludovicianus	Prairie Marmot	78	—	—	—	—	4	0/0/74
Dolichotis patagonum	Mara	16	—	16	4	11	10	3/2/2
Chinchilla lanigera	Chinchilla	—	6(5)	—	—	1	1	1/3
Carnivora								
Canis lupus	Grey Wolf	22	—	1	—	3	—	7/13
Fennecus zerda	Fennec Fox	1	—	—	—	—	1(1)	—
Ursus arctos	Brown Bear	5	—	1	—	1	1	1/3
Ailurus fulgens	Red Panda	2	1	—	—	1	—	1/1
Nasua nasua	Ring-tailed Coati	7	—	—	—	—	—	1/6
Helogale parvula	Dwarf Mongoose	—	8(8)	—	—	—	—	4/4
Panthera leo	Lion	2	—	—	—	—	—	1/1
Panthera tigris	Tiger (Siberian form)	4	1	3	—	1	1	4/2
Panthera onca	Jaguar	2	—	2	—	—	1	0/3
Acinonyx jubatus	Cheetah	14	—	5	3	2	—	6/8

		1	2	3	4	5	6	7
Pinnipedia								
Zalophus californianus	Californian Sealion	6	—	—	—	—	—	2/4
Phoca vitulina	Common Seal	1	—	—	—	—	—	1/0
Halichoerus grypus	Grey Seal	1	—	—	—	—	—	0/1
Proboscidea								
Elephas maximus	Asian Elephant	1	4	—	—	—	2(1)	0/3
Loxodonta africana	African Elephant	1	1	—	—	1	—	0/1
Perissodactyla								
Equus grevyi*	Grevy's Zebra	10	—	1	—	—	1	3/7
*Equus hemionus**	Asiatic Wild Ass (Persian form)	6	—	3	—	—	—	2/7
*Equus przewalskii**	Przewalski's Horse	9	1	4	—	1	2	4/7
Rhinoceros unicornis	Indian Rhinoceros	3	—	1	—	—	—	3/1
Cerototherium simum	White Rhinoceros	9	1	—	—	—	—	2/8
Artiodactyla								
*Phacochoerus aethiopicus**	Wart Hog	1	—	—	—	—	—	1/0
*Tayassu tajacu**	Collared Peccary	3	—	—	—	—	—	1/2
Hippopotamus amphibius	Hippopotamus	2	—	—	—	—	—	1/1
Choeropsis liberiensis	Pygmy Hippopotamus	5	—	—	—	—	—	1/4
*Lama guanicoe**	Guanaco	10	—	—	—	—	—	2/8
Camelus bactrianus	Bactrian Camel	16	—	2	1	2	2(2)	4/9
Camelus dromedarius	Arabian Camel	2	—	—	—	—	—	0/2
Muntiacus reevesi	Reeves's Muntjac	15	—	2	—	2	1	6/6/3
Dama dama	Fallow Deer	55	—	11	2	2	11	15/19/17
*Axis axis**	Axis Deer	38	—	18	5(1)	4	6	16/24/1
*Axis porcinus**	Hog Deer	33	—	15	6	6	—	14/21/1
*Cervus duvaucelî**	Barasingha	25	—	9	2	2	1	14/15
*Cervus nippon**	Sika Deer (Formosan form)	47	—	17	6	7	3	18/29/1
Cervus elaphus	Red Deer	55	9	28	6	3	14	1/68
*Elaphurus davidianus**	Pere David's Deer	37	—	14	2	1	—	12/33/3
Rangifer tarandus	Reindeer	14	4(1)	6	3	1	12(4)	3/5
Hydropotes inermis	Chinese Water Deer	283	—	202	1	20	118	0/0/346
*Giraffe camelopardalis**	Giraffe	4	5(1)	—	—	—	2	5/2
*Tragelaphus angasi**	Nyala	6	3	4	—	3	—	4/6
*Tragelaphus speke**	Sitatunga	14	—	6	—	1	1	9/9
*Tragelaphus strepsiceros**	Greater Kudu	1	—	—	—	—	1(1)	—
*Tragelaphus eurycerus**	Bongo	—	1	—	—	—	—	1/0
*Boselaphus tragocamelus**	Nilgai	22	—	22	4	4	7	2/27
*Bos gaurus**	Gaur	2	—	—	—	—	—	1/1
Bos grunniens	Yak	12	—	2	—	1	2	6/5
*Syncerus caffer**	African Buffalo (Dwarf Forest form)	5	3	2	1	1	1	2/5
Bison bonasus	European Bison	11	—	2	—	3	2	1/7
*Hippotragus equinus**	Roan Antelope	8	—	4	1	1	—	3/7
*Kobus ellipsiprymnus**	Common Waterbuck	11	—	2	—	1	1	5/6
*Oryx gazella**	Gemsbok	4	2	2	—	—	1	3/4
*Oryx tao**	Scimitar-horned Oryx	14	8	7	1	1	2	6/19
*Oryx leucoryx**	Arabian Oryx	2	—	—	—	—	1	1/0
*Damaliscus dorcas**	Bontebok	4	—	—	—	—	—	1/3
*Antilope cervicapra**	Blackbuck	6	17(17)	—	—	4	—	7/12
*Gazella thomsoni**	Thomson's Gazelle	11	—	4	—	3	—	4/8
Ovibos moschatus	Musk Ox	5	—	—	—	—	—	1/4
Ovis musimon	Mouflon	52	—	13	3	10	25	20/7
Domestic								
	Ponies	5	—	2	—	—	2	1/4
	Pygmy Donkey	2	—	—	—	—	2	—
	Ankole Cattle	1	—	—	—	—	—	1/0
	Windsor White Goat	16	2(1)	—	—	4	2(1)	2/10
	Total: Mammals	**1608**	**77(33)**	**556**	**52(1)**	**139**	**405(13)**	**1646**
BIRDS								
Rheiformes								
Rhea americana	Common Rhea	4	—	—	—	1	3	—
Casuariiformes								
Casuarius casuarius	Australian Cassowary	3	—	1	—	—	1	1/1/1
Dromaius novaehollandiae	Emu	9	2(2)	2	1	—	1	4/2/5

