THE ZOOLOGICAL SOCIETY OF LONDON

ANNUAL REPORT 1988 - 1989

This Report covers the period from 1 April 1988 to 31 March 1989. Animals in the Collection, however, will continue to be recorded on a calendar year basis.

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 by 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 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 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: Weavers and Waxbill by H. Grönvold. *Trans. zool. Soc. Lond.* **19** (1910): pl. X

Drawings: David Boys and John Norris Wood. *Photographs:* Michael Lyster

EDITORIAL: Marcia A. Edwards and Peter H. Denton

REPORT OF THE COUNCIL

The Council has pleasure in presenting its 160th Annual Report to the Annual General Meeting of the Society to be held on 27th September 1989 at 3.00 pm in the Society's Meeting Room at Regent's Park.

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PATRON: HER MAJESTY THE QUEEN

COUNCIL 1988–89

President: Sir William Henderson, DSc, FRCVS, FIBiol, FRSE, FRS
Treasurer: The Rt Hon Lord Peyton of Yeovil
Secretary: Sir Barry Cross, CBE, MA, PhD, ScD, MRCVS, FBiol, FRS
Sir John Ackroyd, MA
Professor R McNeill Alexander, MA, PhD, DSc, FIBiol, FRS
Professor R M Anderson, ARCS, PhD, DIC, FIBiol, FRS
Lord Armstrong of Ilminster, GCB, CVO
Professor R J Berry, MA, PhD, DSc, FRSE, FIBiol, FLS, *Vice-President*
Professor A W Cuthbert, MA, PhD, FRS
D C Evered, BSc, MD, FRCP, FIBiol
The Rt Hon Michael Heseltine, MP, *Vice-President*
Mrs Philippa Herbert
Professor P A Jewell, MA, PhD, CBiol
J M Knowles
Anne L McLaren, MA, DPhil, FRS, *Vice-President*
C J S Marler
Professor N A Mitchison, DPhil, FRS
B C Owens, FLS
A J Stevens, MA, BVSc, MRCVS, DipBact
The Hon Sir Ronald Waterhouse, LLD
H G The Duke of Wellington, LVO, OBE, MC, *Vice-President*

HONORARY FELLOWS

Date of Election	
1977	HRH The Prince Philip, Duke of Edinburgh, KG, KT
1952	Professor Seven 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 DF70.91

INTRODUCTION BY SIR WILLIAM HENDERSON, FRS, PRESIDENT,

Sir William Henderson

At the Annual General Meeting in September, I shall be succeeded as President by Professor Avrion Mitchison, FRS, Jodrell Professor of Zoology and Comparative Anatomy at University College London. Professor Mitchison's international scientific reputation allied to his considerable knowledge of the Society, give me every confidence that he will uphold the responsibilities that the office demands.

One of his aims will be to ensure that the Government Funds at the Society's disposal are applied to the best advantage and I have no doubt that with the advice and support of Council, this will be achieved.

There have been some significant changes in personnel during the past year. Dr Richard Laws, FRS resigned as Secretary due to increased pressure of work as Master of St Edmund's College, Cambridge. The Society is most fortunate to have as his successor, Sir Barry Cross, FRS, recently retired from the Directorship of the AFRC Institute of Animal Physiology and Genetics Research. Another key appointment is that of Mr Peter Denton, originally on secondment from the Department of the Environment, who has agreed to remain on a permanent basis as Director of Administration.

The most far-reaching event has been the establishment of Zoo Operations Limited, details of which appear later in this Report. This new company, together with its carefully selected management team, will ensure that both London and Whipsnade Zoos are restored to much of their former glory. The profit from the Zoos will be covenanted to the Society thus securing its future and the continuation of its vital scientific activities. The first task of the Company was to prepare a development strategy. 'The Way Ahead', which contains proposals for the immediate refurbishment and redevelopment of certain areas of the Zoos. This was formally accepted by the Government in November 1988, as part of the conditions attached to the payment of the £10 million endowment.

A great deal of planning and work lies ahead but I take my leave as President in the knowledge that the Society is in good heart and its affairs in competent hands.

Wm. M. Henderson

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

1988 will, I hope and believe, prove to have been the year in which the Society's fortunes and prospects changed decisively. The Government's formal acceptance of the Consultants' recommendations was the first most welcome and all important development. A new management team under Andy Grant started work in April and later produced a long term strategy which has been approved by the Council and the Government. The new trading company, Zoo Operations Limited, of which I am privileged to be the first Chairman, was incorporated in August and started to trade in October. I would like to thank all members of the Board, non-executive and executive, for their most valuable contributions; their names appear in Appendix 1 of this Report. The Government paid over the £10 million as promised: I need hardly say how valuable has been the interest on that sum, at a time when we have, as we expected, been running a deficit on our operations.

I am particularly pleased to report that at London Zoo, the catering has been greatly improved and work on the new shop, from which we can expect significantly better results, was completed on schedule to achieve an opening in time for the high season. The Zoo generally began to emerge from the shadows and to take on a brighter appearance. A refurbished main entrance, which gives the visitor a message of welcome and a sense of having arrived, together with new uniforms for those staff having a high public profile, underlined and emphasised the change. A mild winter, along with those factors, helped to produce results comfortably better than budget. The total number of visitors at both London Zoo and Whipsnade Wild Animal Park was better than expected. The Gloucester Slips Car Park, transferred to the Society in April 1989, is a welcome new asset, a help to visitors and an additional source of earnings.

Considerable progress was made during the year towards securing the future of Whipsnade. The visitor's perception of 'a good place to visit' has changed considerably over the last 50 years and we must be capable of meeting this need. Several companies have shown a healthy interest in forming a partnership with the Society and provided the character of and facilities for research at Whipsnade are retained this looks the most likely solution.

A mutually satisfactory arrangement has been made with the University of London for supporting the work of the Institute of Zoology, made possible by the Government's annual grant of £1.3 million. I am particularly grateful to Mr Peter Holwell, the Principal of the University, who is also a member of the Board of Zoo Operations Limited, for his help in this matter.

I am delighted to report Sir Gordon White's acceptance of my invitation to take the Chair of the Development Trust and in that capacity to conduct the appeal, which has now been launched.

1988 was, we can claim, a year of both performance and promise. Much useful work was done; good foundations were laid for the future and a new note of confidence and enthusiasm was sounded. I am deeply grateful to all who have contributed to this welcome state of affairs, particularly to our dedicated staff, who have been through troubled and worrying times, but have served the Society wonderfully well.

Peyton of Yeovil

TREASURER

GOVERNMENT SUPPORT – KEY POINTS

(ANNOUNCED 11 MAY 1988)

1. Government to endow the Society with £10 million to help restore London Zoo and Whipsnade Wild Animal Park to financial viability.

2. The Institute of Zoology to receive core funding of £1.3 million per year from the Department of Education and Science.

3. A separate zoo operating company to be established, known as Zoo Operations Limited. The Company to be wholly owned by The Zoological Society of London with its profits covenanted to the Society. The Company to produce a master development plan and obtain expert advice on the investment of £10 million.

4. The Senior Management Team of the Company to be selected to reflect the need for expertise in running a major visitor and tourist attraction.

5. The Society to be allowed to exercise its option under existing legislation to acquire a further 10 acres of land in Regent's Park.

6. A new 60 year lease to be granted for the Regent's Park site.

7. The Society to obtain a licence from the Secretary of State for the Environment to manage the Gloucester Slips Car and Coach Parks in Regent's Park.

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.

REVIEW OF THE YEAR

THE RESTRUCTURING OF THE SOCIETY

Background

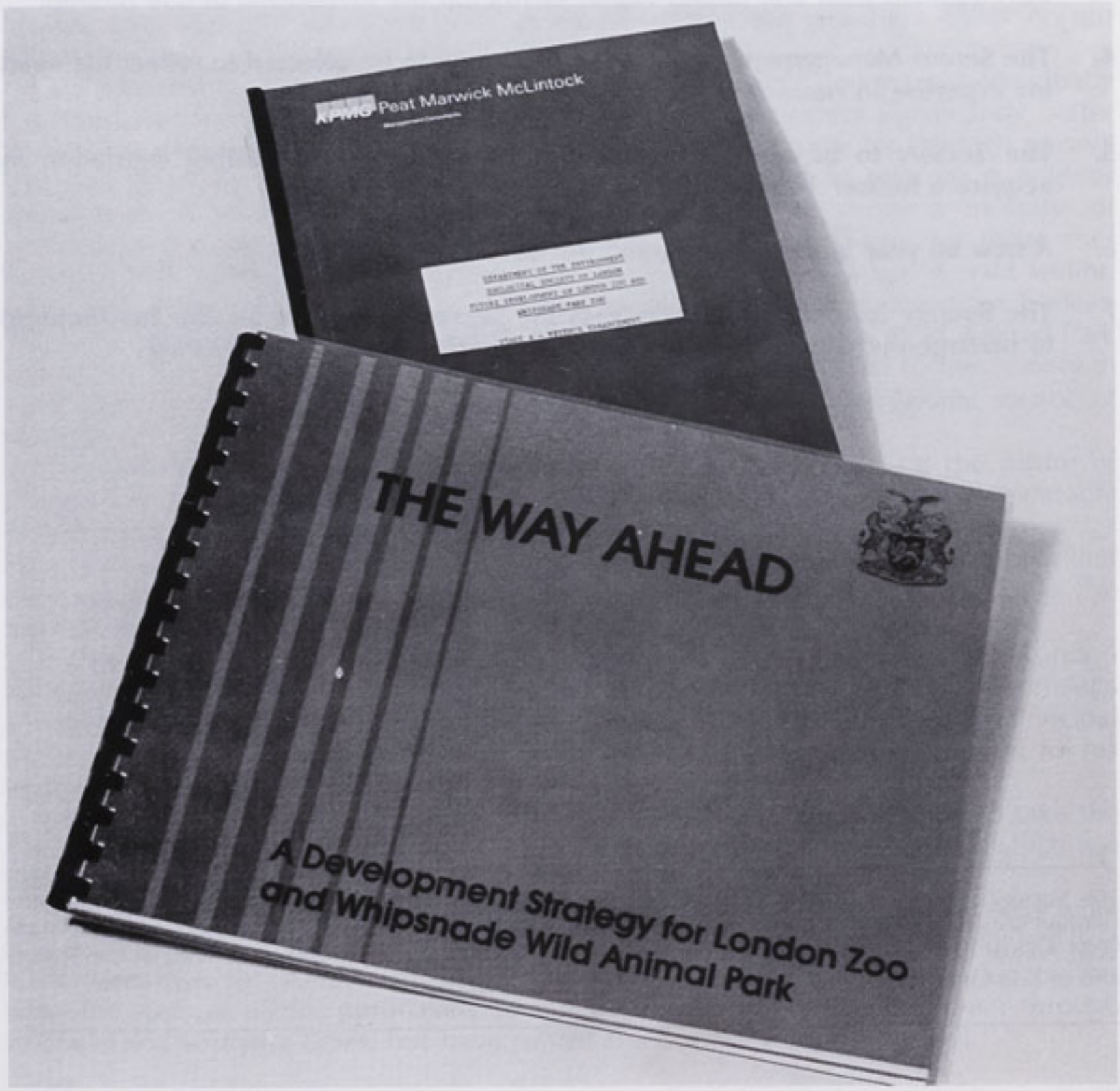
The Society has for some time been dependent on Government support in order to sustain its famous collection of animals at Regent's Park and Whipsnade Wild Animal Park and to meet the costs of the Institute of Zoology. In 1987 the Society and the Department of the Environment jointly engaged a team of leading consultants headed by Peat Marwick McLintock to report on the scope for improving the Society's financial performance and that of the Zoos in particular.

The Government's Rôle

The consultants reported early in 1988. Following careful analysis of their recommendations, the Government announced in May 1988 that in recognition of the special status of the Society as a centre of zoological excellence, it would give a once and for all grant of £10 million towards refurbishing the two Zoos. In addition, there was for the first time a recognition by Government that it was inappropriate for such a world renowned research institute to be dependent for its funding on the number of visitors to a leisure attraction, and that therefore it would guarantee to provide the core funding of the Institute of Zoology.

Changes to the Charter and Bye Laws

To enable the Society to implement the changes and maintain its charitable status it



The report from Peat Marwick McLintock informed the Government's decision to make a once and for all £10 million grant to the Society. 'The Way Ahead' produced by Zoo Operations Limited, a subsidiary company of the Society, provided a more detailed analysis of the challenges facing the zoos.

was necessary to amend the Charter and Byelaws. A ballot of Fellows was held in June 1988 and this produced a substantial (97%) vote in favour of the proposed changes. Privy Council approval was obtained on 26 July.

The Zoos
In order to introduce a more commercial orientation to the zoo operation, the Society has established a separate but wholly owned company whose profits are covenanted to the Society. The Company, known as Zoo Operations Limited, has as its Chairman the Treasurer of the Society, Lord Peyton of Yeovil. The Managing Director is Mr Andy Grant, who until recently was Chief Executive of Leeds Castle and before that the Manager of Zoos in San Diego and Philadelphia. A full list of directors of the Company appears in Appendix 1. The animals and the buildings of both Zoos and the freehold of Whipsnade remain in the ownership of the Society.

The Institute of Zoology
With effect from 1 April 1989 the Department of Education and Science will assume from the Department of the Environment the rôle of sponsor of the Institute and will meet the annual core funding cost of £1.3 million. Accountability for the grant will be achieved through payment being made via the University of London. Whilst the constitution of the Institute Committee has had to be amended slightly to comply with the University's funding rules, the academic freedom of the Society has been retained.

The Publications Department and the Library
The Society retains complete control of the Publications Department and will continue to explore every opportunity to attract additional income through joint publishing ventures. An appeal aimed at raising sufficient money to establish an endowment fund to secure the integrity of the Library will be announced during the summer.

The Committee Structure
The greater accountability of the Zoo Management team, inherent in the establishment of Zoo Operations Limited, led Council to consider the effectiveness and continuing relevance of its committee structure. This resulted in the Management Committee and the Parks & Gardens Committees being dissolved. The remaining committees, which continue to provide an invaluable advisory rôle, are detailed in Appendix 1, together with the individual members.

ANNUAL GENERAL MEETING
The Annual General Meeting was held on 29 September 1988 with the President, Sir William Henderson, in the Chair.

In accordance with Article 10 of the Charter and Byelaw 25, the following Fellows retired as Ordinary Members of the Council: The Rt Hon Peter Archer, The Rt Hon Lord Charteris of Amisfield and Katherine, Viscountess Macmillan (Ordinary Fellows); Mr J F Peake and Professor Sir Richard Southwood (Scientific Fellows). The death of Mr T A P Walker created a casual vacancy for an Ordinary Fellow and Dr R M Laws resigned as Secretary. The nomination of Professor B A Cross in his place created a vacancy for a Scientific Fellow.

In accordance with Articles 11 and 12 of the Charter and Byelaw 26, Professor B A Cross was elected Secretary and the following Fellows were elected Members of Council: Lord Armstrong of Ilminster, Mrs Philippa Herbert, Mr J M Knowles and Mr C J S Marler (Ordinary Fellows); Professor R McNeill Alexander, Professor R M Anderson and Professor A W Cuthbert (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 *Miss Gillian Laurenson,* of the High School (Grammar), Ballyclare, Co. Antrim, for her essay 'A study of the dimensions of orb webs of spiders'. A certificate was also presented to the school's Head of Biology.

The Thomas Henry Huxley Award (for original work submitted as a doctoral thesis) to *Dr Ruth Mace,* University of Oxford, for her thesis 'The dawn chorus: behavioural organization in the great tit (*Parus major*)'.