		1	2	3	4	5	6	7
Tinamiformes								
Nothoprocta perdicaria	Chilean Tinamou	8	—	—	—	1	—	0/0/7
Sphenisciformes								
Aptenodytes patagonica	King Penguin	13	—	—	—	—	—	4/4/5
Eudyptes crestatus	Rockhopper Penguin	9	—	3	—	—	—	5/3/4
Spheniscus humboldti	Humboldt's Penguin	46	2(2)	17	—	2	2(2)	16/15/30
Ciconiiformes								
Ciconia ciconia	White Stork	11	—	2	—	—	—	3/3/7
Phoenicopterus ruber roseus	Greater Flamingo	36	—	6	1	—	—	8/16/17
Phoenicopterus ruber ruber	Rosy Flamingo	51	—	5	—	2	—	23/25/6
Anseriformes								
Cygnus atratus	Black Swan	14	—	—	—	1	—	2/8/3
Cygnus melanocoryphus	Black-necked Swan	2	—	4	3	—	—	1/1/1
Cygnus cygnus	Whooper Swan	2	—	3	—	—	—	1/1/3
Coscoroba coscoroba	Coscoroba Swan	2	—	—	—	—	—	1/1
Anser anser	Greylag Goose	2	—	—	—	—	—	1/0/1
Anser indicus	Bar-headed Goose	37	—	—	—	1	—	15/18/3
Anser caerulescens caerulescens	Lesser Snow Goose	8	—	—	—	1	—	1/1/5
Anser canagicus	Emperor Goose	12	—	2	—	—	7	4/2/1
Branta sandvicensis	Hawaiian Goose	2	—	—	—	—	—	1/1
Branta leucopsis	Barnacle Goose	46	—	—	—	3	20	5/2/16
Branta bernicla orientalis	Brent Goose	3	—	—	—	—	—	1/2
Branta ruficollis	Red-breasted Goose	13	—	—	—	2	—	10/0/1
Cereopsis novaehollandiae	Cape Barren Goose	15	—	5	4(1)	—	8	2/2/4
Alopochen aegyptiacus	Egyptian Goose	12	—	—	—	1	1	2/2/6
Tadorna cana	South African Shelduck	10	—	3	—	1	1	4/3/4
Tadorna variegata	New Zealand Shelduck	3	—	—	—	—	—	2/1
Tadorna tadorna	Shelduck	10	—	—	—	1	1	5/3
Plectropterus gambensis	Spur-winged Goose	2	—	—	—	1	—	1/0
Aix sponsa	Carolina Duck	15	—	—	—	1	—	8/6
Aix galericulata	Mandarin Duck	11	—	5	2	—	2	4/8
Chenonetta jubata	Maned Goose	2	—	—	—	2	—	—
Anas penelope	Wigeon	2	—	—	—	—	—	1/1
Anas sibilatrix	Chiloe Wigeon	12	—	3	—	2	—	3/4/6
Anas falcata	Falcated Teal	4	—	1	—	2	—	2/1
Anas strepera	Gadwall	4	—	—	—	1	—	1/2
Anas crecca	Teal	3	—	—	—	—	1	1/1
Anas specularioides	Crested Duck	6	—	—	—	—	—	2/3/1
Anas acuta	Pintail	4	—	—	—	1	—	1/2
Anas bahamensis	Bahama Pintail	2	—	—	—	—	—	1/1
Anas querquedula	Garganey	3	—	—	—	1	1	1/0
Anas clypeata	Shoveler	4	—	1	—	—	—	2/3
Netta rufina	Red-crested Pochard	10	—	1	—	1	3(3)	3/4
Aythya ferina	Pochard	3	—	—	—	—	1	1/1
Aythya fuligula	Tufted Duck	1	—	1	—	—	—	0/2
Aythya marila	Greater Scaup	6	—	—	—	—	—	3/3
Somateria mollissima	Eider Duck	10	—	4	—	—	—	4/10
Bucephala islandica	Barrow's Goldeneye	2	—	—	—	—	—	0/2
Oxyura vittata	Argentine Ruddy Duck	1	—	—	—	—	—	1/0
Falconiformes								
Gyps africanus	African White-backed Vulture	1	—	—	—	—	—	1/0
Gyps rueppellii	Ruppell's Griffon Vulture	4	—	—	—	—	—	2/2
Torgos tracheliotus	Lappet-faced Vulture	2	—	—	—	—	—	1/1
Buteo jamaicensis	Red-tailed Hawk	—	1	—	—	—	—	0/1
Aquila rapax	Tawny Eagle	—	1	—	—	—	—	1/0
Falco tinnunculus	Kestrel	1	—	—	—	—	—	1/0
Galliformes								
Francolinus erckelii	Erckel's Francolin	1	—	—	—	—	—	1/0
Lophophorus impeyanus	Impeyan Pheasant	4	—	—	—	1	—	1/1/1
Gallus gallus	Red Jungle Fowl	47	4	—	—	—	—	26/21/4
Lophura swinhoii	Swinhoe's Pheasant	3	—	2	—	1	—	2/1/1
Crossoptilon mantchuricum	Brown Eared Pheasant	3	—	—	—	—	—	2/1
Crossoptilon auritum	Blue Eared Pheasant	2	—	—	—	1	—	1/0
Syrmaticus mikado	Mikado Pheasant	3	—	—	—	1	—	1/1
Chrysolophus pictus	Golden Pheasant	1	—	—	—	—	—	1/0
Chrysolophus amherstiae	Lady Amherst's Pheasant	1	—	—	—	—	1	—
Pavo cristatus	Common Peafowl	160	1	20	—	3	2	0/0/176
Numida meleagris	Helmeted Guineafowl	1	—	—	—	—	—	0/0/1

		1	2	3	4	5	6	7
Gruiformes								
Grus monacha	Hooded Crane	1	—	—	—	—	—	0/1
Grus canadensis	Sandhill Crane	1	1	—	—	—	—	1/1
Grus japonensis	Red-crowned Crane	4	—	2	—	—	—	2/2/2
Grus vipio	White-naped Crane	4	—	—	—	—	—	2/2
Grus rubicunda	Brolga	3	—	—	—	—	1	1/1
Bugeranus carunculatus	Wattled Crane	4	3	—	—	—	2	3/2
Anthropoides virgo	Demoiselle Crane	3	—	—	—	—	—	1/2
Anthropoides paradisea	Stanley Crane	4	—	3	1	—	—	2/2/2
Balearica regulorum	South African Crowned Crane	9	—	—	—	1	—	4/3/1
Choriotis kori	Kori Bustard	2	—	—	—	1	1	—
Otis tarda tarda	Great Bustard	—	5	—	—	—	—	3/2
Psittaciformes								
Pseudeos fuscata	Dusky Lory	2	—	—	—	—	—	1/1
Eolophus roseicapillus	Roseate Cockatoo	14	—	—	—	2	11	0/1
Cacatua leadbeateri	Leadbeater's Cockatoo	1	—	—	—	—	1	—
Cacatua galerita	Greater Sulphur-crested Cockatoo	2	2(1)	—	—	—	1	2/1
Cacatua sanguinea	Bare-eyed Cockatoo	2	—	—	—	—	—	1/1
Alisterus scapularis	King Parrot	2	—	—	—	—	—	1/1
Platycercus eximius cecilae	Golden-mantled Rosella	2	—	—	—	—	1	1/0
Psittacus erithacus	Grey Parrot	1	2	—	—	—	—	0/1/2
Psittacus eupatria	Alexandrine Parrakeet	—	1	—	—	—	—	1/0
Ara macao	Scarlet Macaw	3	—	2	—	—	3	0/0/2
Ara chloroptera	Green-winged Macaw	2	—	—	—	—	—	1/1
Cyanoloseus patagonum	Patagonian Conure	1	—	—	—	—	—	1/0
Myiopsitta monachus	Quaker Parrakeet	2	—	—	—	—	—	1/1
Strigiformes								
Tyto alba	Barn Owl	4	1	—	—	—	—	3/1/1
Otus leucotis	White-faced Scops Owl	—	2(2)	—	—	—	—	1/1
Nyctea scandiaca	Snowy Owl	2	—	—	—	—	—	1/1
Athene noctua	Little Owl	2	—	—	—	—	2(2)	—
Strix aluco sylvatica	Tawny Owl	2	—	—	—	—	—	1/1
Strix uralensis	Ural Owl	—	2(2)	—	—	—	—	1/1
Coraciiformes								
Dacelo novaeguineae	Laughing Kookaburra	1	—	—	—	1	—	—
Piciformes								
Baillon baillonii	Saffron Toucanet	2	—	—	—	—	—	1/1
Ramphastos citreolaemus	Citron-throated Toucan	2	—	—	—	—	—	0/2
Ramphastos vitellinus ariel	Ariel Toucan	1	—	—	—	—	—	1/0
Passeriformes								
Carpodacus mexicanus	Mexican Rose Finch	8	—	—	—	2	—	3/3
Urocissa erythrorhyncha occipitalis	Red-billed Blue Pie	—	1	—	—	—	—	1/0
Domestic								
	Old English Game Bantam	2	—	—	—	—	—	2/0
	Birmingham Roller Pigeon	20	—	—	—	1	—	8/11
	Tumbler Pigeon	8	—	—	—	—	—	2/0/6
	Total: Birds	**847**	**31(9)**	**98**	**12(1)**	**44**	**79(7)**	**841**
REPTILES								
Testudines								
Testudo graeca	Spur-thighed Tortoise	24	6	9	—	1	14	6/11/7
Testudo hermanni	Hermann's Tortoise	20	2	4	—	—	8	3/11/4
Sauria								
Eublepharis macularius	Leopard Ground Gecko	4	1	12	—	—	2	1/4/10
Basiliscus plumifrons	Plumed Basilisk	9	—	—	—	2	—	0/0/7
Iguana iguana	Common Iguana	2	4	—	—	—	2	1/1/2
Agama stellio	Starred Agama	—	5	—	—	1	—	0/0/4
Eumeces schneiderii	Schneider's Skink	4	—	—	—	—	—	0/0/4
Scincus scincus	Sand Fish	6	—	—	—	1	—	0/0/5
Uromastyx aegyptius	Egyptian Dabb-Lizard	—	3	—	—	1	—	0/0/2

		1	2	3	4	5	6	7
Serpentes								
Python molurus molurus	Indian Python	1	1	—	—	—	1	0/0/1
Python molurus bivittatus	Burmese Python	—	1	—	—	—	—	0/0/1
Python regius	Royal Python	2	—	—	—	—	—	0/0/2
Epicrates subflavus	Jamaican Boa	1	—	—	—	—	—	0/1
Boa constrictor	Boa Constrictor	1	—	—	—	—	1	—
Malpolon moilensis	Moila Snake	1	—	—	—	—	—	0/0/1
	Total: Reptiles	**75**	**23**	**25**	**—**	**6**	**28**	**89**