The Scientific Medal (awarded to persons under 40 years of age for distinguished work in zoology) to *Dr N. B. Davies,* University of Cambridge, for his work on the behavioural ecology of birds, amphibians and insects.

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 Sir Eric Denton, CBE, FRS,* for his contributions to marine biology, especially in its experimental aspects.

The President also announced that the **Stamford Raffles Award**, for distinguished contributions to zoology by an amateur zoologist, has been made to *Miss Fiona Guinness* for her

contributions to research on red deer in the British Isles.

OBITUARIES

The Council records with deep regret the death of: His Majesty The Emperor Hirohito of Japan, Honorary Fellow since 1971; Major General Sir Charles Dalton, Ordinary Fellow and former Director General of the Society; Dr Henry Gwynne Vevers, Scientific Fellow, former Curator of the Aquarium and later Assistant Director of Science; Sir Michael Perrin, Life Scientific Fellow and former Vice-President of the Society; Mr E M Behrens, Ordinary Fellow and former member of Council and the Management Committee; H G The 10th Duke of Northumberland, Ordinary Fellow and former member of Council; Sir Edward Hulton, Life Fellow and former member of Council; Mr Richard Twisleton- Wykeham-Fiennes, Scientific Fellow and former Pathologist for the Society; Professor Ernest Cotchin, Scientific Fellow and formerly Vice-Principal of the Royal Veterinary College; Dr Ethel Lindgren, Scientific Fellow and founder of the Reindeer Council of the United Kingdom; Professor Geoffrey Bourne, Ordinary Fellow, Vice-Chancellor of St George's University School of Medicine in Grenada, West Indies, and an expert on primates; Lieut-Colonel Fatesinghrao Gaekwad, former Maharajah of Baroda, Ordinary Fellow; Mr Frank Lane, Life Fellow and wildlife photographer.

While this Report was being prepared, Council learned with sorrow of the death of Sir Philip de Zulueta, Ordinary Fellow and former member of Council.

AMENDMENTS TO THE CHARTER AND BYE-LAWS

A Resolution recommending amendments to the Charter and Byelaws was submitted in June to a postal ballot of Fellows. The result was 1,119 Fellows in favour and 30 against the Resolution, with 3 spoilt papers. The amendments were then submitted to the Privy Council and approved on 26 July 1988.

These amendments are given in Appendix 6.

MEMBERSHIP

At the end of the subscription year (31 December 1988) there were 2,269 Fellows and 3,086 Associates, including 239 Student Associates.

Professor Dr Milton Thiago de Mello of the Departmento de Biologia Celular, Instituto de Ciencias Biologicas, Universidad de Brasilia was elected an Honorary Fellow.

FRIENDS OF THE ZOOS

By 31 March 1989 there were 3,035 Family Friends, 4,110 Adult Friends, 73 Student Friends and 425 Junior Friends.

STAFF

At 31 March 1989 there were 81 full-time members of staff employed by the Society and 296 employed by Zoo Operations Limited (ZOL).

General

On 1 October 1988 a large proportion of the Society's staff formally became employees of Zoo Operations Limited. The change was effected under the Transfer of Undertakings Regulations which safeguarded their existing conditions. Those remaining in the Society's employ comprise the staff of the Institute of Zoology, the Publications Department and the Library, and the Director of Administration, Mr Peter Denton, who also serves as Company Secretary of Zoo Operations Limited.

In order to accommodate this change and to take account of recent legislation it was necessary to establish a new pension scheme (the Zoological Society 1988 Pension Scheme) which for the moment operates in parallel with the original scheme but will eventually replace it.

Pay increases during the year were, as usual, awarded in line with those of various outside bodies, mainly in the public sector, which have been used as analogues for many years. However, a good start was made on a radical revision of pay and conditions for ZOL staff. The new package includes progress towards single status conditions, a single pay structure with pay increases linked to the success of the Company rather than to outside analogues, and various measures to enable the Company to compete more effectively in an increasingly competitive labour market. While much work still remains to be done, it is appropriate to record the very considerable amount of time and effort given by staff representatives in the discussions to formulate the new structure. Ballots held by the recognised unions were overwhelmingly in favour of accepting the new personnel policy; this is a significant vote of confidence by the Company's staff on the way forward to a better future.

Staff throughout the Society and the Company were kept informed of developments regarding the Government grant and changes to the management structure of the Society via a series of open meetings, monthly team briefings, personal copies of an internal management information handout known as 'Zewsflash' and eight meetings of the Joint Consultative Committees.

The Secretary, Dr Barry Cross, presents the City and Guilds Bronze Medal to Keeper Julian Chapman

Changes at senior staff level included the appointment of Mr Peter Denton as Director of Administration (previously only on secondment from the Department of the Environment), of Mr W J Griffiths as Acting Head of the combined Education Department and Information and Design Unit, with Mr M Ricketts as Senior Education Officer. At London Zoo the Public Services Department was renamed the Visitor Operations Department. At Whipsnade Wild Animal Park a reorganisation of the management structure replaced the post of Curator with that of Visitor Operations Manager.

Awards

The completion of 25 years' continuous service was recognised by the presentation of gold watches or clocks to P J Levi, V C Curzon, M Lyster, Mrs J M Ryan, and T B Dennett.

In the examinations for the City and Guilds Certificate in Zoo Animal Management all 27 candidates were successful. Mr J C Chapman and Mrs H Wallbank, both Keepers at Whipsnade, were awarded Nobby Ashby Prizes. Mr Chapman was presented with the City and Guilds Bronze Medal in recognition of his achieving the highest marks nationally in the examination.

Retirements

Retirements (years of service in brackets) included Mr R Dumbleton (41) Head Keeper, Aquarium; Mr M K Boorer (28) Education Officer; Mr V J A Manton (27) Curator, Whipsnade Park; Mrs J M Ryan (25) Secretary, Institute of Zoology; Mr P E Wallace (23) Laboratory Superintendent Nuffield Laboratories.

Other departures included Mr D J Eyre (27), Head Keeper, Pheasantry/Ostrich House, London Zoo and Mr R H Willis (18), Assistant Accountant.

Obituaries

We regret to record the deaths of the following pensioners: G A Allen, W Allsopp, R Barrow, L H Conway, Major General Sir Charles Dalton, F Myers, W Stafford, Mrs H Tomkins, R T-W-Fiennes, H G Vevers and J Wright.

ACKNOWLEDGEMENTS

The work of the Society is greatly aided by all those who freely give their time to serve on the various advisory committees and by the numerous individuals and organisations who provide invaluable help and advice.

To these many friends, Council wishes to express grateful thanks.

ZOO OPERATIONS LIMITED

Andrew Grant

Lester Corp

Peter Denton

Zoo Operations Limited was incorporated on 19 August 1988 and commenced trading on 3 October 1988.

The Company operates within a broad policy framework established by the Society yet free from many of the constraints inherent in the previous management structure. It is charged with managing those assets of the Society dedicated to the Zoos at both London and Whipsnade. It is essentially a device for introducing a more commercial dimension to the Zoo operation whilst maximising the benefits to be derived from the charitable status of the Society. The Collections will continue to be known as London Zoo and Whipsnade Wild Animal Park and the casual visitor will be unaware of these internal management changes.

One of the first tasks of the Society was to establish the Company with a Board of Directors. The non-executive directors are drawn from a broad spectrum of commerce and academia. The majority of the executive directors were recruited during the latter half of the year. Their selection reflects the Board's determination to compete on equal terms with the most successful visitor attractions in the country and at the same time maintain the Society's unique contribution to the understanding of animals.

In November the Company published 'The Way Ahead', its development strategy for both Zoos. This document was seen as indicating priorities, providing a blue print on how the Company wishes to enhance the Zoos generally and showed how the executives' combined experience of finance, visitor attraction and animal management was being utilised for the benefit of the Zoos and ultimately the Society. After considering the strategy document, Government Ministers satisfied themselves that their own grant giving criteria had been met and accordingly paid over the £10m on 4 November. The grant was paid to the Society. Although dedicated to Zoo development, a formula has been agreed whereby the money will be released to the Company when Council is satisfied as to need.

The Company is committed to a policy of maximising visitor-derived income. This will allow much of the backlog maintenance to be addressed as well as, hopefully within two to three years, producing a positive cash flow. Part of the Government grant was seen as providing the funding during this transitional period. The balance was a contribution towards a major capital development programme, details of which were to be announced in May 1989.

THE DEVELOPMENT TRUST

The Development Trust's Chairman, Sir Derek Palmar, retired in November 1988, having served his three years as a Trustee. Lord Peyton then accepted the position of Chairman until the appointment of Sir Gordon White in February 1989. Sir Gordon White is Chairman of Hanson Industries Inc. Sir Gordon Booth was elected Deputy Chairman. Application to the Charity Commission to remove the restrictive clause from the Trust Deed that limits the length of time that any Trustee may serve was made during the year and was processed satisfactorily. Miss Daphne Park, on her retirement as Principal of Somerville College, Oxford, will take up the post of Director of the Development Trust. A list of the present Trustees is given in Appendix 1.

The Trust was heavily involved in preparing material for the announcement of the development plans for London Zoo, including a corporate donor programme, 'sponsorship packages' and integration with the 'Lifewatch' concept.

Andrew Forbes

David Jones

Keith Willoughby

Executive Directors of Zoo Operations Limited (For responsibilities see Appendix 2)

THE LONDON ZOO

Visitors during the year: 1,391,749

GENERAL

With the formation of Zoo Operations Limited, preparation of long-term development plans for the Gardens has commenced. All the senior staff and a range of external advisers are involved in this process. Work has begun to accelerate the reduction of the backlog of maintenance required for the older buildings and services, to renew and extend the programme for signs and graphics and to rejuvenate and generally brighten up the grounds.

Concept drawings are meanwhile being prepared to briefs drawn up by staff for the redevelopment of six areas of the Zoo, the North Bank (for birds), the inside and outside of the Mappin Terraces, the Ostrich House and the Parrot House sites, the Children's Zoo and the Concourse area around the main restaurant and amphitheatre. These plans will also incorporate the additonal areas for inclusion from the adjacent parts of Regent's Park. The development of these sites will greatly improve the Zoo visually and enable animals to be presented in ways more in keeping with the best available techniques which the Society has recommended to other zoos in the course of its consultancy work.

THE COLLECTION

Mammals

The most notable event of the year was the decision to send the male Giant Panda, 'Chia Chia' on breeding loan to the Chapultepec Zoo in Mexico City. He left London at the beginning of September 1988, and spent three months on show in the Cincinnati Zoo in Ohio, where his presence raised the large sums of money required to build an extension to the breeding facilities in Mexico City; he was taken there from Cincinnati at the end of November 1988. He has settled in and is getting on well with his prospective mate, the young female 'Tohui'.

In the Sobell Pavilion for Apes and Monkeys, it is particularly pleasing to have the two female Gorillas both raising their young ('Kamili' born in 1987 to 'Zaire', and 'Asali', another female, born in April 1988 to 'Salome'). Two Chimpanzee babies, born in April and July 1988, are also being raised by their mothers in the group. A baby Lar Gibbon was born in April 1988, but, sadly, 'Charlie' the father died in January 1989; he was the Zoo's oldest resident mammal, having arrived in 1961, aged about two years. There have been several movements of Bornean Orang Utans between London and other zoos, and also of Mandrills for population and genetic management purposes. Also of particular importance is the setting up of a breeding programme for the Hamlyn's (Owl-faced) Monkey in the UK. This has been made possible by the loan of animals from Antwerp and Mulhouse which have been deposited at London and two other collections.

In December 1988, the Society presented a pair of Cream Ponies from the Children's Zoo to the Riding for the Disabled Association, and these were accepted by Her Royal Highness The Princess Royal, on behalf of the Association.

In the Clore Pavilion for Small Mammals, there was the usual large number of births; the Clore houses species which are frequently highly fecund. For example, White-faced Saki babies were born in April and June 1988, and a male and female Saki were also sent on deposit to other collections as part of the co-ordinated breeding programme for this increasingly rare South American monkey.

HRH The Princess Royal accepts ponies on behalf of The Riding for the Disabled Association

On the New Lion Terraces, the most important event was the arrival of a male and two female Clouded Leopards from San Diego, and another male from Howletts Zoo Park to make up two pairs. These animals are an important addition to the UK population of this rare species, and considerable efforts are

Young Asian elephants at bath time

being made to provide them with the correct facilities for breeding.

Successes with Giraffe continued with the birth of two males, one in April 1988 and the other in January 1989 (numbers two and three in a run of three males), and a female born in March 1989. Moves of important ungulates, such as Bongo, Roan and Sable antelope, continue between the Society and other collections, but principally with Marwell, with whom we have a Joint Ownership Agreement involving 42 species (see Appendix 4).

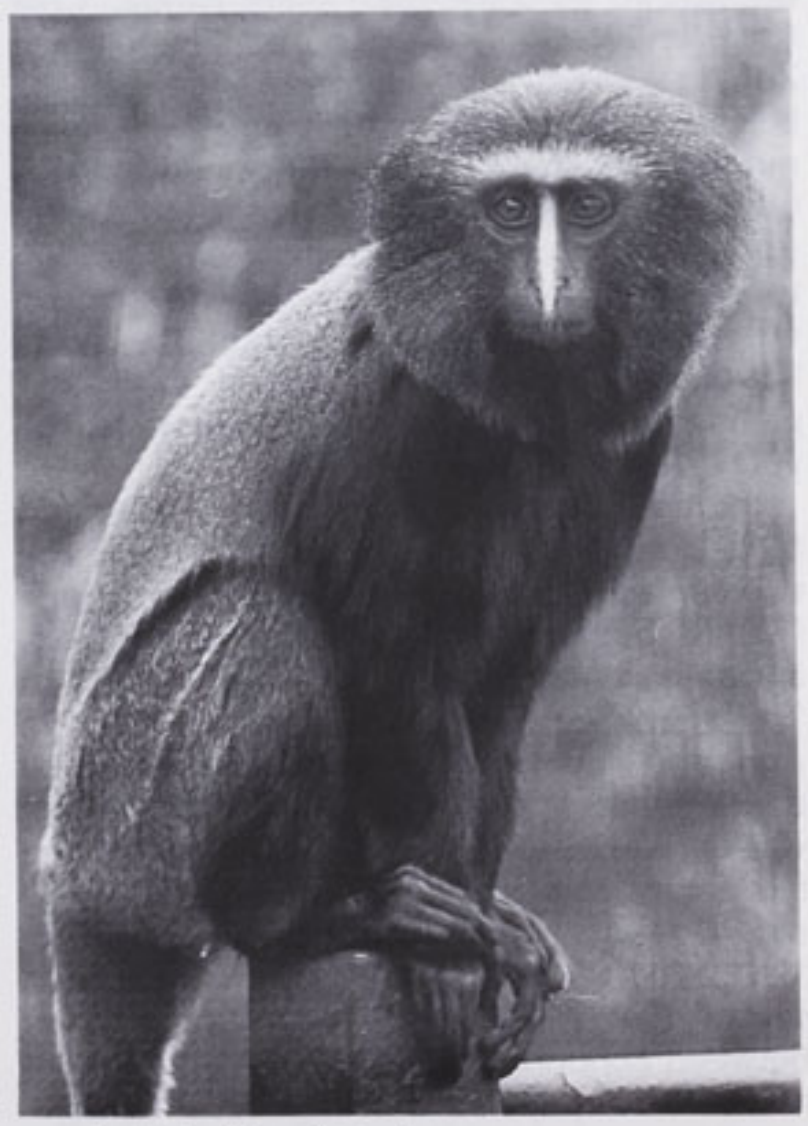
In the Elephant House, two major events marked 1988. The first was the birth of 'Rosie' the Black Rhino in November. Her mother, who is now in her mid-twenties and has reared calves successfully in the past, did not look after her, and she is being hand-reared. This has not proved to be an easy task, since Black Rhinoceros are known to be difficult in this respect and her birth weight was very low. She is now doing well and is proving to be a considerable attraction to visitors and the media. She also provides an excellent example of how a well presented living animal can act as an ambassador to highlight the conservation problems of her species in the wild. In December 1988, the first of the young elephants from Burma arrived to join the two Asian females already in London, 'Dilberta' and 'Layang-Layang'. These three elephants will be joined by another in the near future, and a further four will go to Whipsnade, providing quiet, trained groups at each Zoo to give demonstrations, children's rides, and to breed when they are mature.