AMPHIBIANS

Caudata								
Ambystoma mexicanum	Axolotl	—	4(4)	—	—	2	—	0/0/2
Anura								
Bufo marinus	Cane Toad	2	—	—	—	—	—	0/0/2
Ceratophrys cornuta	Horned Toad	2	10	—	—	4	6	0/0/2
Atelopus spp.	Harlequin Frog	2	—	—	—	2	—	—
Dendrobates auratus	Black/Green Poison Arrow Frog	4	—	—	—	—	—	0/0/4
Dendrobates pumilio	Strawberry Poison Arrow Frog	2	—	—	—	1	—	0/0/1
Colosethus trinitatis	Trinidad Stream Frog	—	3	—	—	3	—	—
Hyla septentrionalis	Cuban Tree Frog	4	—	—	—	1	—	0/0/3
	Total: Amphibians	**16**	**17(4)**	**—**	**—**	**13**	**6**	**14**

SUMMARY

London Zoo

	1	2	3	4	5	6	7	Number of Species (excluding domestic)
Mammals	1242	105(13)	927	96(2)	239	780(33)	1159	119
Birds	963	83(7)	124	46	129	111(9)	884	262
Reptiles	448	103	161	11	97	144	460	103
Amphibians	199	129	73	36	101	62(4)	202	53
Total	**2852**	**420(20)**	**1285**	**189(2)**	**566**	**1097(46)**	**2705**	**537**

Estimated number of fishes and invertebrates in the Collection at 31 December 1989:

Fishes	Approx 2,500+	280+ species
Invertebrates (excluding some common species)	Approx 13,000 (+ 9 colonies)	120+ species

Whipsnade Wild Animal Park

Mammals	1608	77(33)	556	53(1)	138	405(13)	1646	62
Birds	847	31(9)	98	12(1)	44	79(7)	841	93
Reptiles	75	23	25	—	6	28	89	13
Amphibians	16	17(4)	—	—	13	6	14	6
Total	**2546**	**148(46)**	**679**	**65(2)**	**201**	**518(20)**	**2590**	**174**

Estimated number of fishes and invertebrates in the Collection at 31 December 1989:

Fishes	Approx 101+	16 species
Invertebrates (excluding some common species)	Approx 161+	14 species

Grand Total Zoological Society of London	**5398**	**568**	**1964**	**254**	**767**	**1615**	**5295**	**640***

*The species common to Regent's Park and Whipsnade Park are counted as one.

ADVISORY AND CONSULTANT SERVICES

Animal Management and Conservation

Al-Areen Wildlife Park, Bahrain: Semen preservation in Arabian Oryx.

The Alistair Reid Snake Venom Research Unit, WHO Collaborative Centre for the Control of Antivenoms, Liverpool School of Tropical Medicine: Advice on housing and management of venomous snakes.

Chapultepec Zoo, Mexico: Advice and assistance with breeding of Giant Pandas.

Corporation of London Veterinary Department and Animal Quarantine Station: Advice on identification, handling and management of reptiles.

Doha Zoo, Municipality of Doha, Qatar: Management of the national zoo for the Qatar Government.

People's Republic of China Ministry of Forestry (with International Union for Conservation of Nature and Natural Resources/World Wide Fund for Nature/North of England Zoological Society/Marwell Zoological Park/Longleat/Glasgow Zoo): Continuing monitoring of reintroduced Père David's Deer.

HM Customs: Housing and advice on identification of reptiles.

International Union for the Conservation of Nature and Natural Resources, Species Survival Commission: Discussion document on threatened species categories of Red Data Book Lists; participation in a wide range of species conservation programmes.

John Radcliffe Hospital, Oxford (Nuffield Department of Clinical Medicine): Advice on housing and management of venomous snakes.

Kenya Wildlife Service: Assistance with funding and organization of conservation programmes for Black Rhinoceros and African Elephant.

King's College, London: Collaborative studies on behavioural enrichment.

Dept de la Faune, Pêche et Pisciculture, Niger: Assistance with development of reintroduction programmes for the Scimitar-horned Oryx and Addax.

Government of Oman: Assistance with the development of future plans relating to the management of Arabian Oryx.

Peruvian Zoological Trust: Advice on husbandry of captive animals, and on wild status of endemic species.

Police and Local Authorities: Advice and assistance on identification, handling, management and capture of reptiles.

Queen Mary and Westfield College, London: Collaborative research on a behavioural enrichment device for apes.

Saudi Arabia: Development of the King Khalid Wildlife Research Centre on behalf of the National Commission for Wildlife Conservation and Development.

Government of the Republic of Seychelles: Development of a research and conservation centre on Curieuse Island, with special reference to the Aldabran Giant Tortoise.

Tunisia Forest Department: Continuing monitoring of reintroduced Scimitar-horned Oryx.

University of Reading: Collaborative studies on behavioural enrichment.

University of Sussex: Collaborative studies on behavioural enrichment.

Wildfowl and Wetlands Trust: Study and advise on population management of White-winged Wood Duck.

Comparative Medicine and Physiology

AFRC Welsh Plant Breeding Station, Aberystwyth: Studies on reproductive physiology and nutrition of South American camelidae.

British Antarctic Survey: Collaborative study on nutrients metabolism in Macaroni and Gentoo Penguins during different physiological states.

Clinical Research Centre, Northwick Park Hospital: Collaborative research on effects of increased atmospheric pressure on the blood.

Dalgety Plc and Anglia Higher Education College, Cambridge: Collaborative research on chemical communication in mammals.

Dvur Kralove Zoo, Czechoslovakia: Collaborative studies on the reproductive physiology of the Northern White Rhinoceros; collaborative research on artificial insemination in the Scimitar-horned Oryx.

German Primate Centre, Göttingen: Collaborative research on pheromonal and neuroendocrine controls of reproductive suppression in subordinate Marmoset and Tamarin Monkeys.

Glasgow College of Technology (Department of Biological Sciences): Collaborative research on the reproductive biology of Tamarin Monkeys.

Guy's Hospital, London: Collaborative study on in-vitro fertilization and embryo transfer in Tigers.

Homerton Hospital, London: Collaborative project on dietary fats and nutrition in pregnancy.

Hospital for Tropical Diseases, London: Collaborative study on malaria screening; laboratory service for testing of serum for diagnosis of *Toxocariasis*.

Humana Hospital Wellington, London: Collaborative study on control of human granulosa cells luteinized *in vitro*.

Institute of Anatomy, Free University of Berlin: Collaborative research on structure-function relationship of primate granulosa cells.

Institute of Biochemistry, Veterinary University, Vienna: Collaborative studies on faecal hormone analysis in exotic species.

Institute of Cancer Research, London: Collaborative studies on incidence of retroviruses in primates.

Jersey Wildlife Preservation Trust: Collaborative research on the reproductive biology of the Goeldi's Monkey.

King's College [KQC], London (Department of Anatomy and Human Biology): Collaborative research of the neuroendocrine mechanisms involved in suppression of ovulation in the subordinate female Marmoset Monkey and Naked Mole-rat.

The London Hospital (Department of Anatomy): Collaborative studies on marsupial sexual differentiation.

London School of Hygiene and Tropical Medicine: Collaborative study on the use of monoclonals in assays for chlamydia, Chagas disease and Hepatitis B.

Marwell Zoological Trust: Collaborative project on artificial insemination in Addax.

National Institute for Biological Studies and Control, London: Collaborative studies on the haematological effects of immunodeficiency virus.

National Institute for Medical Research, London: Collaborative studies on growth hormone and posterior pituitary peptides in Naked Mole-rats.

North London Blood Transfusion Service: Provision of materials and advice in relation to malaria screening.

Pontificia Universidad Catolica de Chile, Santiago, Chile: Studies on reproductive physiology of South American camelidae.

Princess Anne Hospital, Southampton (Department of Human Reproduction and Obstetrics): Collaborative investigation on control of the human and Marmoset corpus luteum.

Regional Health Authorities: Laboratory service for testing of serum for diagnosis of *Toxocariasis*.

Robens Institute (Environmental Health Unit), University of Surrey: Examination of environmental samples for *Clostridium botulinum*.