An Aardvark baby born in the Children's Zoo in March 1988 had to be hand-reared, and, although all went well initially, unfortunately she died in May. The gale of October 1987, that wreaked havoc over southern England, blew down the 'Tree of Heaven' that grew in the middle of the Red Panda enclosure. The animals survived this disaster, but when the female of the pair died in June 1988, it was decided that the species should not be displayed again until suitable accommodation can be provided for them. Consequently the male has been sent to Kristiansand Zoo in Norway, to be paired with an unrelated female there.

As always, animal riding and the Meet-the-Animals presentations proved extremely popular, and, this year, they were put on twice daily. Visitors want more than simply to look at animals, and closer interactions between them, the animals, and their keepers are increasingly important in the daily life of the Zoo.

Birds

One of the most notable events of 1988 was the successful hatching and rearing of a Bateleur Eagle. Notable because this species is rarely bred outside the wild and because in this case the egg was incubated and the young reared by the female alone. She had



Hamlyn's (Owl-faced) Monkey

been in the collection since May 1970, and her mate since February 1979. The first egg from this pair was laid in 1981, but it was not until 1984 that an egg removed to an incubator hatched and a chick was hand-reared. In 1985 the Bird of Prey aviaries were demolished and the Bateleur Eagles were transferred to the Eastern Aviary. An egg was laid in 1986 and, though fertile, did not hatch. Another egg laid in 1987 was found to be 'clear'. In 1988 an egg was laid on 17 August. The male was moved to another aviary because of the pair's persistent and mutual aggression which could have caused the egg to be broken or abandoned. The female incubated the egg alone, and on the 9 October it hatched. An incubation period of 53 days was recorded which fits into the 52–55 days recorded in the wild. The chick was assiduously cared for by the female, and on 20 January 1989, fully fledged and in perfect condition, it took its first flight from the nest. The fledging period of 103 days compares with data from the wild of 97–115 days. This would constitute the first UK record of a parent-reared Bateleur Eagle, and is probably the first single- parent reared Bateleur Eagle in the world.

Of almost equal satisfaction was the rearing of five Kookaburras, four being hand-reared and one being reared by the parents. Our pair, which were presented by Perth Zoo, Australia in 1983, had laid eggs but had either broken them or abandoned the nest. In 1988 a new nesting site was provided and the first clutch was removed to an incubator. One egg hatched on 23 April and the chick was hand-reared. The three eggs of the second clutch, also removed to an incubator, hatched on the 29 May, and all three chicks were hand-reared. The third clutch was left with the parents and a single egg hatched on 6 July. The chick was reared by the parents with no problems. The overall incubation period was 24 days. Kookaburras had not been hand-reared in this collection before, and the process was carefully monitored. On hatching, the chicks, naked and blind, weighed an average 24 g. At first they were fed hourly on pieces of mouse and cricket soaked in a mineral/vitamin supplement, with added calcium lactate. By day three, small whole mice were also eagerly eaten and food was given until they stopped begging. By day 11 the first feather tips were seen, though it was not until day 26 that the eyes were fully opened. By day 36 the chicks were almost fully fledged but it was not until day 45 that they began to pick up food themselves. They were still taking food from keepers up to 13 weeks after hatching.

Among the 37 other species bred there were a number of particular interest. They included Emu (hand-reared after being abandoned), Abdim's Stork, Sacred Ibis, Satyr Tragopan, Vulturine Guineafowl, Crowned Crane and Saffron Finch. Blackfooted Penguins also bred in 1988, making a total of 37 now in the colony, of which the majority have been hand-reared; there has been only one importation into the colony since 1967 when an 8–10 year old male was received from another collection in 1982; the first hand-reared chick was raised in 1977 and she is now one of a

'Asali' the young Gorilla with her mother, 'Salome'

Keeper Lee Sambrook hand-feeding 'Rosie' the Black Rhino

number of grandparents in the colony. A White- cheeked Turaco was hatched in the Snowdon Aviary in late November but fell out of nest after two weeks and was taken for hand-rearing. Two clutches of White-faced Scops Owls were reared in 1988; 17 have been reared by the parents since 1986.

A disappointment was the lack of breeding in the flamingo colony due almost certainly to disturbance by foxes which killed three known breeding birds in February.

Over a hundred birds were brought into the collection, mainly as potential mates for individuals already here. The majority were taken in exchange, on breeding loan, or were presented. Those of special note included captive-bred Ferruginous Buzzard, Red-crowned Crane, Water Rail, Avocet, Lapwing, Redshank, Pin-tailed Sandgrouse, Kea, White-cheeked Turaco and Black-throated Laughing Thrush. Four Saffron Toucanets and four Chopi Grackles, which were confiscated as part of an illegal importation, were received from the Customs and Excise authorities.

A most welcome collection of waterfowl was presented by Lady Dunluce, a daughter of the late Mrs Audrey Sacher who is remembered as a generous and close friend of the Zoo.

Birds sent on breeding loan to other collections included a One-wattled Cassowary, Hyacinthine Macaw, Buffon's Macaw, Lead-beater's Cockatoo, Crowned Cranes, and White-faced Scops Owls.

A Penguin Nursery facility was provided by adapting an old brick-built pump-room near the Children's Zoo. This not only gives conditions that are more hygienic and controllable, but also allows the public to see the birds being handled and fed.

A special 'Waterbirds Week' was organised for the period 29 August–4 September, and two Bird Evenings were held in July and September. These events, which were most successful, gave visitors a chance to see and hear about some of the wide-ranging activities of the Bird Department.

Reptiles

During 1988 21 species and 131 individuals were successfully bred.

Fewer species and individuals were bred in 1988 than in 1987 due to the disturbance caused by the installation of the new heating system in the Reptile House and the theft of a large number of snakes earlier in the year. A sophisticated security system has been installed which hopefully will prevent any further thefts.

A number of species were however bred for the first time at London Zoo. These included the Southern Alligator Lizard, Northern Side-blotched Lizard, Western Banded Gecko and Desert Spiny Lizard.

Great Horned Eagle Owl chick at two weeks old

Young Bateleur Eagle

Also, of particular interest was the breeding of the Russell's Viper (which last bred here in 1937), the Malayan Pit Viper (last bred here in 1973), and the Chuckwalla (last bred here in 1982).

Notable acquisitions included Russell's Vipers, Mangrove Pit Vipers and Malayan Pit Vipers. These snakes are on view in the Venomous Snakes exhibit.

Illegal imports would appear to be on the increase. A number of confiscated reptiles were received from HM Customs & Excise, including seven Sungazer Lizards, a protected species from South Africa. During the year, Customs also discovered a consignment of venomous Gila Monsters and Rattlesnakes which had been sent illegally through the parcel post.

A number of reptiles were acquired for the forthcoming Reptile demonstration and handling sessions. These included Boa Constrictors, Royal Pythons, Indigo Snakes and Rat Snakes. The Lizards are to be represented by Bosc's Monitors, Blue-tongued and Shingleback Skinks.

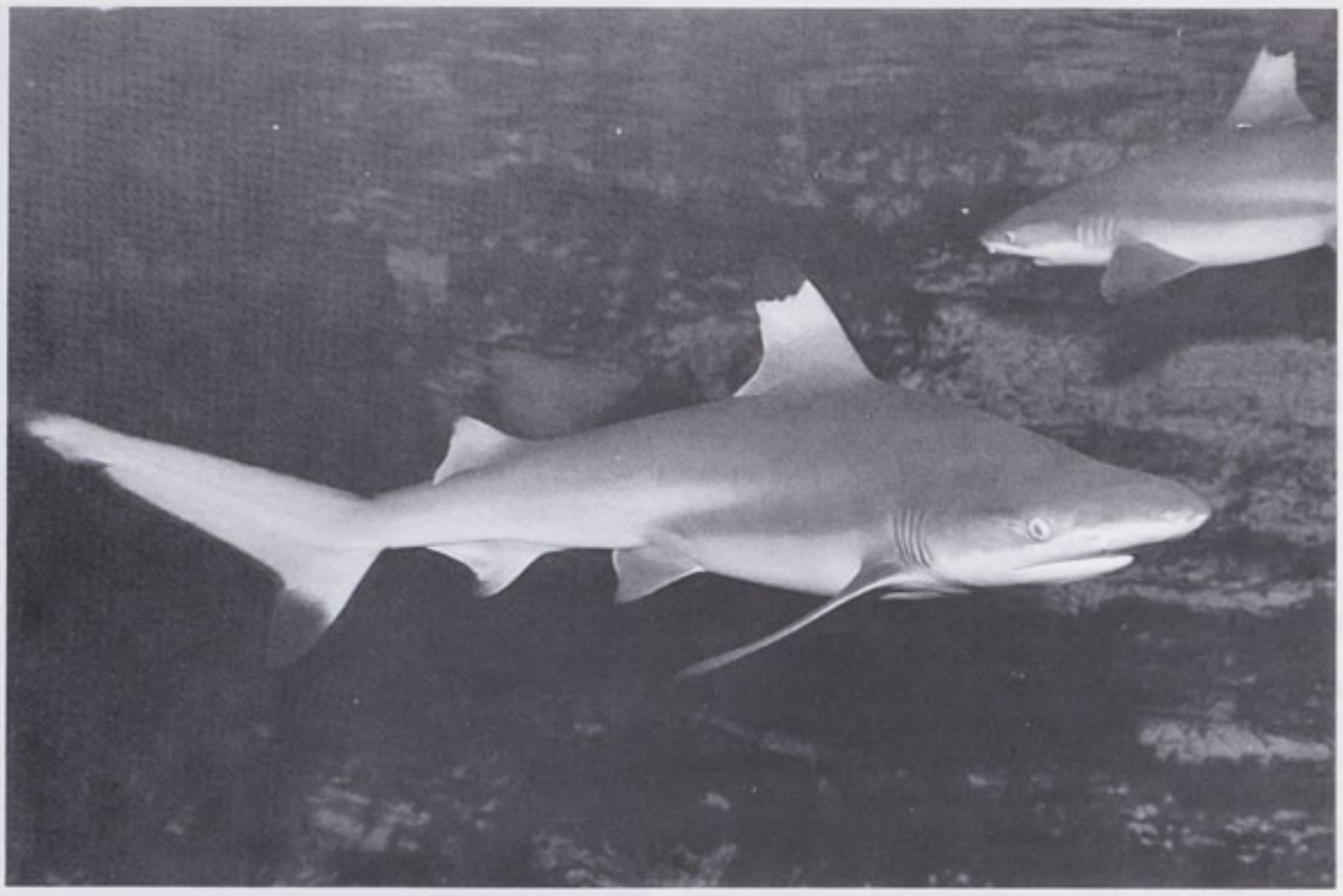
The Chinese Alligators went on exhibition in their new enclosure in May 1988. Since their introduction the two females have shown marked territorial behaviour. The male, however, was content to be with either or both of them. As a result, off-exhibit accommodation was provided for one female in an adjoining enclosure. This allowed the females to live alternately with the male and to ensure that the placid relationship between the animals is not impaired.

The Assistant Curator of Reptiles attended the Reptile Joint Management Group meeting at Edinburgh Zoo in October. A commitment was made amongst the members for greater co-operation in the placement of animals for breeding purposes both in the UK and Europe.

A new public address system improved the presentations of talks, feeding commentaries, tours and the 'Meet-a-Reptile' programme. In addition to the full programme during the two Reptile Weeks, the Volunteers organised another full day of talks and demonstrations.

One of the four hand-reared Kookaburras

Chinese Alligator in the new enclosure



Black-tipped Reef sharks, two of three in the Aquarium

'Reptiles 88' was very well received by visitors, especially the 'Lizards of Oz', where they were introduced to the complexities of arranging for a consignment of reptiles to be sent from Melbourne Zoo.

A consignment of Australian Bearded Dragons was received from Edinburgh Zoo and this unrelated group will augment the existing colony.

Robber crab from the Seychelles

Three young Rhinoceros Iguanas were sent to Cotswold Wildlife Park, and a number of pairs of Namib Geckos have also been sent to other collections.

Aquarium and Insect House

To complement the diverse range of vertebrate and invertebrate animals exhibited in the Aquarium and in the Insect House, several improvements to the displays were made. These included the creation of a number of split-level tanks, along with more varied lighting methods in the Aquarium, and the linking of adjacent displays into common themes in the Insect House. In order to control water conditions, isolated filtration systems for coral reef fish, brackish water fish and cool water marine invertebrates have been installed in the Aquarium, and an attractive rain forest butterfly area has been created in the Insect House. Although emphasis in both houses remains on the display of animals in naturalistic settings, the 'clinical' style of the Leafcutter Ant exhibit continues to be very popular with visitors to the Insect House.

Notable acquisitions include 20 Tomato Frogs, three Black-tipped Reef Sharks, 10 Mudskippers, a group of Mangrove Jellyfish, a colony of New Zealand Wetas and six Robber Crabs. The crabs were flown to London from the Seychelles with the help of the British Airways Conservation Unit, and the Zoo is

hoping to work in conjunction with the British Museum (Natural History) to investigate the possibility of breeding these threatened invertebrates in captivity.

Staff from the Aquarium and the Insect House helped to organise and contributed to a wide range of meetings and symposia throughout the year, including a Royal Entomological Society Symposium on the Welfare of Captive Invertebrates and the Fifth World Conference on Breeding Endangered Species in Captivity. Behind-the-scenes tours and late night open houses proved very popular additional events, with increasing use being made of both the Aquarium and the Insect House for special functions and parties.

BUILDING, SERVICES AND GROUNDS

Although a great deal of time was spent on the preparation of the new development plan, 'The Way Ahead', other work has also progressed. Many areas throughout the grounds have been cleaned and tidied and a major repainting scheme has commenced. Specific buildings dealt with included the interior of the Elephant House and the exterior of the Main Gate and of the Aquarium.

Other ground improvements involved the phased refurbishment and repainting of the old metal garden seats, the installation of new litter bins, and repairs to and renewal of some of the paved areas. Among the many items carried out in connection with the health and safety of the staff were the continuing programme of asbestos removal, and the start of a programme to replace the entrance doors to the Rhinoceros Pens. Animal welfare was not neglected, and the original floors in the Elephant Exhibits, which had become worn and unhygienic after more than twenty years of constant use, were replaced.

The largest building refurbishment project carried out was the conversion of the old North Gate buildings (which are listed as being of national interest) into a new Bird Incubation Unit, together with some new staff changing rooms. Other major work included the conversion of the old Clock Tower into two retail outlets, the conversion of the Penguin Building into a Discovery Centre, with an adjoining shop, the provision of new ticket kiosks at the Main Gate together with a new circulation layout; and the building work in connection with the upgrading of the storage system in the Retail Stores. Work also started on the transformation of the ground floor of the Pavilion Building into the new, themed, Zoo Shop, to replace the original twenty-year-old temporary building.

1988 saw more work carried out in the gardens and surrounding areas than for many years previously. Some of the shrubberies have been completely replanted and many other areas have been cleared, all as part of the effort to improve the general appearance and so create a good impression for visitors.

The 1989/1990 season promises to be extremely busy. Ten areas have been identified as Development Areas, where major changes are required, two of which are associated with boundary changes along the southern side of the Zoo. These proposals have taken into consideration the general views expressed in the past by various conservation bodies, and as many existing buildings as possible will be retained.

Among the major backlog maintenance items to be tackled are the refurbishment of the Mappin Café and the exterior of the Elephant and Reptile Buildings. New work will cover the completion of the new Zoo Shop, together with the associated updating of the Catering Stores in the basement of the Pavilion Building; the management of the Gloucester Slips Car Park, the construction of the new Concourse in front of the Regent Building, the possible reconstruction of the Eastern Aviary; and the formation of a new Amphitheatre on the south bank of the canal.

WHIPSNADE WILD ANIMAL PARK

Visitors during the year: 442,678
Cars brought into the Park: 64,408

Greater Flamingo chick hatched at Whipsnade

GENERAL

Much effort has recently been spent on planning for the future at Whipsnade, and the proposed developments are both varied and exciting. The new name 'Whipsnade Wild Animal Park' is more in keeping with the mainly free-ranging system of animal management and the new plans will reinforce its reputation as one of the world's best zoological collections and conservation centres.

Work is in hand to reduce the size and obtrusiveness of animal barriers round exhibits and paddocks. This will improve the appearance of openness and freedom for the animals and also enhance the landscape. The geographic zoning is well advanced. These regional exhibits, representing particular areas of the world, will help visitors to learn about and enjoy the animals more fully.

Modifications to the Children's Zoo have begun and the Coatis have been moved to a new area on the edge of the Downs.

Attendances during this financial year were higher than in 1987/1988. The improved attractions at the Park including the successful Discovery Centre, and the Children's Zoo, together with new Giraffe, Rhino, Zebra and Antelope houses, and the falconry display, were no doubt important factors. The mild winter accounted for much of the increase in attendance and was a welcome break from the usually more severe conditions.

The refurbished restaurant and banqueting facilities were well attended. The improved decor, service areas and the higher standard of cuisine were appreciated.

THE COLLECTION

A number of notable developments occurred during the year. The Grevy's zebra herd is now building up and four foals were born during the year. The group forms a vital part of the programme for captive breeding in support of conservation of the species. An Indian Rhino calf was born, the sixth at Whipsnade, and it is hoped to establish a second pair in the Collection. The Black Rhino male was sent to Howletts Zoo Park for breeding purposes.

As part of the Society's efforts towards the reintroduction of species to their natural habitats, two female Onagers were sent to the Shuamari Park in Jordan to found a breeding group of this species.

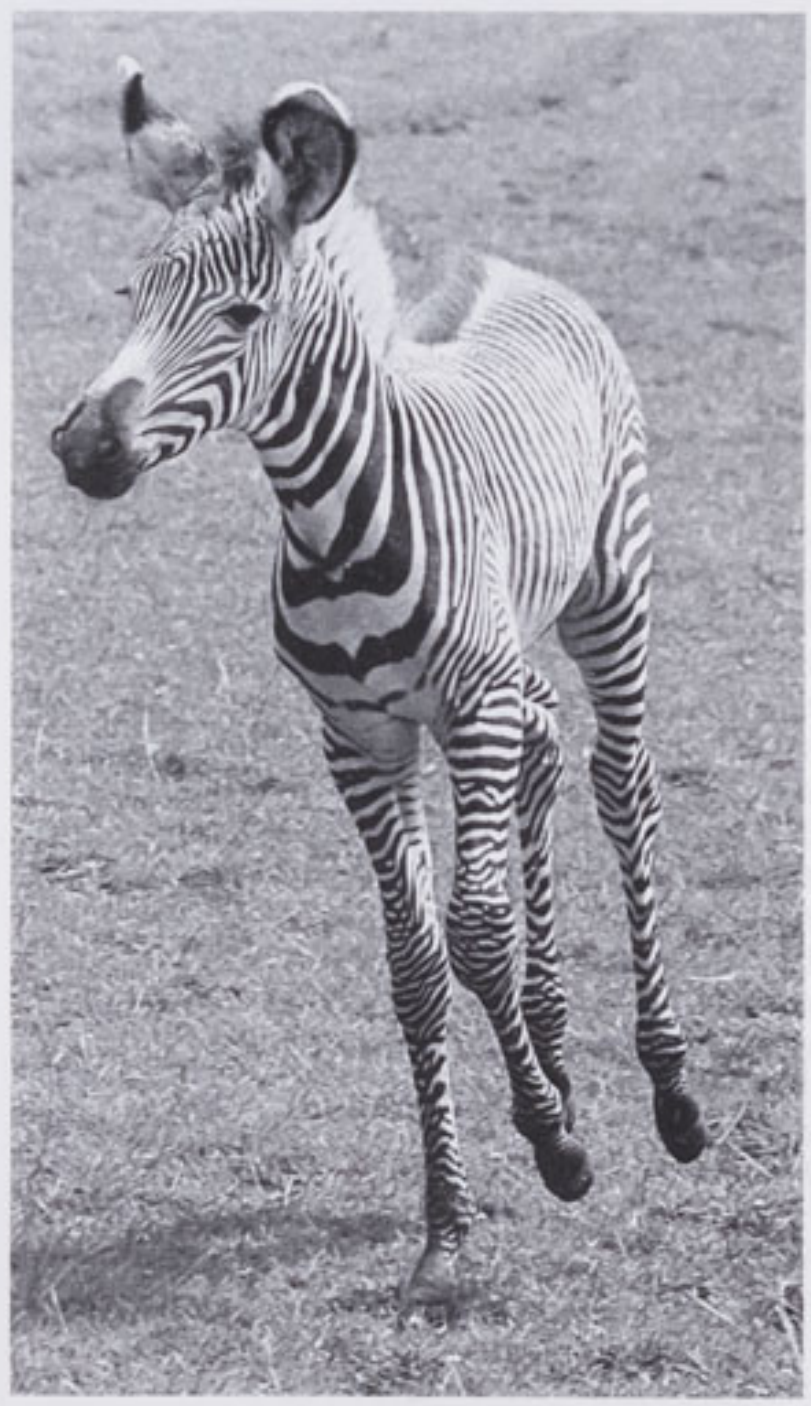
The first calf was born to the Roan Antelope group, and this striking species, jointly owned with Marwell, has evidently settled in well at Whipsnade.

Gaur, impressive bovids from South East Asia, were brought from London Zoo to replace the Black Rhino. This is the first time that Gaur have been exhibited at Whipsnade.

The Reindeer herd now numbers 16 animals as the result of intensive efforts to improve their reproduction, nutrition and management. There is increasing scientific and cultural interest in this species and to have a viable and productive group is very gratifying.

Amongst the new species brought to Whipsnade was a group of Nyala from Marwell and a number of calves have already been born.

Penguins were successful again this year with 24 chicks reared from the Humboldt's group, as well as chicks of King and Rockhopper penguins.



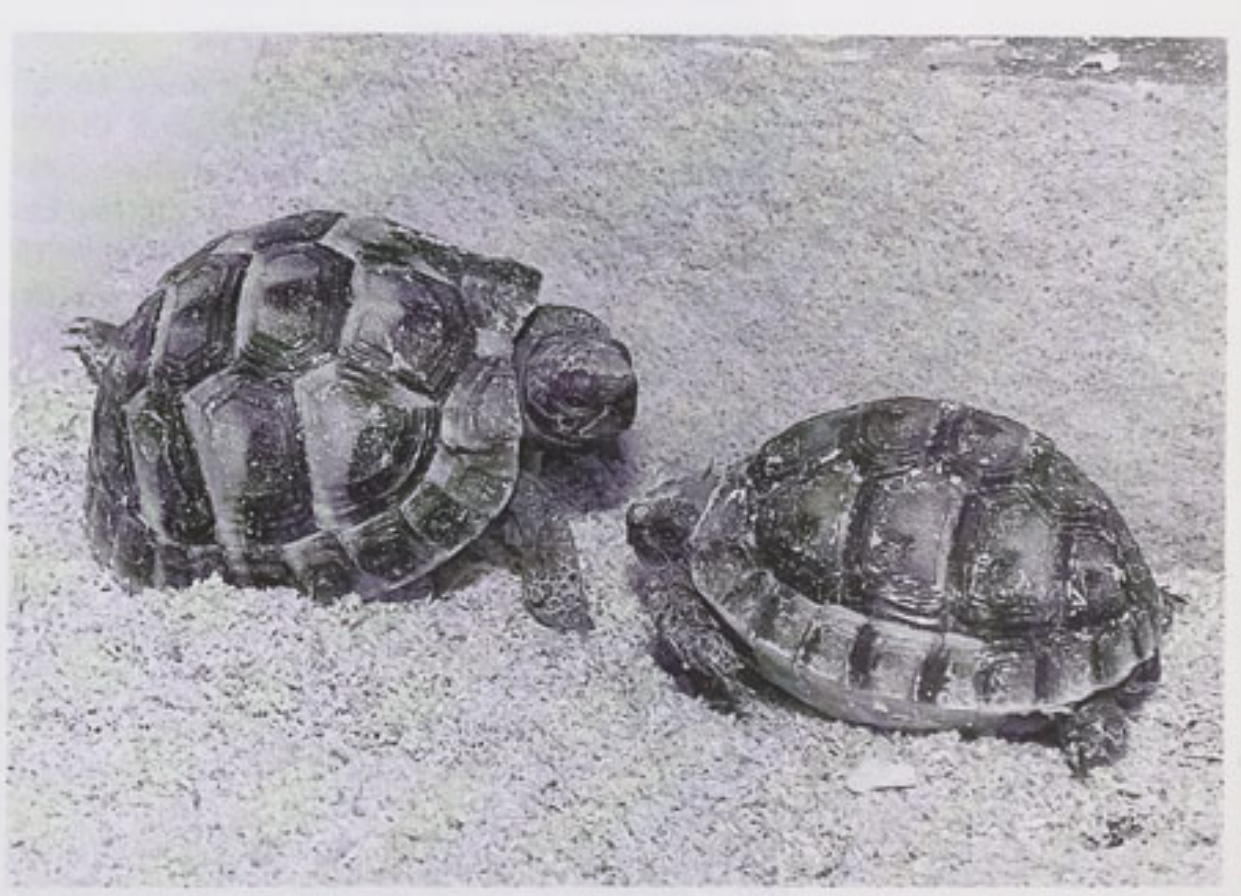
Grevy's Zebra foal, three weeks old

The new tortoise rearing facility at the Children's Zoo has resulted in a reproductive rate unequalled in this country, so enabling some captive bred animals to be contributed to reintroduction programmes.

The Dolphins have now left Whipsnade as the facility was considered inadequate for the purposes of maintaining breeding animals in the long term. The complex is being converted for keeping Californian sealions. A group of six of these animals has been established and alterations are in hand to provide a spectacular demonstration and interesting exhibit for the visitors.

Indian Rhino calf, the sixth born at Whipsnade

Californian Sealions viewed underwater



Young Tortoises hatched at Whipsnade

FINANCE

The Society's consolidated operating deficit before other and exceptional income for the year is £0.86 million compared with the operating deficit for the previous year of £1.87 million.

Government grants for the year totalled £12.1 million. Of this sum, £750,000 was a further capital grant to match £ for £ what the Society had raised from private sources in 1987/88; £10 million was received as a once-off payment, to replace both the previous annual revenue support and the capital matching funds arrangements and a separate annual revenue grant (the first) of £1.3 million towards the costs of the Institute of Zoology was received.

After deducting the government revenue grant of £1.3 million and transferring £271,400 to the Building and Equipment Fund, which is in respect of consultancy fees and interest earned on capital funds, the deficit for the year is £174,100. The balance brought forward at 31 March 1988 of £540,900 has been decreased to £366,800.

The total number of visitors to both Zoos is up by 5.9% over the corresponding year, of which approximately 3.5% is due to the occurrence of two Easter periods in the 1988/89 year. Excluding the effect of the second Easter, the number of visitors was still the best for seven years. At both Zoos, the second half of the year witnessed increased attendances, aided by a very mild first quarter of 1989. The greater number of visitors provided both additional income from admission charges and higher contributions from catering and retail as a result of increased average spending.

DONATIONS, GRANTS AND GIFTS

Council wishes to express its thanks to all those who contributed to general funds of the Society, particularly South Bedfordshire District Council, who allocated 50% discretionary relief of rates for the year of a sum of £28,000 and a further £7,200 Repair Grant. Dunstable Town Council generously donated £3,000 and the Kweller Charitable Trust, £500.

The sum of £500 was received from the executors of the late Mr H P Harfield, and £1,000 from the executors of the late Mrs C M Burton.

Grants of £1,300,000 were received from the Department of the Environment and £708,000 received from research bodies to support the important work of the Institute of Zoology; details are given in the Financial Statements.

As in previous years, several additions to the Collections were presented by members of the public, by governments, local authorities and other establishments and all were gratefully received.

ZOO RESTAURANTS LIMITED

London Zoo

Food service facilities at London Zoo are managed on behalf of the Society by Compass Services (UK) Limited.

Facilities for day visitors have not changed in style during the year, although menu choice has been increased and operating methods enhanced, generating a higher per capita spend and improvement in quality. During the latter part of the year discussions took place between Zoo Operations Limited and Compass Services to plan for strategic developments aimed at providing visitors with a greater choice of product within the Zoo.

The number of functions held in the Regency Suite and other areas has increased considerably over previous years, generating a higher income.

Food service at London Zoo contributed £283,000 to Zoo income during 1988.

Whipsnade Wild Animal Park

Facilities at Whipsnade Wild Animal Park are managed by J Lyons Catering. The new development within the Cloisters Complex is proving successful and popular with visitors, and the redecorated banqueting area is attracting interest from local companies and other organisations. The Society receives a fee of 7.5% of turnover which has generated £33,000 income during 1988.

ZOO ENTERPRISES LIMITED

Zoo Enterprises Limited operates the Retail departments at both London Zoo and Whipsnade Wild Animal Park.

At London Zoo turnover increased to £1.4m from existing facilities producing a profit of £281,600, 70% higher than last year. It became apparent during the year that, with increased attendances, there was a lack of retailing space. Plans were therefore drawn up and work commenced to convert the Pavilion building, previously a bar, into a new shop to complement the proposed Concourse area. This will provide 3,500 square feet of retail space. In addition, work began to provide increased warehousing facilities to support the new shop.

At Whipsnade Wild Animal Park the shop has been increased in size to provide much needed retail space. Warehousing has also been provided so that Whipsnade can carry its own stock. Turnover increased to £425,000 during the year, an increase of 30%, producing a profit of £103,000.

MARKETING

PUBLIC RELATIONS

London Zoo

There was extensive national television and press coverage of animals and events at London Zoo. One notable occasion was the departure of the male Giant Panda 'Chia-Chia', on breeding loan, to Mexico. This story included farewell visits from Mr Edward Heath, the Mexican Ambassador and staff of the Chinese Embassy. 'Chia-Chia's' journey was closely followed by the *Sunday Express* Magazine. Thanks are due to 'British Airways Assisting Nature Conservation', who with our keepers and vets took good care of him during the flight.

Other giants captured the headlines. First, the Giant Aldabra Tortoise. The Seychelles High Commissioner attended the press call and also a special fund-raising evening. Thanks go in particular to the *Daily Telegraph* for their interest. Secondly, the 'Giant' Robber Crabs, again from the Seychelles, caught the attention of the media and featured in the BBC 1 'Really Wild Show'.

Television appearances were made by many animals. Some in the studio; two juvenile Penguins starred on Sue Lawley's 'Wogan' show. Some from their paddocks at the Zoo; the latest Giraffe calf was greeted by Henry Cooper and met his namesake with much media interest. The formation of Zoo Operations Limited, the new team of Directors, and future developments were of great interest and many articles have followed the two press conferences in May and November.