Royal Ear, Nose and Throat Hospital, London: Collaborative research on electron microscopic studies of olfactory mucosa of Marmoset Monkeys and Opossums.

Royal Veterinary College, London (Department of Physiology): Collaborative studies on impaired testicular steroidogenesis and spermatogenesis in the subordinate male Marmoset Monkey.

Royal Veterinary College Field Station, Hatfield: Collaborative research on ultrasound investigation of reproductive cycles and pregnancy in ungulates.

St Bartholomew's Hospital Medical College, London: Collaborative studies on bone growth.

St George's Hospital, London: Collaborative investigation into the role of *Mysobacterium paratuberculosis* in the pathogenesis of Crohn's disease.

St Mary's Hospital Medical School, London: Collaborative studies on red cell viscosity in mammals.

St Peter's Hospital and The London Hospital, London: Collaborative research on human sperm maturation.

Special Diets Services, Witham: Collaborative development of diets for wild animals in captivity.

University of Cambridge (Engineering Laboratory): Collaboration on computer programming systems for sperm motility assessment.

University of Cape Town, RSA: Collaborative studies on the natural suppression of reproduction and growth in the Naked Mole-rat.

University College, London: Collaborative research into behaviour of laboratory Rabbits; collaborative investigation on human sperm antigens.

University College Hospital, London: Collaborative research on nutritional baselines in Penguins.

University of Heidelberg, W Germany: Collaborative research on the genetics of the major histocompatibility complex of the Naked Mole-rat.

University of Leeds (Department of Animal Physiology and Nutrition): Collaborative investigation on ovarian action of melatonin in the ewe.

University of Oxford (Department of Zoology): Collaborative studies on the blood of feral Cats.

University of Reading (Department of Psychology): Collaborative research on hormonal indicators of stress in endangered South American primates. *(Department of Physiology and Biochemistry):* Collaborative study of inhibin concentrations in the Marmoset Monkey.

University of Surrey: Collaborative study on antifungal therapeutic regimes for invertebrates.

World Health Organization: The Institute of Zoology is a collaborating centre for malaria reference and research, comparative medicine and pathology of non-domestic vertebrates, reproduction and child health.

Zoos: Monitoring reproductive status in exotic species.

Training and International Liaison

British Council: Training of visiting workers in hormone assays, nutritional biochemistry and serology.

World Health Organization: Training of visiting workers in serology.

Veterinary Consultancy

Bohedma Reserve, Tunisia: Health assessment of Reserve animals, especially reintroduced Scimitar-horned Oryx.

Eastman Kodak, Tennessee: Oral supplementation of Black Rhinoceros with tocopherol polyethylene glycol.

Nature Conservancy Council: Health assessment of Red Kites for reintroduction.

Royal Society for Nature Conservation, Jordan: Veterinary assistance with the management of Arabian Oryx.

RSPCA Seal Assessment Centre, Docking: Clinical haematology of Common and Grey Seals.

Consultant Veterinary Advice, Treatment of referred cases, Microbiology, Pathology and Histopathology: Government departments, Research institutes, Universities, Zoological collections and Veterinary practices both in the UK and abroad.

Representation on Scientific Societies, Zoological, Conservation and Research Organizations

Whether in an individual capacity or as representatives of the Society, members of staff play an active role in many organizations concerned with animal management, conservation, the publication of specialist journals, and other research activities.

Action Research on Multiple Sclerosis (ARMS): Mr P J Drury (Computer Consultant); Mr L S Harbige (Honorary Research Associate)

Agriculture and Food Research Council: Professor J P Hearn (Deputy Secretary; Member, Animals Research Committee) – until January

AFRC Institute of Animal Physiology and Genetics Research: Professor A P F Flint (Visiting Scientist)

Anthropoid Ape Advisory Panel: Dr J H W Gipps (Convenor, Scientific Committee); Dr G M Mace; Dr J K Kirkwood; Dr J K Hodges (Members, Scientific Committee)

Association for Animal Haematology: Mr M G Hart (Committee)

Association of Veterinary Anaesthetists: Mr R A Kock (Committee)

Australian Research Grants Board: Professor J P Hearn; Dr H D M Moore (Assessors)

Biological Council: Mr P J S Olney (Zoological Society Representative; Member, Expedition Awards Committee)

British Andrology Society: Dr H D M Moore (Treasurer)

British Deer Society: Dr A S I Loudon (Chairman, Scientific Advisory Committee)

British Dietetic Association: Mrs W Doyle (Member, Community and Paediatric Dieticians' Groups)

British Endocrine Societies 10th Annual Meeting 1991: Professor A P F Flint (Chairman, Programmes Organizing Committee)

British Nutrition Foundation: Sir Cyril A Clarke (Chairman, Task Force on Sugars and Syrups)

British Ornithologists' Union: Mr P J S Olney (Member, Meetings Committee)

British Veterinary Association: Mr D M Jones (Member, Veterinary Policy Group)

British Veterinary Zoological Society: Dr J K Kirkwood (Treasurer and Meetings Secretary); Mr R A Kock (Council)

British Wildlife Rehabilitation Council: Dr J K Kirkwood (Treasurer)

Brooke Hospital for Animals, Cairo: Mr D M Jones (Vice Chairman)

Brunel University: Professor M A Crawford (Associate Research Fellow)

Central Middlesex Hospital: Professor M A Crawford (Member, Council of Management of ARMS Research Unit)

Coronary Prevention Group: Mrs W Doyle (Member, Nutrition Group)

Department of the Environment: Mr D J Ball; Mr D M Jones; Dr J K Kirkwood; Mr R A Kock (Secretary of State's List of Inspectors under the Zoo Licensing Act 1981)

Domestic Animal Endocrinology: Professor A P F Flint (Editorial Board)

European Community Association of Zoos and Aquaria: Mr D M Jones (Zoological Society representative)

European Union of Aquarium Curators: Dr C Andrews (Member)

Family Budget Unit: Mrs W Doyle (Committee)

Fauna and Flora Preservation Society: Mr D M Jones (Chairman)

First World Congress of Herpetology: Mr P J S Olney (Member, UK National Executive Committee)

Freshwater Fisheries Society: Dr C Andrews (Member)

German Research Council: Professor J P Hearn (Member, Steering Committee, German Primate Research Centre)

Great Bustard Trust: Mr P J S Olney (Council Member)

Harvard University: Professor J P Hearn (Member, Scientific Advisory Board, New England Primate Research Center)

Hawk Trust: Dr J K Kirkwood (Scientific Committee)

Health and Safety Executive: Professor J P Hearn (Member, Advisory Committee on Genetic Manipulation) – until January

Herpetological Conservation Trust: Mr P J S Olney (Trustee)

Howletts & Port Lympne Zoo Parks: Mr D M Jones (Council Member)

International Council for Bird Preservation: Dr J K Kirkwood (Member, World Working Group on Birds of Prey); Mr P J S Olney (Zoological Society representative)

International Ornithological Committee (Committee of 100): Mr P J S Olney (Member)

International Recovery and Management Committee for the Golden-headed Lion Tamarin: Dr G M Mace (Member)

International Union for Conservation of Nature and Natural Resources (Species Survival Commission): Dr C Andrews (Chairman, Freshwater Fish and Member, Captive Breeding, Specialist Groups); Dr P M Bennett (Member, Captive Breeding Specialist Group); Miss A M Dixon (Member, Antelope, Parrot, Captive Breeding and Reintroduction Specialist Groups, Zoological Society representative on UK Committee); Dr J H W Gipps (Member, Captive Breeding, Re-

introduction and Rodent Specialist Groups); Professor J P Hearn (Member, Genome Preservation and Primate Specialist Groups); Mr R A Kock (Member, Veterinary and Bison Specialist Groups); Mr D M Jones (Member, Asiatic Elephant, Antelope and Captive Breeding Specialist Groups); Dr A S I Loudon (Member, Deer Specialist Group); Dr G M Mace (Member, Captive Breeding and Reintroduction Specialist Groups); Mr P J S Olney (Member, Captive Breeding Specialist Group; Zoological Society Representative; Regional Member)

International Union of Directors of Zoological Gardens: Mr D M Jones (Zoological Society Representative)

Institute of Biology: Professor J P Hearn (Member, Fellowship Committee)

Jersey Wildlife Preservation Trust: Dr G M Mace (Member, *Ad hoc* Scientific Advisory Committee)