Liaison with Thames TV resulted in the launch of 'Owl TV' at the Zoo and many contributions to this new series. Together with BBC 1 we assisted in the production of the top rating TV programme 'Eastenders' which was filmed at the Zoo. Sky Channel and Children's Channel continue to work closely with us, as does the TV-AM 'Wide Awake Club'. A major outside broadcast 'live' from the Zoo was staged with BBC 1 'Going Live' and featured many of our animals and keepers.

The media star of the year must be the hand-reared Black Rhino calf, 'Rosie'. She caught everyone's imagination and has featured on eight television stories and in numerous national and local papers. Special mention goes to the *Daily Mirror, The Times,* the local *Hampstead & Highgate Express,* and to actress and animal lover Rula Lenska who supported the press call.

World Magazine continued to cover Zoo stories; the Panda, Great-horned Owl, Pelican and many more.

Some of the zoological research work reported in the popular press included milk diets for hand-reared animals and the reproductive cycle of Rhinos.

Joint promotions with other charities have resulted in mutual media benefit; Leukaemia Research, Variety Club, Taxi Drivers Association, Riding for the Disabled and St John Ambulance.

Late Evening openings were held three times a year. The magazine 'Zoo News' is published quarterly for all categories of membership and includes details of events at the Zoos as well as many interesting articles.

Whipsnade Wild Animal Park

Increased activity over the year resulted in some excellent media coverage for Whipsnade, with local radio, press and TV continuing to take an active interest in the Park.

A series of special events attracted much public interest. One of these was a party, held in conjunction with the Chambourcy Food Company, to celebrate the 40th birthday of the Hippo, and another, Conservation Week, reminded visitors of the plight of many species. All these activities were supported by the dedicated teams of Volunteers who gave invaluable help during the year.

Friends and Adopters

Many special Animal Open Houses were held for Friends, Members and Adopters and continue to prove popular. Adopters' Aquarium Breakfasts were a huge success and the original notion of one, ran instead to three mornings due to demand. Lunchtime lectures continued on a monthly basis.

Christmas Adoptions reached a record £42,000. Celebrity Adopters included BBC 1 presenter Andy Crane, Henry Cooper, Eddie Edwards, Linda Lusardi and Steve Davis. Special thanks also go to ITV's 'The Time and The Place', *The Lady, Early Times* and *Good Housekeeping. Family Circle* and *TV Times* ran competitions to promote the scheme, and major Adopters included Courtaulds Viscose, Brook Street, the Wellcome Foundation and *Today*.

Friends of the Zoos: 7,643 (income £173,600)
London Adopters: 4,000 (income £147,881)
Whipsnade Adopters: 814 (income £18,560).

Promotions

'Zoo Month' in July and August gave additional activities, competitions and prizes to our visitors. Christmas brought 'Meet a Reindeer', a Paynes Poppets promotion and a float in the Lord Mayor of Westminster's Parade. Other commercially sponsored promotions included those by Cadbury and Thorntons.

INFORMATION AND DESIGN UNIT

Throughout the year, the Unit was heavily engaged on aspects of the development programme, in particular, the production of the strategy document 'The Way Ahead'. More recently, presentation of these plans to the press and the public have dominated the work schedule.

Associated with this programme, a new corporate identity was introduced. The logo type was derived from the Society's coat-of-arms. By extrapolating the four animals within the device a co-ordinated frieze has been produced which lends itself to reproduction on the new range of merchandise on sale in the Zoo shops. The implementation of the identity throughout the Zoos has already started with the Main Entrances being the first areas to be so treated.

A new guide for London Zoo was the largest print project undertaken during the year. This makes greater reference to the history and work of the Society than did the previous editions.

Other major projects commenced during the year included the planning and construction of an interactive Discovery Centre in the old Penguin Café at London Zoo where young visitors can try on ears, legs or feet of different shapes and sizes to investigate their benefits and constraints. A gigantic periscope gives a giraffe's view of the world and there is an opportunity to see what difference colours, vision or aerofoil shapes make to the animals that possess them.

At London Zoo, special attention was given to the Reptile House, in particular the new Chinese Alligator exhibit, with the Sobell Pavilions and Hoofed Animal Displays also receiving new graphics. With the introduction of a co-ordinated programme of daily events there was an increased demand for promotional signs, notices and printed materials, which were all prepared by the Unit.

PROGRAMMES FOR SCHOOLS AND COLLEGES

At both London Zoo and Whipsnade the range and variety of programmes offered by the Education Department this year were the widest ever available to teachers at primary and secondary schools. Details of the programmes appear in the accompanying table.

During the Autumn and Spring Terms, as well as these regular programmes, many 'one off' talks were given by special request to tie in with projects in individual schools, such as Chinese New Year Animals, Spirals, Noses. A large number of special visits were also arranged for groups of students from tertiary colleges all over the country. These included textile design students from Chesterfield, animal technicians from South London College, anthropology students from University College London, zoology students from Oxford University and trainee chiropodists from Chelsea College.

At London Zoo, 1,055 schools booked sessions with the Education Department during the year, and at Whipsnade the number of schools was 513. At both Zoos the total number of students taught was slightly lower than in 1987/88. At London Zoo the number of school visits was influenced by the wet weather during the summer and, as always, the increasing cost and time spent on travelling and by problems of organisation and cover for teachers taking groups out from school. At Whipsnade the lower total reflects the demand for 'hands on' sessions for smaller groups in preference to lectures or audio-visual programmes catering for two or more classes at a time.

The recent trend at London Zoo continued with about two-thirds of the pupils coming from junior schools, and one third at secondary and tertiary levels. At Whipsnade 86% were from junior schools and 14% from secondary schools. At both Zoos, although the majority of schools came from the surrounding area, there were many who travelled long distances for their educational visits. The numbers of children taught during the year are given below.

Mr Michael Boorer retired in December 1988 after 28 years as Head of the Education Department at London Zoo and Whipsnade. Of the four Education Officers presently on the staff, two are trained at primary level and two are secondary teachers.

OTHER COURSES AND EVENTS

An Open Day for primary teachers from the Outer London Boroughs was held on 8 May 1988. The aim was to familiarise them with the

Programmes for schools and colleges

		Number of Topics at London Zoo	Whipsnade
For Juniors	OUTREACH eg Animal Allsorts	—	2
	STORYTIME AND HANDS ON eg Suka's baby, Reptiles	8	4
	ILLUSTRATED TALKS eg Colours and Patterns, Living in Groups	9	—
	ZOO TALKS eg Water Animals, Big Cats	5	—
	AUDIO VISUAL PROGRAMMES eg Young Animals, Shapes for Living	10	5
	THEMED TOURS eg Let's Move, The Rare Ones	3	3
For Secondary Schools	AUDIO VISUAL PROGRAMMES eg Apes and Monkeys, Classification	10	7
	'O' LEVEL LECTURE TOURS eg Locomotion, Communication	4	—
	GCSE PACKAGES eg Animal Diversity, Conservation Matters	2	—
	'A' LEVEL LECTURE TOURS eg Social Behaviour, Vertebrate Evolution	6	2

Number of pupils taught by the Education Department during 1988–89

	London Zoo	Whipsnade
Primary school pupils taught by volunteers	3,946	1,536
Primary school pupils taught by Society's staff	30,777	12,076
Secondary school pupils	19,357	1,850
Tertiary students	1,063	—
Total	**55,143**	**15,402**

Zoo and the facilities and resources offered by the Education Department. It was attended by 396 teachers.

Thirty primary teachers attended a one day course at London Zoo on 15 November. This was organised jointly with BBC Schools Broadcasting and Enfield Science Advisors to help teachers planning a Zoo visit as a follow up to the BBC TV programme 'Zig Zag', to get the most out of their day.

A Sixth Form Symposium on the 'Natural History of Wetlands', organised jointly with The Wildfowl Trust, was held on 17 January 1989. It attracted an appreciative audience of 170 students from schools all over the South of England.

The staff of the Department help prepare Keepers for the City and Guilds certificate in Zoo Animal Management. In May 1988, 27 Keepers (15 from London Zoo and 12 from Whipsnade) passed the examination. Outstanding results were obtained by Julian Chapman and Helen Wallbank (both from Whipsnade) who achieved distinctions in both their written papers and practical assessments. During 1988/89 there are nine Keepers on the second year of the course, and eight on the first year. The course work has been complemented by talks from various Zoo Directors, Curators, Veterinary Officers and Hospital staff, Overseers, Head Keepers and Senior Keepers, and by visits to Marwell, Twycross, Port Lympne and Howletts Zoos.

Education Officers took a colourful and informative display to the Schools Visits Exhibition organised by the London Tourist Board at the Victoria and Albert Museum on 10 and 11 February 1989. Many enquiries were received from teachers at the Exhibition.

The Department has continued to arrange regular events for the Junior Friends of the Zoos, including visits to Slimbridge in the Spring and to Whipsnade in the Summer. The three 'Meet the Animals' Events at Christmas were well attended, as were the regular monthly 'Behind the Scenes' visits on Sunday afternoons.

The staff of the Department also take responsibility for the centre page features of the magazine 'Zoo News', which are aimed especially at younger readers.

VOLUNTEER ACTIVITIES

Volunteers continued to play an important rôle at both London Zoo and Whipsnade, especially during the Summer, in giving visitors a more enjoyable and worthwhile day at the Zoo. At London Zoo, as well as established activities such as primary school tours, the Information Bureau, nine Touch Trolleys and the Art Cart, volunteers produced leaflets in five languages to help overseas visitors find their way around the Zoo. They also represented London Zoo at several London Exhibitions. Brass Rubbing and Mask Making activities, although limited to a three month period, again proved popular with visitors and volunteers. At Whipsnade, Brass Rubbing and Touch Tables were manned by volunteers who also conducted tours and gave commentaries on the Road Train. Before Christmas they helped to run 'Santa's Grotto' in the Children's Zoo, where 840 young children met reindeer and received special gifts from Santa Claus.

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 describes briefly the main activities of the various units within the four research groups; further details of the research projects described here, and others omitted here due to limitations on space, can be obtained in the Scientific Report published in 1988, which covers work carried out between 1984 and 1987.

As noted elsewhere in this Report, during the period under review a good deal of effort has been put into establishing a link with the University of London that will provide a means for the transfer of core funding from the Department of Education and Science for the support of the Institute of Zoology. As a result the Institute will from April 1989 be a grant-aided Institution funded by the Universities Funding Council through the Senate of the University of London. We all look forward to making the most of the further opportunities for scientific collaboration which this formal association brings.

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

Our ability to grow in culture isolated trophectoderm cells from the Marmoset Monkey blastocyst provides a way of obtaining relatively large quantities of trophectoderm secretory proteins. These can be added to other cell incubations and cultures (for instance to cells from the corpus luteum) and, in addition, trophectoderm cells can be cocultured with other tissues. By these means a better understanding can be obtained of the functions of these secreted proteins. One important trophectoderm secreted protein is chorionic gonadotrophin, the luteotrophic effects of which are well established. However a number of other high molecular weight glycoproteins are secreted concomitantly with chorionic gonadotrophin, and the rôles of these compounds in the control of the corpus luteum in early pregnancy and of events in embryogenesis and implantation are currently under study. One way by which such studies can be carried out involves the use of specific antisera directed against the secretory products: in a collaborative study it has been shown that a monoclonal antibody to a human trophoblast protein also identifies proteins in the Marmoset embryo, suggesting that the Marmoset could be used to test the contragestative effects of human trophoblast vaccines.

Work on the freezing and thawing of Marmoset embryos has identified embryonic age as an important factor determining whether primate embryos remain viable after being stored in liquid nitrogen. This clearly is of relevance in the context of the techniques used in the pre-implantation diagnosis of genetic disorders in human embryos.

In addition to the embryo-secreted proteins described above, the luteotrophic and luteolytic activities of a number of other agents controlling corpus luteum function have been studied in the Marmoset *in vivo* and *in vitro*. These agents include prostaglandins, catecholamines and melatonin, and the interactions between them, and their effects at different stages of early pregnancy are being defined. Results indicate that the corpus luteum responds to an embryonic stimulus within two days of embryo attachment and, as a result, is protected from lysis. The second messenger systems involved in these responses are also being explored.

Antiluteolytic compounds produced by the pre-implantation conceptus in domestic ruminants have been identified by amino acid and cDNA sequencing as belonging to the α-interferon family of proteins. On administration into the uterus in non-pregnant animals, recombinant interferons mimic those produced by the trophoblast, by reducing uterine prostaglandin secretions and delaying luteal regression. The possible use of these proteins for the prophylactic treatment of early embryonic loss, which occurs at a high rate in sheep and cattle and may reflect inadequate production of the antiluteolysin, is being investigated.

Gamete Biology

The development of artificial insemination techniques for Antelopes, using Blackbuck as a model for endangered species, has continued. Seven calves have been born, some after inducing oestrus using prostaglandin treatment, which simplifies insemination timing. Artificial insemination is now being used to improve the genetic composition of herds of Addax and Scimitar-horned Oryx in the UK. Evaluation of a cryomicroscope system as a practical way of determining species differences in semen freezing requirements has shown that cryomicroscopy will make an important contribution to the long-term storage of gametes from endangered species.

The marsupial, Grey Short-tailed Opossum, is undifferentiated sexually at birth, unlike the

neonates of placental mammals, and therefore provides a unique opportunity to investigate gonadal development. A basic but important observation is that the presumptive gonad of a genetic male is larger than that of a genetic female of the same age, and of a different shape. This finding calls into question the dogma that gonadal development and androgen synthesis initiate sexual differentiation.

Grey Short-tailed Opossum new born pups – sexually undifferentiated

Following on from investigations of implantation *in utero* in the Marmoset Monkey, a method has been found for successfully culturing Marmoset uterine endometrium. It is anticipated that by introducing pre-implantation embryos with these cultures we can study implantation events *in vitro*.

Behavioural Physiology

In a study of the natural suppression of reproduction in socially subordinate Marmoset Monkeys, both pheromonal and behavioural cues from dominant females were found to play separate inhibitory rôles in maintaining the suppression of ovulation in subordinate females. Initial evidence suggested that behavioural cues involved physical contact between the females; visual contact was insufficient to maintain the suppression of ovulation. Ultrasound scanning of the ovaries of subordinate females showed that follicular development was inhibited, ovarian volume was reduced relative to that in dominant animals and there were no groupings of large follicles similar to those found prior to ovulation in dominant females. Subordinate males, while maintaining spermatogenesis, showed reduced plasma testosterone and LH concentrations.

Studies of reproductive suppression in Naked Mole Rats demonstrated that suppressed LH, and probably GnRH, secretion was responsible for the inhibition of ovulation and reduced testicular testosterone secretion in subordinate females and males, respectively. However, subordinate females rapidly commenced ovulating on removal from their breeding 'queen' and colony, and separated subordinate males paired with females showed increased testosterone and LH secretion. The first genetic fingerprinting of Naked Mole Rats, using probes for both the class I major histocompatibility complex and mini-satellite DNA, showed that these animals have little genetic variability. As these animals appear to inbreed naturally in the wild, further studies may reveal a unique degree, for a mammal, of genetic uniformity between individuals.

A study of maternal behaviour in Red-bellied Tamarin Monkeys provided the first evidence that high oestrogen levels in late pregnancy are important for the full display of maternal behaviour, and thus the survival of the offspring, in a primate. This was especially evident in females with no previous experience of rearing infants. In the first study of the reproductive endocrinology of female Goeldi's Monkeys, oestrone conjugates were identified as the most useful urinary markers of the ovarian cycle and pregnancy. In this primate, which is taxonomically intermediate between the Marmoset and Cebid Monkeys, elevated urinary oestrogen concentrations denoted the luteal phase of the ovarian cycle, as in Marmosets, and not the pre-ovulatory stage, as found in Cebid Monkeys.

Collaboration with an industrial company led to the identification of the chemical components present in Lion dung which are responsible for its Deer repelling action. Commercial analogues were produced and a patent application was filed. Initial field trials with these materials are promising.

Physiological Ecology

The Bennett's Wallaby has proved to be a most appropriate animal in which to study the endocrine control of ovarian function, since in this species reproduction is inhibited both by lactational and photoperiodic stimuli. Studies have been made of the rôle of prolactin in the control of ovarian function during the breeding season and during the period of seasonal quiescence. Treatment with prolactin prevented the ovary and quiescent embryo from reactivating following loss of pouch young and was also effective in blocking the inductive effects of short photoperiods during seasonal quiescence. These results provide clear evidence that in macropodid marsupials the hormone of lactation has also been used

as part of the mechanisms controlling the time of breeding via an action on ovarian function. This latter aspect may offer a potential model for the study of infertility and hyperprolactinaemia in other mammals including Man.

Further work on the seasonal control of reproduction and metabolism in Deer highlighted the rôle of the hormone prolactin in regulating the growth and moult of the winter and summer coat, while in a study of free-ranging Red Deer, evidence was obtained for an effect of melatonin treatment in the regulation of appetite in grazing animals. These observations further emphasise the importance of seasonal rhythms in the physiology of many wild animals adapted to life in high latitudes.

Endocrinology

Investigations in the Marmoset Monkey using *in vitro* cell culture techniques have explored the way in which the growth of an ovarian follicle is controlled by its own local environment. Findings of a profound effect of locally produced steroids and polypeptide growth factors are notable in providing new information relevant to our understanding of human ovarian function. Other studies in the Marmoset have focussed on the use of a novel, highly potent synthetic antagonist of the naturally occurring releasing factor GnRH to explore the hormonal requirements for ovarian function *in vivo*. The antagonist has provided important basic information on follicular and corpus luteum function as well as demonstrating potential for therapeutic and antifertility applications.

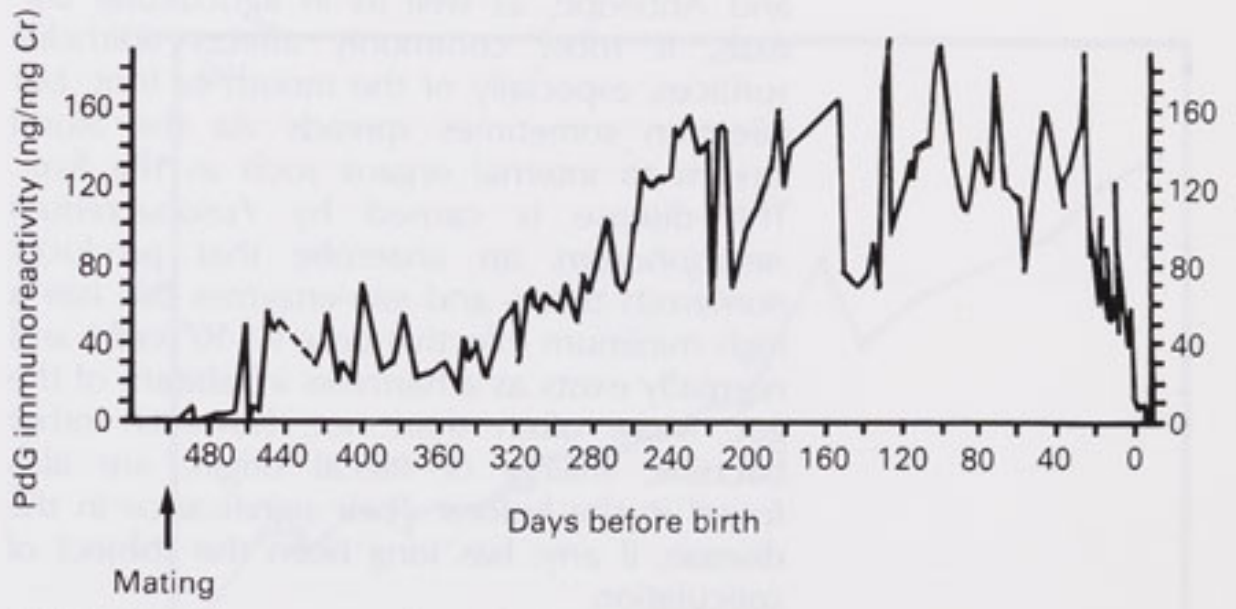
Comparative studies in Rhinoceros have yielded valuable information on species differences in the metabolism and excretion of reproductive hormones. Identification of the different steroid metabolites in urine and faeces and the establishment of appropriate assays for their measurement has greatly improved prospects for monitoring reproduction in this highly endangered group of animals (see Fig. 1). Advances have also been made in the development of simple, practical tests for ovulation and pregnancy in a variety of other exotic species and the results of such tests are routinely used in breeding programmes in this and other Zoological Collections (eg 'Salomie's pregnancy, see Fig. 2).

COMPARATIVE MEDICINE

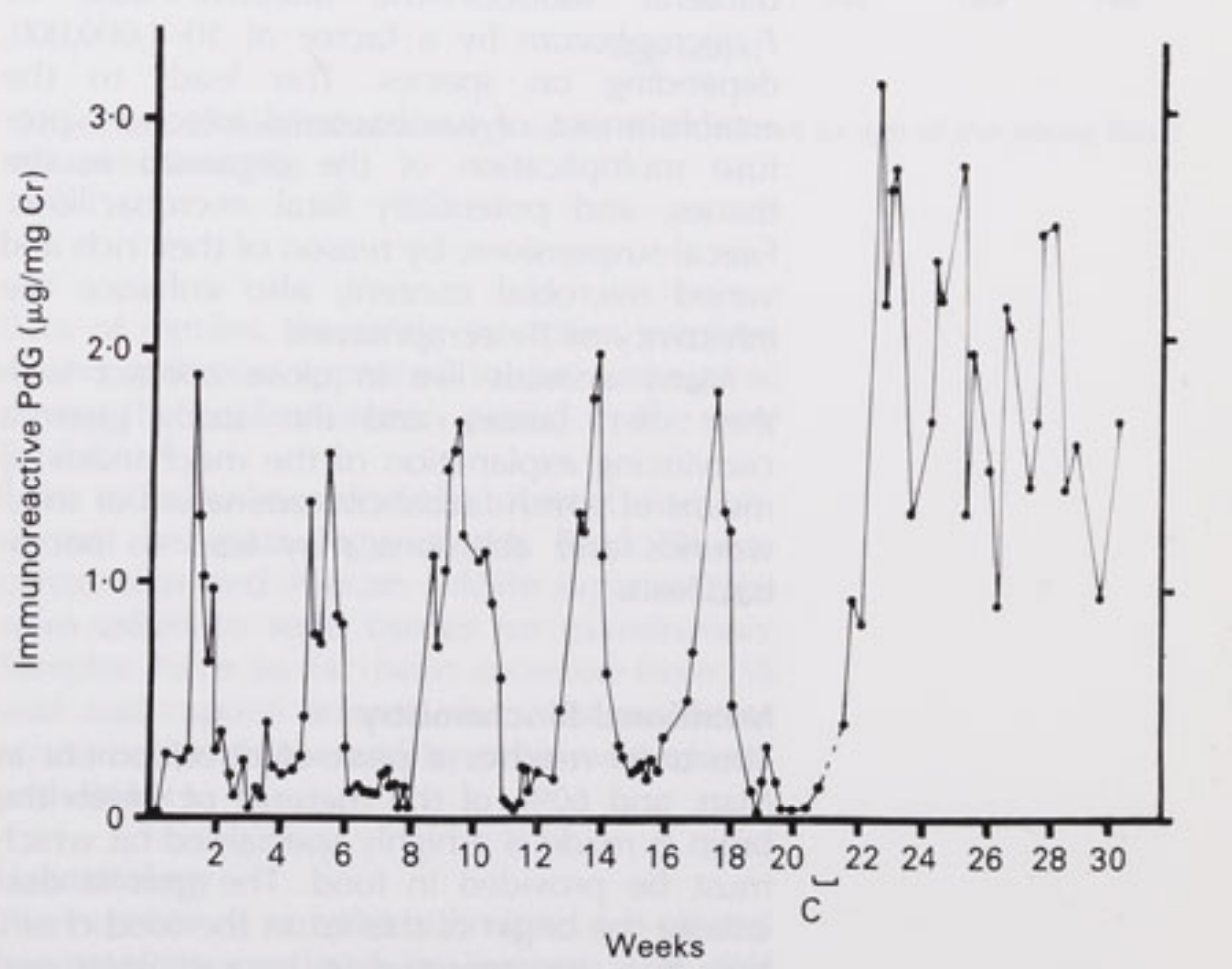
Applied Immunology

The Unit has consolidated its position as one of the leading international centres for non-isotopic immunoassays. This is reflected in the many co-operative projects and the large number of visiting workers accommodated in the laboratory. The aim is to establish simple enzyme immunoassays applicable to a wide range of infectious diseases. Particular mention should be made of the evaluation of human monoclonal antibodies to Hepatitis B, carried out in conjunction with the London School of Tropical Medicine, and of other collaborative work on the use of monoclonal antibodies in assays for chlamydia and Chagas disease.

An investigation of the applicability of an ELISA assay for quinine is now well under way; over 400 malaria-infected patients have been investigated and results are currently being analysed.



Black rhinoceros pregnancy (Fig. 1)



The pregnancy of the Gorilla 'Salome" (Fig. 2)

On the technical side the Unit is involved in developing paper dot-blot test systems, which are essentially 'immuno-dipsticks', simple to use and not requiring complex instruments for their evaluation. Currently and in the future colorimetric, fluorometric and luminescence systems will be investigated. Complex assays for anti-idiotypic antibodies are also being set up.

During the period under review visiting workers were received from Argentina, Australia, China, Colombia, Kenya, Kuwait, Iraq, Nigeria, Malaysia, Switzerland, Venezuela and the USA.

Microbiology

Necrobacillosis occurs in free-living and captive wild animals, especially macropods, Deer and Antelope, as well as in agricultural animals. It most commonly affects epithelial surfaces, especially of the mouth or foot, but infection sometimes spreads via the blood stream to internal organs such as the liver. The disease is caused by *Fusobacterium necrophorum*, an anaerobe that produces numerous toxins and exo-enzymes but has a high minimum infective dose ($>10^6$ cells) and normally exists as a harmless inhabitant of the gut. More often than not, however, other bacteria, mainly of faecal origin, are also found in the lesions. Their significance in the disease, if any, has long been the subject of speculation.

It is clear from current research that the presence of sub-lethal numbers of these 'other bacteria' reduces the infective dose of *F necrophorum* by a factor of 10–1,000,000, depending on species. This leads to the establishment of fusobacterial infection, profuse multiplication of the organism in the tissues, and potentially fatal necrobacillosis. Faecal suspensions, by reason of their rich and varied microbial content, also enhance the infectivity of *F necrophorum*.

Many animals live in close contact with their own faeces, and this study gives a convincing explanation of the mechanism by means of which faecal contamination of small wounds and abrasions may lead to necrobacillosis.

Nutritional Biochemistry

The brain reaches a peak of development in Man, and 60% of the material of which the brain is made is a highly specialised fat which must be provided in food. The Unit is describing the origin of this fat in the food chain, how it is incorporated in neural tissue and why it is that Man is unique in respect of brain size. From comparative data there is growing evidence of the significance of dietary lipids and their associated micronutrients in membrane integrity, a function which underscores studies in wildlife brought into captivity as well as early human development and neurodegenerative disease in Man.

An investigation was made in response to reports of an unusually high mortality rate in Penguins in the Falkland Islands. The data suggest under-nutrition as a cause of death, implying interference with the marine climate and food chain. Follow-up studies have shown that Rockhopper and Magellanic Penguins utilize a wide range of foods; this suggests that they should be fed a varied diet in captivity. This and parallel studies on Seals have led to collaboration with the British Antarctic Survey.

The Unit's principal interest is in the rôle of essential fats in brain development and it has benefitted during the year under review from the attachment of Professor P Budowski, on sabbatical leave from the Faculty of Agriculture, Rehovolt, Israel. In collaboration with St Bartholomew's Hospital, retinopathy of premature infants is being investigated using measurements on cell membrane composition and function using the umbilical artery, erythrocytes and lymphocytes in Man and experimental animals.

VETERINARY SCIENCE

Clinical Studies

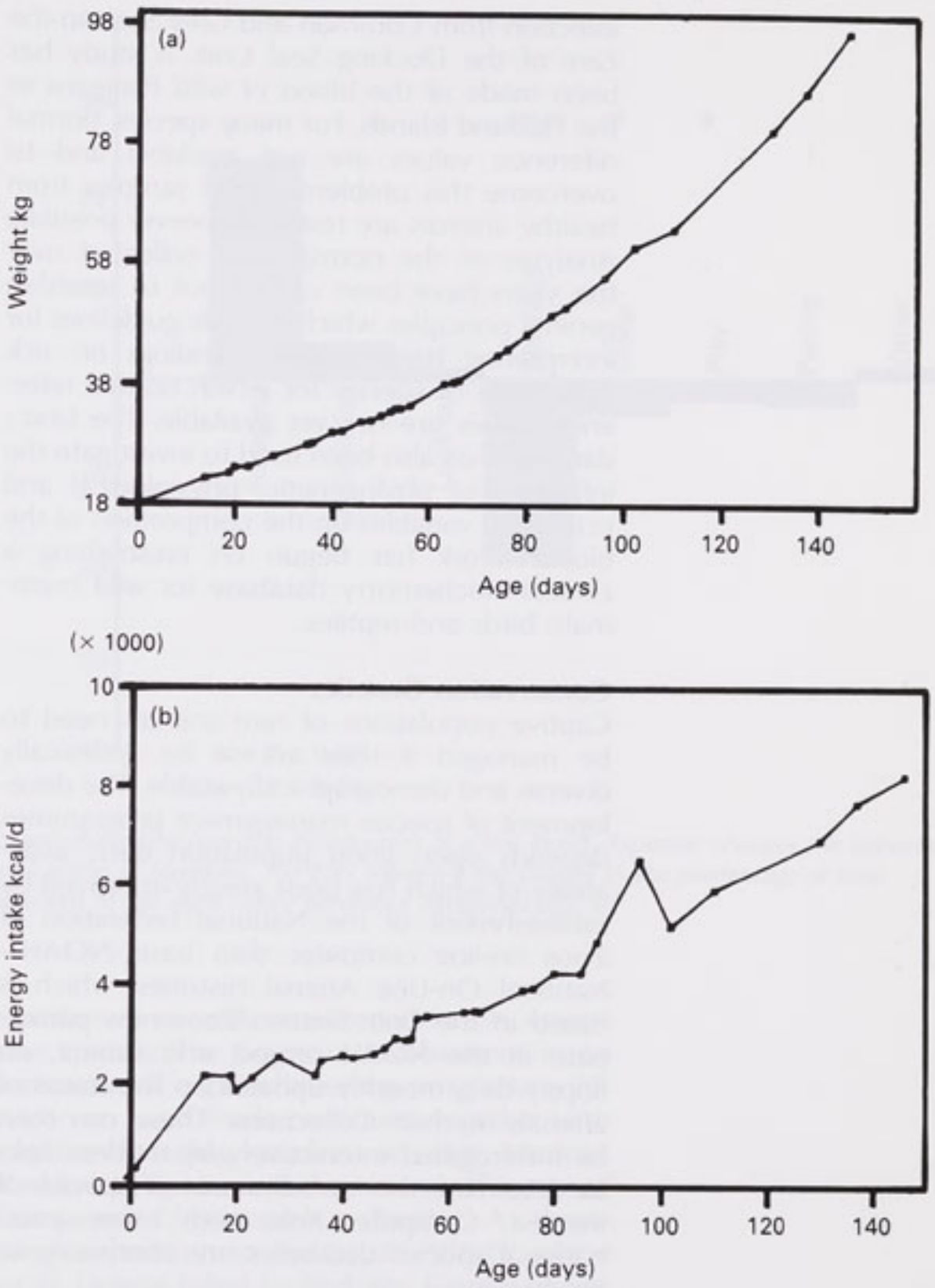
The aim of the Unit is to develop the veterinary science of wild animals through their treatment and care. This objective is met while discharging the Veterinary Science Group's responsibility for the health and welfare of the animals in the Collections. The range of diseases encountered in such a diverse collection is wide: this year cases have included pyelonephritis in a Sumatran Tiger, malignant catarrhal fever in a Roan Antelope, and heart failure in a Pygmy Marmoset due to a large thrombus in the left atrium. Particular efforts have been put into pediatrics, techniques of sedation and anaesthesia, antibiotic pharmacokinetics, and the study of limb bone growth in birds.