Joint Management of Species Group in the British Isles: Mr P M Bennett (Secretary)

Joint (UK) Elephant Management Group: Dr J K Hodges (Member)

Journal of Clinical Laboratory Analysis: Dr A Voller (Editorial Board)

Journal of Clinical Pathology: Dr A Voller (Editorial Board)

Journal of Comparative Pathology: Dr G R Smith (Chairman, Editorial Board)

Journal of General Microbiology: Dr A Voller (Editorial Board)

Journal of General Virology: Dr A Voller (Editorial Board)

Journal of Immunoassay: Dr A Voller (Editorial Board)

Journal of Immunological Methods: Dr A Voller (Editorial Board)

Journal of Medical Microbiology: Dr G R Smith (Editorial Board)

Journal of Medical Primatology: Professor J P Hearn (Editorial Board)

Journal of Reproduction and Fertility: Dr H D M Moore (Council of Management)

Journal of Virological Methods: Dr A Voller (Editorial Board)

Kenya Wildlife Service: Dr R A Brett; Dr R Hoare (on secondment, Rhinoceros and Elephant studies)

Linnean Society of London: Dr M A Edwards (Editorial Committee)

London Food Commission: Professor M A Crawford (Trustee)

Mammal Society: Dr J H W Gipps (Council Member)

Marwell Zoological Trust: Mr D M Jones (Trustee); Dr G M Mace (Member, Scientific and Animal Management Committee)

Medical Research Council: Professor G H du Boulay (Member, Cell Board); Professor A P F Flint (Member, Systems Boards' Grants Committee B); Professor J P Hearn (Member, Siman Virus Committee) – until January

Medicina: Dr A Voller (Editorial Board)

National Federation of Zoological Gardens of Great Britain and Ireland: Dr P M Bennett (Secretary, Conservation and Animal Management Committee); Miss A M Dixon; Mr R A Kock; Mr P J S Olney (Members, Conservation and Animal Management Committee); Mr W Griffiths (Member, Education Committee); Mr D M Jones (Treasurer)

National Hospital for Nervous Diseases, London: Professor G H du Boulay (Honorary Consultant; Trustee, Queen Square Development Foundation)

National Marine Aquarium, Plymouth: Dr C Andrews (Member, Management Committee)

National Museums of Kenya: Professor J P Hearn (Member, International Scientific Advisory Board, Institute of Primate Research)

National Trust: Mr C Webster (Whipsnade Advisory Committee)

Neuroradiology: Professor G H du Boulay (Editor-in-Chief)

Open University: Dr D H Abbott (Undergraduate Course Consultant, Department of Biology)

Oxford Reviews of Reproductive Biology: Professor A P F Flint (Editorial Board)

Primate Society of Great Britain: Dr D H Abbott; Dr G M Mace (Members, Captive Care Working Party); Dr J K Kirkwood (Council; Member, Captive Care Working Party)

Programme for Appropriate Technology in Health (PATH): Dr A Voller (Technical Advisory Group)

Radiological Research Trust: Professor G H du Boulay (Director)

Reproduction Research Information Services: Dr A S I Loudon (Member, Management Board)

Royal (Dick) School of Veterinary Studies, Edinburgh: Dr G R Smith (External Examiner in Veterinary Microbiology)

Royal Society of Medicine: Dr G R Smith (Council Member, Section of Comparative Medicine)

Royal Society for the Prevention of Cruelty to Animals: Mr P J S Olney (Member, Wild Animals Advisory Committee)

XIV Symposium Neuroradiologicum 1990: Professor G H du Boulay (President)

Tropenmedizin und Parasitologie: Dr A Voller (Editorial Board)

Trust for Research and Education in the Biology of Reproduction: Professor A P F Flint (Committee)

University of Bristol: Dr J K Kirkwood (Visiting Lecturer, Department of Animal Husbandry)

University of London: Dr D H Abbott (Honorary Research Fellow, Department of Biology, University College; Visiting Lecturer, Department of Physiology, King's College and Royal Veterinary College); Professor G H du Boulay (Emeritus Professor of Radiology, National Hospital for Nervous Diseases); Mr C G Faulkes (Visiting

Lecturer, Department of Physiology, King's College [KQC]); Professor A P F Flint (Member, Academic Advisory Board in Biology; Member, Board of Studies in Biology; Visiting Professor in Biology, University College; Visiting Professor, Biosphere Sciences Division, King's College [KQC]); Professor J P Hearn (Visiting Professor in Biology, University College; Member, Board of Studies in Biology – until January); Dr J K Hodges; Dr A S I Loudon; Dr H D M Moore; Dr H J Shaw; Dr G E Webley (Course Lecturers, Department of Biology, University College); Dr W V Holt; Dr G E Webley (Honorary Lecturers in Physiology, King's College [KQC]); Mr D M Jones (Member, Board of Studies in Biology); Dr J K Kirkwood (Visiting Lecturer, Department of Medicine, Royal Veterinary College); Dr G M Mace (Course Lecturer, Intercollegiate Lecture Courses); Dr G R Smith (PhD Examiner); Dr A Voller (Reader in Immunology of Parasitic Diseases, London School of Hygiene and Tropical Medicine; Council Member, London School of Hygiene and Tropical Medicine)

University of Nottingham School of Agriculture: Professor M A Crawford (Special Professor of Applied Biochemistry and Nutrition); Professor A P F Flint (Specialist Professor of Molecular Biology)

Vaccine: Dr A Voller (Editorial Board)

Veterinary Deer Society: Mr R A Kock (President)

Veterinary Research Club: Dr G R Smith (Council)

Wildfowl and Wetlands Trust: Dr J K Kirkwood (Scientific Advisory Committee)

Wildlife Link: Miss A M Dixon (Member; Zoological Society representative)

World Association of Wildlife Veterinarians: Mr A W Sainsbury (Corresponding Secretary)

World Health Organization: Professor J P Hearn (Member, Committee on Research Development); Dr A Voller (Member, Expert Advisory Panel on Parasitology; Member, WHO/IUIS Subcommittee on Standardization of Reagents for Enzyme Immunoassays)

World List of Scientific Periodicals: Mr R A Fish (Council Member)

The World Parrot Trust: Dr P M Bennett (Board of Management)

World Pheasant Association: Mr P J S Olney (Council Member)

World Wide Fund for Nature: Dr R A Brett (Project Executive, Rhinoceros Conservation Programme, Laikipia, Africa); Mr D M Jones (Trustee and Member of Conservation Review Group, UK)

Zoo Biology: Professor J P Hearn; Dr J K Hodges (Editorial Board)

FINANCIAL STATEMENTS

Consolidated Revenue Account for the year ended 31st March 1990

	Notes		Year ended 31st March 1990 £'000s	Year ended 31st March 1989 £'000s
Income from activities	2		6,996.5	7,429.5
Cost of activities	2		11,807.0	9,545.5
Net deficit on activities			(4,810.5)	(2,116.0)
Administrative expenses			(188.7)	(147.3)
			(4,999.2)	(2,263.3)
Other operating income	3		18.2	21.8
Operating deficit for the year			(4,981.0)	(2,241.5)
Income from investments	4	79.7		57.3
Interest receivable	5	1,559.7		837.1
			1,639.4	894.4
Deficit for the year	6		(3,341.6)	(1,347.1)
Government Grants	8		1,315.0	12,050.0
			(2,026.6)	10,702.9
Exceptional items				
Grants for purchasing fixed assets			985.3	52.2
Surplus on sale of assets			83.7	286.4
			(957.6)	11,041.5
Extraordinary item				
Payment on early termination of contract			(200.0)	—
Excess of expenditure over income				
(1989 – income over expenditure)			(1,157.6)	11,041.5
Appropriations				
Transfer (to)/from Endowment Fund			1,623.7	(9,621.0)
Transfer (to) Development Fund			(650.4)	(951.6)
Transfer (to) Other Designated Funds			(80.4)	(247.1)
Transfer (to)/from Building and Equipment Fund			(218.9)	48.5
			(483.6)	270.3
General Fund balance brought forward			991.4	721.1
General Fund balance carried forward			507.8	991.4

The notes on pages 64 to 74 form part of these accounts.

Consolidated Balance Sheet at 31st March 1990

	Notes	£'000s	1990 £'000s	1989 £'000s
Fixed Assets				
Tangible assets	9		5,004.7	2,249.7
Investments	10		991.1	906.9
			5,995.8	3,156.6
Current assets				
Stocks	11	670.4		184.8
Debtors	12	1,731.6		1,645.1
Bank balances		9,364.3		13,109.0
		11,766.3		14,938.9
Creditors: Amounts falling due within one year	13	(2,936.8)		(2,103.8)
Net current assets			8,829.5	12,835.1
Total assets less current liabilities			14,825.3	15,991.7
Creditors: amounts falling due after more than one year	14		(14.7)	(23.5)
			14,810.6	15,968.2
Funds	15			
Endowment	16		7,997.3	9,621.0
Development	17		3,705.4	3,055.0
Other Designated	18		1,151.7	1,071.3
Building and Equipment	19		1,448.4	1,229.5
General			507.8	991.4
			£14,810.6	£15,968.2

Approved by Council 18th July 1990
PEYTON
Treasurer
PROFESSOR AVRION MITCHISON
President

The notes on pages 64 to 74 form part of these accounts.

Consolidated Statement of Source and Application of funds for the year ended 31st March 1990

	£'000s	Year ended 31st March 1990 £'000s	Year ended 31st March 1989 £'000s
Source of Funds			
Deficit for the year		(3,341.6)	(1,347.1)
Government Grants		1,315.0	12,050.0
		(2,026.6)	10,702.9
Item not involving the movement of Funds			
Depreciation		512.9	269.0
Total generated by operations		(1,513.7)	10,971.9
Funds from other sources			
Surplus on sale of assets	83.7		286.4
Grants for purchasing fixed assets	985.3		52.2
		1,069.0	338.6
		(444.7)	11,310.5
Application of Funds			
Net increase in investments		84.2	390.2
Purchase of tangible fixed assets		3,267.9	767.4
Extraordinary item		200.0	—
		3,552.1	1,157.6
		(3,996.8)	10,152.9
Movement in working capital			
Increase/(decrease) in stocks		485.6	35.3
Increase/(decrease) in debtors		86.5	257.5
(Increase)/decrease in creditors		(466.5)	(810.3)
		105.6	(517.5)
Movement in net liquid funds			
Increase/(decrease) in bank balances		(4,102.4)	10,670.4
		(3,996.8)	10,152.9

The notes on pages 64 to 74 form part of these accounts.

Report of the Auditors
TO THE COUNCIL OF THE ZOOLOGICAL SOCIETY OF LONDON

We have audited the financial statements on pages 61 to 74 in accordance with approved auditing standards.

In our opinion the financial statements give a true and fair view of the state of affairs at 31st March 1990 and of the excess of expenditure over income and source and application of funds for the year ended on that date.

ERNST & YOUNG *Chartered Accountants*
18th July 1990

Notes to the Financial Statements

1. ACCOUNTING POLICIES

(a) *Accounting Convention*
The financial statements are prepared under the historical cost convention.

(b) *Changes in Accounting Policies*
The Society changed its accounting policy for fixed assets and depreciation to that stated below from January 1984. Freehold land and buildings acquired prior to December 1983 are fully depreciated; other buildings, plant, vehicles and fittings and furnishings were written off in the year of purchase.

(c) *Basis of Financial Statements*
The Society received in November 1988 from the Department of the Environment an endowment of £10 million. It also receives on going revenue grants from the Department of Education and Science to support the Institute of Zoology. The financial statements have accordingly been prepared on a going concern basis.

(d) *Consolidation*
The financial statements consolidate the results and the assets and liabilities of Zoo Operations Limited, a wholly owned subsidiary which manages the activities of the Zoological Gardens at London Zoo and Whipsnade Wild Animal Park and of the Education Department; activities formerly carried out by the Society itself.

(e) *Form of Accounts*
The Society maintains a number of internal funds earmarked by the Society itself for specific purposes. These designated funds are:

(i) Endowment Fund: This fund was created from a grant received from the Department of the Environment. The capital and income are available to help pay for the upkeep, improvement and management of the Zoological Gardens at London Zoo and Whipsnade Wild Animal Park.

(ii) Development Fund: This fund relates to expenditure incurred on new buildings, the restoration of existing buildings and changes to the infrastructure of the Society's properties carried out to improve the facilities available to the animals and to the members of the public. It is financed from donations and grants received from the public which in certain circumstances have been matched by grants from the Government.

(iii) Other Designated Funds: These have been given or bequeathed to the Society to be used in accordance with resolutions passed by the Council of the Society. Both the capital and the income may be spent. Until they are spent, the funds are invested in stocks, shares and deposits.

(iv) Building and Equipment Fund: The fund comprises grants received and appropriations from the General Fund which are wholly invested in tangible assets and which are released back to revenue over the expected useful life of the relevant asset by equal annual amounts.

(v) General Fund: The General Fund is the free fund of the Society. It has to provide for the maintenance, improvement and management of the Library, Publications, Institute of Zoology and membership administration as well as for the Society's requirement for working capital.

(f) *Restricted Funds*
Restricted funds of the Society which have conditions attached to their use are not included in the balance sheet. Details of these are set out in note 20.

(g) *Grants*
Government grants received of a revenue nature are credited to the General Fund in the year in which they are received. Grants received of a capital nature are credited to the appropriate designated fund and are released to revenue over the expected useful life of the relevant assets by equal annual amounts.

(h) *Fixed Assets and Depreciation*
Fixed assets acquired by purchase or gift during the year are shown at cost or valuation depreciated on a straight line basis at rates appropriate to write off the cost over their expected useful lives. Freehold and leasehold buildings are depreciated over a range of 15 to 40 years; plant and equipment 5 to 10 years and motor vehicles 5 years.

(i) *Investments and Investment Income*
Listed investments are included in the balance sheet at cost. Dividends and interest are accounted for when the cash is received. The amount shown includes the related tax credits which, because of the Society's charitable status, are recoverable. Interest on bank deposits is accounted for on an accruals basis.

(j) *Stocks*
Stocks are stated at the lower of direct cost and net realisable value with the following exceptions: no value is placed on the animals, farm and garden stocks and the library; stocks of scientific publications are included at nominal valuation.

(k) *Pension Costs*
The cost of providing pension benefits is charged to the revenue account over the period benefiting from employees' services.

(l) *Leasing Commitments*
Assets obtained under finance leases are capitalised in the balance sheet and are depreciated over their useful lives. The interest element of the rental obligations is charged to profit and loss account over the period of the lease and represents a constant proportion of the balance of capital repayments outstanding.

2. INCOME AND EXPENDITURE ON ACTIVITIES IS ATTRIBUTABLE AS FOLLOWS:

	Notes	Income £'000s	Expenditure £'000s	1990 Surplus/ (Deficit) £'000s	1989 Surplus/ (Deficit) £'000s
Specific activities					
Zoological Gardens					
London Zoo	2(a)	4,226.8	6,121.9	(1,895.1)	(425.8)
Whipsnade Park	2(a)	1,395.8	2,867.0	(1,471.2)	(504.6)
Education	2(b)	129.3	208.7	(79.4)	(55.7)
Library	2(c)	2.0	107.9	(105.9)	(89.0)
Publications	2(d)	315.6	288.1	27.5	19.3
Institute of Zoology	2(e)	874.1	2,213.4	(1,339.3)	(1,110.5)
		6,943.6	11,807.0	(4,863.4)	(2,166.3)
General activities					
Members subscriptions and fees		106.0		106.0	77.8
Donations		7.8		7.8	23.8
Less: Transfer to income from investments		(60.9)	—	(60.9)	(51.3)
		6,996.5	11,807.0		
Net deficit on activities				(4,810.5)	(2,116.0)

2 (a) Zoological Gardens

	Notes	London Zoo 1990 £'000s	London Zoo 1989 £'000s	Whipsnade Park 1990 £'000s	Whipsnade Park 1989 £'000s
Income					
Admission of visitors		3,564.0	3,786.5	1,083.4	1,120.4
Catering and retail	2(f)	477.6	705.7	207.8	178.7
Miscellaneous income		85.9	122.1	61.7	99.4
Lifewatch and Friends of the Zoos		99.3	105.2	42.9	39.6
		4,226.8	4,719.5	1,395.8	1,438.1
Expenditure					
Staff costs		2,684.6	2,316.7	1,142.5	939.5
Provisions		336.5	293.5	196.8	161.4
Less: Income from animal adoption scheme		(164.4)	(145.9)	(19.5)	(16.7)
Overheads		2,100.9	1,804.9	876.7	528.1
Publicity and advertising		574.1	426.5	357.8	178.7
Publications		10.0			
Backlog maintenance		346.2	288.8	221.4	95.1
Depreciation		234.0	160.8	91.3	56.6
		6,121.9	5,145.3	2,867.0	1,942.7
(Deficit)		(1,895.1)	(425.8)	(1,471.2)	(504.6)