The Black Rhinoceros calf 'Rosie' weighed just 18 kg at birth (less than half the average birthweight) and was taken for hand-rearing because she was too weak to suck. An artificial milk which, like Rhinoceros milk, was relatively dilute and contained a very high proportion of lactose, was fed, and rearing 'Rosie' has provided an opportunity for detailed measurements of weight gain, and of

milk and energy intake (see Fig. 3). The successful hand-rearing of this calf to close to weaning weight more than justifies previous studies of milk composition and neonatal dietary requirements, upon which her treatment was based.

The elimination rate and disposition of drugs have, with few exceptions, been studied only in some domestic animals and Man. There is no well-established method for estimating dosage for other species, although this will remain an important issue in wild animal medicine. Specific data are needed for wild species and a study of the rate of decline of oxytetracycline in the blood of Red-necked Wallabies provides a basis for dosage estimation for this species. There is also a need to investigate how drug kinetics vary between species. A significant relationship was found between plasma oxytetracycline half-life and bodyweight amongst all species for which data are available, which can assist in devising dosage regimes for this antibiotic.

A Veterinary Hospital, which includes surgical and radiographic facilities, was created out of the old quarantine facility at Whipsnade. Contributions for the project came from the public and various industrial companies, with a number of staff putting in extra time and effort to complete the Hospital within the year. The Hospital is now fully operational with the first patients, a young Mara with a severe wound infection and a Brolga (Australian Crane) with a broken foot, on the road to recovery.



Growth (a) and metabolisable energy intake (b) in relation to age of the young Black rhinoceros 'Rosie' (Fig. 3)

Pathology

During the year gross *post-mortem* examinations were carried out on 708 animals: 573 from the Society's Collections, 81 from the Institute and 54 referred by other veterinary surgeons. Of the carcasses examined, 158 were of neonates. Bacterial infections accounted for the deaths of 53 animals or birds at Regent's Park; of these 16 were due to *Yersinia pseudotuberculosis*, including outbreaks in Saffron Finches and Rock Hyrax. Among the many unusual cases examined was a Golden Lion Tamarin with oesophageal and intestinal lesions which show similarities to Crohn's disease in Man.

A high rate of mortality in the new Desert Lizard Exhibit in the Reptile House was investigated. Internal abscessation was a common finding, the gastro-intestinal tract and liver being the organs most frequently involved. These abscesses yielded pure cultures of *Salmonella* spp. (which are being identified) as did the gastro-intestinal tracts of other Lizards which did not have abscesses. Although salmonellae are often part of the normal enteric flora of reptiles, the strain or strains involved in this instance appeared to be pathogenic during the acclimatisation period in the new Exhibit.

In order to examine the normal and abnormal histopathology of the Black Rhinoceros, zoos and African wildlife organisations were asked to send tissues for examination. Samples have so far been received from 16 wild and captive animals. Sections are being scrutinised in house and by other wild-animal pathologists.

Haematology

The number of samples submitted for clinical haematology continues to increase and, this year, has included many with suspected viral

infection from Common and Grey Seals in the care of the Docking Seal Unit. A study has been made of the blood of wild Penguins in the Falkland Islands. For many species, normal reference values are not available and to overcome this problem, blood samples from healthy animals are tested whenever possible. Analyses of the normal data collected over the years have been carried out to establish general principles which provide guidelines for interpreting haematological findings on sick individuals of species for which normal reference values are not yet available. The Unit's database has also been used to investigate the influence of phylogenetic, physiological and ecological variables on the composition of the blood. Work has begun on establishing a clinical biochemistry database for wild mammals, birds and reptiles.

Conservation Genetics

Captive populations of rare animals need to be managed if they are to be genetically diverse and demographically stable. The development of species management programmes depends upon good population data, availability of which has been greatly improved by establishment of the National Federation of Zoos on-line computer data base (NOAH – National On-Line Animal Histories) which is based in the Unit. Sixteen Zoos now participate in the NOAH project and submit, on floppy disc, monthly updates on the status of animals in their Collections. These can then be interrogated interactively by modem links to determine the overall status of species of interest. Computer links with other international species databases are continuing to be developed.

Breeding plans and population analyses were completed for a number of species at national and international levels, including Tigers, Golden Lion and Cotton-headed Tamarins, Arabian and Scimitar-horned Oryx, and various Parrot species.

Techniques for pedigree analysis by computer simulation were developed further, and the results incorporated into breeding plans. The utility of DNA fingerprinting in the development of breeding plans was also investigated in collaborative studies on Scimitar-horned Oryx and Rothschild's Mynah. The highly inbred nature of many Zoo populations reduces the power of the technique but further studies are underway.

CONSERVATION AND WELFARE

Field Studies

On Ol Ari Nyiro Ranch, Laikipia, Kenya, monitoring of a protected population of Black Rhinoceros has continued. Forty-four animals have been individually identified from footprint marks and measurements, and occasional sightings. Six animals, four males and two females, have been fitted with radio transmitters for their protection, and also to study the mating system and to determine the size and interactions of the breeding population. Further fresh urine samples have been collected from radio-tracked Rhinoceros, including a female that gave birth in January 1988. Assays of the metabolites of reproductive hormones in these samples establish the basis of a field pregnancy test for this species. It was confirmed that breeding in males is not monopolised by the largest dominant animals. Although breeding males did not exclude other dominants from well-defined territories in the manner of White Rhinoceros in the wild, the home ranges of neighbouring breeding males had little overlap. In areas with a high density of Black Rhinoceros, breeding males shared their home ranges with several subordinate males. A census technique was developed and used in a country-wide census of the Black Rhinoceros remaining in different habitats in Kenya.

During the first full year of the Society's project to manage the King Khalid Wildlife Research Centre, Riyadh, Saudi Arabia, activities were centered on establishing the disease status of the animal collection and investigating the taxonomic status of the Gazelles there. To facilitate disease investigations, a diagnostic laboratory was constructed, equipped and brought into operation. In the course of the year more than 150 animals were screened for a range of diseases, with special attention being paid to tuberculosis. An important result of this investigation was that it established that species in the collection show differential susceptibility to the disease, with the Sand Gazelle having a very low rate of infection despite prolonged exposure to the disease. Taxonomic research produced good evidence that the Sand Gazelle in the collection belong to the native Arabian subspecies and are therefore a valuable asset. Further important activities during the year included the successful hand-rearing of a large group of neonatal Gazelles, field surveys of Gazelle distribution and a systematic programme of Gazelle breeding. During the coming year the activities of the project's first year will be consolidated and extended and additional activities will be undertaken. These will involve, in particular, more active management of the animal collection with a view to converting it into a scientifically planned breeding stock and the diversification and intensification of research effort.

Dr J Samour, Veterinary Officer at Al-Areen Wildlife Park, Bahrain, and an Overseas Research Fellow of the Institute, has continued to establish and develop the Veterinary Department at Al-Areen, which now comprises an Animal Hospital, Outpatients Department (Falcon Hospital), with post-mortem, laboratory and research facilities. Much of the current work is with falcons, and preliminary research has been undertaken to evaluate the use of lasers in the post-operative therapy of pododermatitis (bumble-foot), but studies have also been carried out on the sedation of free-ranging ostriches, and on Arabian Oryx and gazelles. Highlight of the year was the successful repair of a compound fracture of the distal metacarpal bone in a female Arabian Oryx.

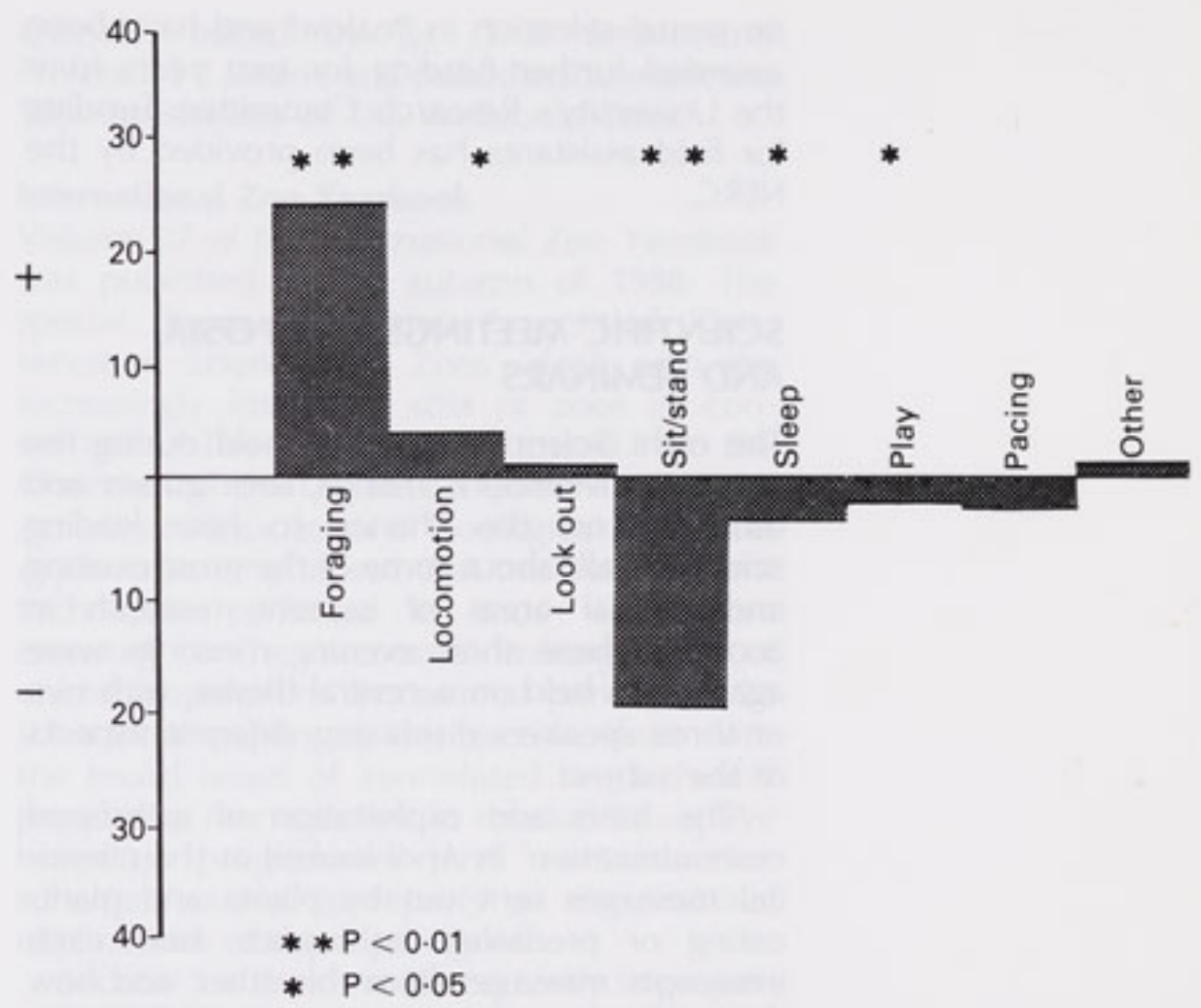
Behavioural Enrichment

The aim of this project, funded jointly by the Society and the Universities Federation for Animal Welfare, is to find out how captive animals behave and to devise and test ways of changing their environment so that they have the opportunity to display natural behaviour patterns. Several methods of presenting food for animals in a more naturalistic way have resulted in increased natural behaviour patterns such as eating and foraging, and have reduced abnormal (eg stereotypic) behaviours (see Fig 4). Communication between groups is also important for many wild animals. Playing recorded songs of wild Gibbons to those in the Collection mimics the wild situation and has resulted in more species-typical brachiation and vocalisation.

Mammals, Fish and Invertebrates

Regional and international studbooks form an extremely important part of the management procedure for the captive population of any species, particularly those that are threatened in the wild. The International Studbook for Giant Pandas is run jointly by the Curator of Mammals and Dr Devra Kleiman, the Deputy Director of Science at the National Zoo in Washington DC. Several regional studbooks for the UK are run from London, including that for Slow Loris by Michael Clarke, Keeper in the Clore Pavilion for Small Mammals, and that for Mandrills by Neil Bemment and Sarah Christie, Keepers in the Sobell Pavilion for Apes and Monkeys. Several other regional studbooks are in the course of preparation by various London Zoo Keepers.

As part of a joint effort with other European and North American Zoos and Aquaria, plans for captive breeding programmes for endangered fish are developing with attention focussed on Lake Victoria Cichlids and a



Graph illustrating how the introduction of a live insect dispenser changes the behaviour of a group of Meerkats. The bars represent the change in the percentage of time devoted to the eight major behaviour categories (Fig. 4)

number of severely threatened North American species. The Society's involvement in an international captive breeding programme for Moorean Land Snails continues, together with captive breeding studies on the Mexican Red-kneed Spider and the severely threatened European *Chrysocarabus* Beetle. A three-week expedition to the South Atlantic island of St Helena failed to find any Giant Earwigs, suggesting that this species is now extinct. However, a wealth of useful information was collected which resulted in a symposium being held at Regent's Park to consider the plight of the island's unique flora and fauna.

Birds and Reptiles

Baseline data were obtained on temperature and humidity requirements of incubating eggs, and on the techniques of hand-rearing.

Behavioural studies on Red Junglefowl at Whipsnade continue in collaboration with Dr Marian S Dawkins of the Animal Behaviour Research Group, Oxford University. These studies are part of a wider research project which is looking at welfare aspects of keeping domestic fowl in different agriculture systems. The establishment of basic data on the natural behaviour of the ancestral form has been the top priority of the work at Whipsnade.

Drs M Petrie and T Halliday of the Open University continued their work at Whipsnade

on sexual selection in Peafowl and have been awarded further funding for two years from the University's Research Committee. Funding for field assistants has been provided by the NERC.

SCIENTIFIC MEETINGS, SYMPOSIA AND SEMINARS

The eight Scientific Meetings held during the year gave Members, Friends, their guests and other visitors the chance to hear leading scientists talk about some of the most exciting and topical areas of current research in zoology. These short evening meetings were again each held on a central theme, with two or three speakers discussing different aspects of the subject.

'The basis and exploitation of arthropod communication' in April looked at the chemical messages sent out by plants and plant-eating or predatory arthropods, how each intercepts messages from the other, and how this might be used in pest control. The May meeting, 'The rôle of gamebird management in land use and conservation', was also concerned with the practical applications of research. In June, the meeting on 'The power game and infertility' considered how, in some mammal societies, the ability to breed is switched on or off according to social status, and included new film of those TV stars, the Meerkats.