(b) Education

	London Zoo		Whipsnade Park	
	1990	1989	1990	1989
	£'000s	£'000s	£'000s	£'000s
Income				
Education visits	79.5	99.5	28.9	25.4
Miscellaneous	20.9	—	—	—
	100.4	99.5	28.9	25.4
Expenditure				
Staff costs	127.3	128.6	13.4	18.7
Overheads	48.9	29.8	6.3	3.5
Publicity and Advertising	9.6	—	3.2	—
	185.8	158.4	22.9	22.2
Surplus/(deficit)	(85.4)	(58.9)	6.0	3.2

(c) Library

	1990	1989
	£'000s	£'000s
Income	2.0	0.8
Expenditure		
Staff costs	66.6	60.1
Overheads	41.3	29.7
	107.9	89.8
(Deficit)	(105.9)	(89.0)

(d) Publications

	Journal of Zoology Symposia	International Zoo Yearbook	Zoological Record and Nomenclator	1990 Total	1989 Total
	£'000s	£'000s	£'000s	£'000s	£'000s
Income					
Sales	294.7	20.8	0.1	315.6	295.0
Expenditure					
Staff costs	51.7	41.8	21.9	115.4	126.0
Overheads	11.3	10.7	6.7	28.7	28.5
Printing	143.4	—	—	143.4	120.3
Depreciation	—	0.6	—	0.6	0.9
	206.4	53.1	28.6	288.1	275.7
Surplus/(deficit)	88.3	(32.3)	(28.5)	27.5	19.3

International Zoo Yearbook. Fixed costs are written off in the year in which they are incurred. Paper and printing costs are charged in the year in which each volume is published. No volume was published in 1989/90 (1988/89 – one volume published).

(e) Institute of Zoology

	Veterinary Science	Wellcome Laboratories	Nuffield Laboratories	1990 Total	1989 Total
	£'000s	£'000	£'000s	£'000s	£'000s
Income					
Fees	11.8	1.6	6.4	19.8	8.9
Scientific Fund –					
Investment income (Note 18)	—	—	60.9	60.9	51.3
Other investment income	—	—	0.4	0.4	—
Grants					
Specific projects	—	461.3	331.7	793.0	708.2
	11.8	462.9	399.4	874.1	768.4
Expenditure					
Staff costs	311.0	429.0	661.0	1,401.0	1,280.9
Overheads	160.4	228.7	384.3	773.4	571.3
Depreciation	—	19.5	19.5	39.0	26.7
	471.4	677.2	1,064.8	2,213.4	1,878.9
Surplus/(deficit) on activities	(459.6)	(214.3)	(665.4)	(1,339.3)	(1,110.5)
Government Grant	462.2	228.8	624.0	1,315.0	1,300.0
Surplus/(deficit)	2.6	14.5	(41.4)	(24.3)	189.5

(f) Catering and Retail

The turnover of and net contribution to the Society from Catering and Retail services were as follows:

	1990			1989		
	London Zoo	Whipsnade Park	Total	London Zoo	Whipsnade Park	Total
	£'000s	£'000s	£'000s	£'000s	£'000s	£'000s
TURNOVER OF SERVICES						
Catering	2,143.8	439.7	2,583.5	2,241.9	439.5	2,681.4
Retail	1,232.8	360.6	1,593.4	1,421.6	424.6	1,846.2
	3,376.6	800.3	4,176.9	3,663.5	864.1	4,527.6
CONTRIBUTION TO SOCIETY						
Catering	211.8	27.5	239.3	283.3	33.0	316.3
Retail	265.8	180.3	446.1	422.4	145.7	568.1
	477.6	207.8	685.4	705.7	178.7	884.4

	1990 £'000s	1989 £'000s
3. OTHER OPERATING INCOME		
Income from consultancies	18.2	21.8

No provision has been made for taxation on consultancy income received from abroad. The Society does not believe there to be a liability to overseas taxation.

	1990 £'000s	1989 £'000s
4. INCOME FROM INVESTMENTS		
Listed investments	79.7	57.3
5. INTEREST RECEIVABLE		
Bank deposits	1,559.7	820.2
Zoo Restaurants Ltd and Zoo Enterprises Ltd	—	16.9
	1,559.7	837.1
6. OPERATING DEFICIT		
After charging		
Auditors' remuneration	25.8	24.0
Depreciation	512.9	269.0
Consultancy fees	169.2	161.1
7. STAFF COSTS		
Wages and salaries	5,290.0	4,241.4
Employers National Insurance contributions	532.4	404.6
Other pension costs	404.5	366.8
	6,226.9	5,012.8
The average weekly number of employees during this year was made up as follows:		
Zoological Gardens – London Zoo	233	197
Whipsnade Park	110	102
Education	7	10
Library	4	4
Publications	8	10
Institute of Zoology	76	78
Administration	29	27
	467	428
8. GOVERNMENT GRANTS		
Revenue grants were received as follows:		
For Institute of Zoology	1,315.0	1,300.0
Capital grants were received as follows:		
Matching £ for £ sums raised by the Society	—	750.0
Endowment	—	10,000.0
	1,315.0	12,050.0

9. TANGIBLE FIXED ASSETS

	Freehold land and buildings £'000s	Short leasehold buildings £'000s	Plant and equipment £'000s	Motor vehicles £'000s	Leased plant £'000s	Total £'000s
Cost						
At 31st March 1989	751.4	1,319.6	701.0	289.2	58.0	3,119.2
Additions during this year	190.0	2,147.2	835.4	95.3	—	3,267.9
Disposals	—	—	—	(2.9)	—	(2.9)
At 31st March 1990	941.4	3,466.8	1,536.4	381.6	58.0	6,384.2
Depreciation						
At 31st March 1989	154.0	249.6	275.8	178.7	11.4	869.5
Charge for the year	37.4	224.3	191.3	55.9	4.0	512.9
Disposals	—	—	—	(2.9)	—	(2.9)
At 31st March 1990	191.4	473.9	467.1	231.7	15.4	1,379.5
Net book value						
At 31st March 1990	750.0	2,992.9	1,069.3	149.9	42.6	5,004.7
At 31st March 1989	597.4	1,070.0	425.2	110.5	46.6	2,249.7

Included in additions during the year is £2,157,286 incurred by the Development Fund.

	1990 £'000s	1989 £'000s
10. INVESTMENTS		
Investments at cost		
Quoted investments	991.1	906.9
Market valuation at 31st March 1990	1,366.1	1,318.7
These investments are attributed to:		
Scientific Fund	1,341.7	1,299.3
Fantham Bequest	24.4	19.4
	1,366.1	1,318.7
11. STOCKS		
Raw materials and consumables	247.2	168.0
Finished goods and goods for sale	423.2	16.8
	670.4	184.8
12. DEBTORS		
Trade	67.4	103.4
VAT	186.2	—
Amounts due from Zoo Restaurants Ltd and Zoo Enterprises Ltd	—	622.2
Other debtors	1,213.7	714.0
Prepayments and accrued income	264.3	205.5
	1,731.6	1,645.1

13. CREDITORS: amounts falling due within one year

	1990 £'000s	1989 £'000s
Trade	1,000.3	560.1
PAYE and National Insurance contributions	149.1	140.1
Other creditors	872.5	264.5
Accruals and deferred income	557.2	995.3
Amounts due to Zoo Restaurants Ltd and Zoo Enterprises Ltd	—	143.8
Bank overdraft	357.7	—
	2,936.8	2,103.8

14. CREDITORS: amounts falling due after more than one year

Finance lease obligations	14.7	23.5

15. FUNDS

In accordance with the new accounting policy, it has been decided to designate five main funds in order to present more clearly the substantial inflows in the last few years of funds received for capital development purposes and from the Government. The consequent restatement of the Funds and Reserves at 31st March 1989 is set out below.

	Deferred Government Grant £'000s	Funds £'000s	Building & Equipment Fund £'000s	Income & Expenditure Account £'000s	1989 Accounts Total Restated £'000s
Endowment	10,000.0	—	—	(379.0)	9,621.0
Development	1,914.6	—	1,175.2	(34.8)	3,055.0
Other Designated	—	1,071.3	—	—	1,071.3
Building and Equipment	—	—	1,229.5	—	1,229.5
General	30.6	—	180.2	780.6	991.4
Funds and Reserves per 1989 Accounts	11,945.2	1,071.3	2,584.9	366.8	15,968.2

16. ENDOWMENT FUND

	1990 £'000s	1989 £'000s
Balance at 31st March 1989	9,621.0	NIL
Government Grant	—	10,000.0
Interest receivable	1,206.9	337.5
Deficit of Zoological Gardens	(2,830.6)	(716.5)
Being transfer (to)/from Revenue Account	(1,623.7)	9,621.0
Balance at 31st March 1990	7,997.3	9,621.0

17. DEVELOPMENT FUND

Balance at 31st March 1989	3,055.0	2,103.4
Grants for purchasing fixed assets	674.3	747.9
Interest receivable	137.0	242.9
Depreciation for the year	(160.9)	(39.2)
Being transfer from Revenue Account	650.4	951.6
Balance at 31st March 1990	3,705.4	3,055.0

18. OTHER DESIGNATED FUNDS

	Heer Bequest	Fantham Bequest	Scientific Fund	Composition Fund	Staff Benevolent Fund	Lord Zuckerman Bursary Fund	Total
	£'000s	£'000s	£'000s	£'000s	£'000s	£'000s	£'000s
Balance at 31st March 1989	0.1	9.3	1,021.6	33.0	3.7	3.6	1,071.3
Investment income	—	1.2	55.1	—	—	1.9	58.2
Additional capital	—	—	—	1.3	—	5.5	6.8
Surplus on sale of investments	—	—	76.9	—	—	—	76.9
Loan to staff	—	—	—	—	(0.6)	—	(0.6)
Transfer to Institute of Zoology (Note 2(e))	—	—	(60.9)	—	—	—	(60.9)
Being transfer from Revenue Account	—	1.2	71.1	1.3	(0.6)	7.4	80.4
Balance at 31st March 1990	0.1	10.5	1,092.7	34.3	3.1	11.0	1,151.7

19. BUILDING AND EQUIPMENT FUND

	1990 £'000s	1989 £'000s
Balance at 31st March 1989	1,229.5	1,278.0
Grants for purchasing fixed assets	342.0	17.7
Surplus on sale of assets	—	32.9
Depreciation for the year	(123.1)	(99.1)
Being transfer (to)/from Revenue Account	218.9	(48.5)
Balance at 31st March 1990	1,448.4	1,229.5

20. RESTRICTED FUNDS

(a) De Arroyave Fund

The capital of the fund is held by the Official Custodian for Charities. The net income was £21,342.

(b) Davis Fund

The capital of the fund is held in trust by the Society but is not included on the balance sheet. The income from the fund was £161.

21. PENSION SCHEMES

The Society participates in several Pension Schemes and employees join the appropriate scheme, depending on their employment terms. The total pension cost of the Society was £404,500 (1988/89 £366,800).

(a) Universities Superannuation Scheme: This is a defined benefit scheme which is externally funded and contracted out of the State Earnings-Related Pension Scheme. The Fund is valued every three years by a professionally qualified independent actuary using the projected unit credit method, the rates of contribution payable being determined by the trustee on the advice of the actuary. In the intervening years, the actuary reviews the progress of the Scheme. Pension costs are assessed in accordance with the advice of the actuary, based on the latest actuarial valuation of the Scheme, and are accounted for on the basis of charging the cost of providing pensions over the period during which the Society benefits from the employees' services. Unless it is considered prudent to recognise deficiencies over a shorter period, variations from regular cost are spread over the expected average remaining working lifetime of Members of the Scheme after making suitable allowances for future withdrawals.

The Scheme provides benefits based on final pensionable salary for employees of all UK universities and some other employers such as the Society. The assets of the Scheme are held in a separate trustee-administered fund.

The latest actuarial valuation of the Scheme was at 31st March 1987. The main actuarial assumptions were an investment return of 8½% per annum, salary scale increases of 6½% per annum and that pensions would increase by 5% per annum.

At the date of the last actuarial valuation, the market value of the assets of the Scheme was £3,783 million and the actuarial value of the assets was sufficient to cover 81% of the benefits which had accrued to Members after allowing for the effect of future increases in their earnings. The level of contributions paid by the Society takes into account this actuarial deficiency.

(b) Zoological Society of London Pension Fund and Zoological Society of London (1988) Pension Fund: The Society's own self-administered occupational pension schemes are non-contributory defined benefit schemes which are externally funded and are not contracted out of the State Earnings-Related Pension Scheme. The funds are valued every three years by a professionally qualified independent actuary using the attained age method. In the intervening years, the actuary does not review the progress of the Schemes. Payments made to the schemes and charged in these financial statements are based upon actuarial advice. The assets of the schemes are held in separate trustee-administered funds.

The latest actuarial valuation of the Zoological Society of London Pension Fund was at 30th June 1987. The main actuarial assumptions are an investment return of 9% per annum, salary increases would average 7.5% per annum and that pensions would increase by 3% per annum.

At the date of the latest actuarial valuation the market value of the assets was £7 million and the actuarial value of the assets exceeded the benefits that had accrued to members by 4.5%, after allowing for the effect of future increases in their earnings.

In recent years, the Society has formed subsidiary companies to carry out its trading functions. Under the terms of the Trust Deed of the Zoological Society of London Pension Fund, they cannot participate as employers. To overcome this the Zoological Society of London (1988) Pension Fund was established from 2nd October 1988, after which all eligible new staff have joined this fund. The Fund has not yet been subject to a full actuarial valuation. The terms, conditions, scale of contributions, and benefits are identical to those of the Zoological Society of London Pension Fund. Council is of the opinion that the funding requirements of this new scheme are similar to those of the earlier scheme. It is intended to wind up the Zoological Society of London Pension Fund and transfer its assets and liabilities to the Zoological Society of London (1988) Pension Fund as soon as possible.

(c) Department of Education and Science: The Society contributes for four staff to a pension scheme administered through the Department of Education and Science, for teachers employed by the Society during their period of service.

	1990 £'000s	1989 £'000s
22. CAPITAL COMMITMENTS		
Expenditure contracted	1,100.6	542.9
Authorised but not yet contracted	338.2	30.0
23. FINANCE LEASE OBLIGATIONS		
Net amount payable		
Next year	9.0	7.8
In the second to fifth years	14.7	23.5
Thereafter	—	1.0
	23.7	32.3

24. STATUS OF THE SOCIETY

The Society is incorporated by Royal Charter and is a registered charity, No. 208728. It is exempt from United Kingdom taxation.

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Sauria

Iguanidae

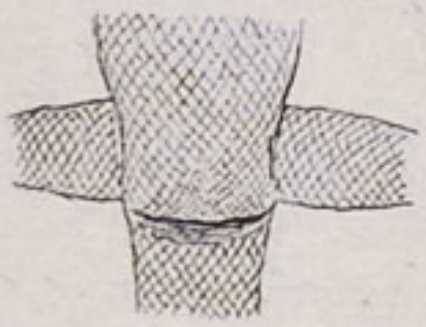

Fig 1

Fig 2

Calotes mystaceus

Definition *

Family. The Iguanidae (or Eunotes of Dumeril) are a family of lizards for the most part armed with a crest along the back of a somewhat compressed form. A thick fleshy tongue, free only at tip. Eyes rather small, not covered by skin, & with a round pupil. [illegible] ther large scales. no plates any [illegible] Family is divided by Dumeril in[illegible]

Obs[illegible] dorsal crests in many genera. [illegible] of tail alone. Cervical Verteb[illegible] cording to genus. with lateral fa[illegible] ulated upon a single condyle [illegible] gle in some - in others a series [illegible] ter slender - in-reously arrang[illegible]

Obs[illegible] of frontal single in a hollowed [illegible] ill: sides of smell obscure. [illegible] vered with villous & papillous. Typ[illegible] te maxillary - & hypoides with[illegible] te genera of the pouched throa[illegible] as such have tuberculous [illegible] ation of Bibro-

THE ZOOLOGICAL SOCIETY OF LONDON

ANNUAL REPORT
1989 - 1990