The highly topical subject of 'The use of genetic fingerprinting in the study of animal populations' opened the next session of meetings in October, giving an account of the theoretical background, illustrated by examples of particular applications. In November, 'Cuckoos and parasitic ants: brood parasitism as an evolutionary arms race' explored interactions between parasites and hosts. A more co-operative life-style was displayed by the tube-worms and their symbiotic bacteria featured in the December meeting, 'Deep, dark and hot', which included fascinating film of the creatures that live around hydrothermal vents deep in the ocean. 'Sperm competition', in February, presented a surprising variety of ways in which males (and sometimes females) of many animal groups try to ensure that insemination by one individual rather than another will succeed, and considered how this might affect the populations concerned. The last meeting in the period, 'Ecotoxicology', in March, was also on a topical theme, that of poisons in freshwater, marine and terrestrial habitats: how new chemical products can be tested before they are licensed for use, and how causes of observed toxic effects can be deduced.

Members who were unable to attend meetings may be interested to know that the themes of the Scientific Meetings now form the subject of brief reviews appearing in the *Journal of Zoology*. The first of these Brief Reviews, covering the October meeting, appeared in Volume 217 Part 2, and it is hoped that they will become a regular feature. Another innovation, introduced in February, was to include at the start of each meeting a short account, by a member of the Institute of Zoology or the curators, of some of the scientific work being carried out by the Society.

The Society is extremely grateful to all the speakers who took part in these meetings, often travelling considerable distances, and contributing to a programme of great interest and variety.

One Symposium was held in the period: a two-day meeting in May on the subject 'The biology of large African mammals in their environment', organised by Professor P A Jewell of Cambridge University and Professor G M O Maloiy of the University of Nairobi. The meeting was dedicated to the Society's retiring Secretary, Dr R M Laws. Generous help from sponsoring organisations made it possible to bring together scientists from Kenya, Uganda and Tanzania as well as from the United Kingdom and the United States of America to report and discuss the impressive range of studies being carried out in Africa. The Society is very grateful to the speakers, chairmen, organisers and sponsors of this well-attended meeting, the proceedings of which will be published in the series *Symposia of the Zoological Society of London*.

The Institute of Zoology also organises a series of seminars, held on Tuesday afternoons in each academic term, at which invited scientists and staff members present brief accounts of current relevant research to members of the Society's staff and their guests. The Society is grateful to all contributors to this seminar series.

PUBLICATIONS

Journal of Zoology

During the year, Volumes 214 Part 4, 215, 216 and 217 Parts 1–3 were published, containing a total of 163 papers. Editorial policy continues to be to maintain the *Journal of Zoology* as a broadly based publication covering the whole field of experimental and descriptive zoology, with rigorous standards of selection and production. An on-going survey

of contributors and users throughout the world was begun in 1988 and the response confirms the high reputation of the *Journal* worldwide – 'one of the best and most widely read zoological journals' – with comments on its excellent reputation, high quality of content and presentation and rapid and efficient processing of papers. The part played by expert, helpful and constructive referees was also noted, and the Editor is extremely grateful to the many referees who have given their time to help in the assessment of papers.

Zoological Record

Volume 124 (1987/88) was published in December 1988 and provides references and detailed index entries to more than 80,000 papers published world-wide.

ZR Online, the computer-readable version of the *Zoological Record*, now contains details of all papers indexed for the last ten volumes of the *Record* and is added to month-by-month as indexing progresses. A chart has been produced to identify the various system commands used for Dialog Information Services and BRS Information Technologies, two vendors that provide access to *ZR Online*. This chart enables users to search the file rapidly and more effectively and it also contains much other useful information.

Another publication, *ZR Serial Sources*, has also been launched. It gives complete listings of all serials scanned for the *Record*, commencing with Volume 124, and includes new, ceased and changed titles. Full and abbreviated title entries for some 6,000 serials are provided, together with a list of publishers and the serials they publish. *ZR Serial Sources* is published annually and contains much of particular value to librarians and others interested in the literature coverage of the *Zoological Record*.

BIOSIS also continues to arrange educational courses designed to increase knowledge of the *Zoological Record* and of the various services it offers.

The Council acknowledges with gratitude the accommodation and other facilities so readily given by the Director of the British Museum (Natural History) and the Director General of the Document Supply Centre, Boston Spa.

Symposia

Two volumes in the series *Symposia of The Zoological Society of London* were published for the Society by Clarendon Press in the period: No. 59, 'Aspects of decapod crustacean biology', edited by Dr A A Fincham and Dr P S Rainbow, and No. 60, 'Reproduction and disease in captive and wild animals', edited by Dr G R Smith and Professor J P Hearn, and published to mark the 50th anniversary of The Wellcome Trust.

International Zoo Yearbook

Volume 27 of the *International Zoo Yearbook* was published in the autumn of 1988. The special theme of Section 1, entitled 'Conservation Science and Zoos', dealt with the increasingly important rôle of zoos in conservation. The introductory article, by the Chairman of the Legislation Committee of the American Association of Zoological Parks and Aquariums, emphasised that the management techniques perfected in zoos were often essential to the successful management of animal populations in national parks. The 24 substantial papers in this section dealt with the broad issues of zoo-related research and population management in relation to captive breeding programmes and reintroduction schemes, as well as reports on the practical applications of these principles.

Section 1 of Volume 28, currently in preparation, is devoted to papers on Reptiles and Amphibians. Reptiles, last dealt with in depth in Volume 19 (1979), is a popular theme and, as expected, the request for papers has met with an enthusiastic response. Over 40 papers have been accepted covering the husbandry, breeding and conservation of some of the most endangered and fascinating species, including the South American poison arrow frogs, the Japanese Giant Salamander, giant tortoises, iguanas, agamids, monitor lizards, boas, aquatic snakes and vipers. The list of contributors contains many names well-known in the herpetological field from the USA, Europe, including the USSR, Israel, Japan and Australia.

Section 2, New developments in the zoo world, includes articles on various aspects of breeding, husbandry and hand-rearing of birds and mammals, including two reports on the environmental enrichment studies being undertaken by David Shepherdson and his team at London Zoo.

The reference section includes the biennial list of zoos and aquaria of the world, the annual lists of vertebrates bred and the census of rare species in captivity, and the list of studbooks for rare or endangered species in captivity.

The rôle of studbooks is regarded as one of growing importance by the international community and the number of species covered continues to expand. As editor of the *International Zoo Yearbook*, Peter J S Olney, is the International Studbook Co-ordinator, work which requires a considerable commitment of time in liaising with IUCN, International Union

of Directors of Zoological Gardens, the AAZPA Conservation Committee and the Captive Breeding Specialist Group. In October 1988 he attended a meeting of the CBSG and the 5th World Conference of Breeding Endangered Species in Captivity which were both held at Cincinnati.

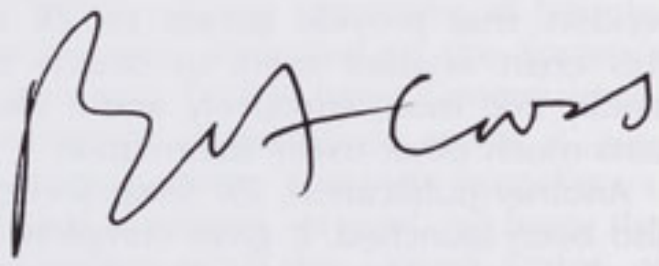
LIBRARY

The Library continues to provide a full service to members of the Society and its staff, and to the staff of Zoo Operations Limited and the Institute of Zoology. It also provides a service to members of the public who have applied for a Reference Ticket.

In a number of ways the Library seeks to augment its income. There is a charge for the Reference Ticket, 110 of which were purchased during the year. The Library has a collection of over 25,000 black and white photographs of animals and events in the Gardens since 1870, from which it sells photographic prints and charges a reproduction fee; during the year £1,018 was received from this source.

Publication of some of the magnificent paintings and drawings in the Library is also arranged in conjunction with commercial publishers. They are usually used to illustrate books for which royalties are received. During the year two such books were published, one illustrated with watercolours by Henry Jones, the other with watercolours by Brian Hodgson. In November 1988, for books in this programme, the Society and Oxford University Press won jointly the Certificate of Merit of the Laurent-Perrier Champagne Award for Wild Animal Conservation.

The generosity of those who donate books is important to the Library in maintaining its services. Particularly worthy of mention is a fine collection given by Mr D Bird, but the Society is also grateful to the following donors: Dr C Andrews, Mr A W Baker, Dr E D Barlow, Mr D Bruce, Professor J L Cloudsley-Thompson, Professor S B Day, Mr J Elphick, Dr W J Gladwin, Dr C Hawkey, Professor E J Moynahan, Mr B Ryan, Mr K Ryz, Mr D Vingoe, Mrs D J Willimott, Mr G S Wood, Mrs L Young, Jonathan Cape Ltd, Diwan of Royal Court, Oman, Marshall Editions, Salamander Books.



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PUBLICATIONS BY SOCIETY'S STAFF AND RESEARCH WORKERS

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ANIMALS IN THE COLLECTIONS

column 1 Number of animals in the Collection at 1st January 1988.

column 2 Number of animals received in 1988 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 1988.

column 4 Number of animals which died in 1988 within 30 days of birth or hatching. The figures in brackets indicate animals born or hatched during December 1987 and which died during January 1988. Stillbirths are not included.

column 5 Number of animals which died from natural causes during 1988 apart from those included in column 4.

column 6 Number of animals disposed of in 1988 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 1988 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	—	—	—	—	—	2/2
Marsupialia								
Monodelphis domestica	Grey Short-tailed Opossum	12	—	4	—	4	3	5/4
Phalanger gymnotis	Grey Ground Cuscus	3	—	—	—	—	—	1/2
Gymnobelidus leadbeateri	Leadbeater's Possum	5	—	—	—	—	—	3/2
Petaurus breviceps	Sugar Glider	6	—	—	—	3	—	2/1
Dasyuroides byrnei	Byrne's Pouched Mouse	5	—	—	—	2	—	0/3
Vombatus ursinus	Common Wombat	1	—	—	—	—	—	0/1
Bettongia penicillata	Brush-tailed Bettong	7	—	2	—	1	—	5/3
Macropus rufogriseus	Red-necked Wallaby	3	—	1	—	—	1(1)	1/2
Macropus parma	White-throated Wallaby	1	—	—	—	—	—	1/0
Dendrolagus goodfellowi	Goodfellow's Tree Kangaroo	1	—	—	—	—	—	0/1
Insectivora								
Erinaceus europaeus	European Hedgehog	3	1	—	—	—	1	1/0/2
Paraechinus aethiopicus	Desert Hedgehog	1	—	—	—	1	—	—
Chiroptera								
Pteropus giganteus	Indian Fruit Bat	17	—	3	2	—	—	5/11/2
Carollia perspicillata	Seba's Short-tailed Bat	41	—	16	1	7	—	0/0/49
Scandentia								
Tupaia glis	Common Tree Shrew	11	—	—	—	3	2	3/3
Tupaia tana	Large Tree Shrew	2	—	—	—	1	—	0/1
Primates								
Lemur catta	Ring-tailed Lemur	6	1	—	—	—	2	1/4
Lemur fulvus	Brown Lemur	11	—	4	3	—	2	3/7
Lemur mongoz	Mongoose Lemur	2	—	—	—	—	—	1/1
Varecia variegatus	Ruffed Lemur	6	—	—	—	—	—	3/3
Cheirogaleus medius	Fat-tailed Dwarf Lemur	6	1	—	—	—	1	3/3
Microcebus murinus	Grey Mouse Lemur	9	—	—	—	3	—	5/1
Loris tardigradus	Slender Loris	4	—	3	2	—	—	2/2/1

		1	2	3	4	5	6	7
Nycticebus coucang	Slow Loris	9	—	1	1	2	—	2/4/1
Galago crassicaudatus	Thick-tailed Bushbaby	1	—	—	—	1	—	—
Galago senegalensis	Senegal Bushbaby	4	—	3	—	1	—	5/1
Aotus trivirgatus	Douroucouli	6	—	1	—	—	—	4/3
Pithecia pithecia	White-faced Saki Monkey	7	—	2	—	—	2	3/4
Saimiri sciureus	Squirrel Monkey (Olive-capped form)	16	—	3	—	1	—	8/10
Ateles geoffroyi	Black-handed Spider Monkey	2	—	—	—	—	—	1/1
Callithrix jacchus	Common Marmoset	8	—	11	7	1	—	2/5/4
Cebuella pygmaea	Pygmy Marmoset	7	—	2	2	1	—	3/3
Saguinus oedipus	Cotton-headed Tamarin	2	2	—	—	—	—	2/2
Saguinus illigeri	Red-mantled Tamarin	11	2	2	—	2	3	3/5/2
Saguinus imperator	Emperor Tamarin	4	—	—	—	—	—	2/2
Leontopithecus rosalia	Golden Lion Tamarin	7	—	—	—	1	1	2/3
Callimico goeldii	Goeldi's Marmoset	5	—	2	—	—	2	2/1/2
Macaca nemestrina	Pig-tailed Macaque	24	—	6	3	1	—	8/15/3
Mandrillus sphinx	Mandrill	11	2	1	—	1	2	5/5/1
Cercopithecus diana	Diana Monkey	6	2	1	—	—	4	2/3
Cercopithecus hamlyni	Owl-faced Monkey	2	3	—	—	—	1	2/2
Colobus polykomos	Western Black & White Colobus Monkey	4	—	—	—	—	—	3/1
Hylobates lar	Lar Gibbon	2	—	1	—	—	—	1/2
Pongo pygmaeus	Orang Utan	11	2	—	—	—	3	4/6
Pan troglodytes	Chimpanzee	10	—	2	—	—	—	6/6
Gorilla gorilla	Gorilla	4	—	1	—	—	—	1/4
Edentata								
Myrmecophaga tridactylus	Giant Anteater	2	—	—	—	—	2	—
Choleopus didactylus	Two-toed Sloth	1	1	—	—	—	—	1/1
Dasypus novemcinctus	Nine-banded Armadillo	1	—	—	—	1	—	—
Chaetophractus villosus	Hairy Armadillo	2	—	—	—	—	—	1/1
Rodentia								
Sciurus vulgaris	Red Squirrel	4	—	—	—	1	—	2/1
Ratufa bicolor	Malayan Giant Squirrel	2	—	—	—	—	2	—
Callosciurus prevosti	Prevost's Squirrel	2	—	—	—	—	—	1/1
Cynomys ludovicianus	Prairie Marmot	7	—	—	—	1	—	0/1/5
Tamias sibiricus	Siberian Chipmunk	3	—	6	—	—	9	—
Tamias townsendi	Townsend's Chipmunk	8	—	—	—	—	2	3/5
Glaucomys sabrinus	Northern Flying Squirrel	8	—	—	—	—	—	3/5
Castor canadensis	American Beaver	2	—	—	—	—	—	1/1
Pedetes capensis	Springhaas	8	—	4	2	1	—	5/4
Peromyscus maniculatus	White-footed Mouse	6	—	—	—	3	3	—
Peromyscus polionotus	Oldfield Mouse	10	—	31	1	3	—	13/24
Sigmodon hispidus	Cotton Rat	25	—	24	—	13	24	8/4
Phodopus sungorus	Dwarf Hamster	54	7	3	—	32	14	7/10/1
Cricetulus barabensis	Chinese Hamster	9	—	28	1	18	—	9/9
Gerbillus perpallidus	Pallid Gerbil	—	45	8	3	4	—	20/26
Meriones unguiculatus	Clawed Jird	21	—	11	—	16	3	5/8
Meriones shawi	Shaw's Jird	—	9	18	—	1	—	14/12
Dicrostonyx torquatus	Collared Lemming	17	—	20	5	16	—	4/3/9
Clethrionomys glareolus	Bank Vole	29	—	27	—	16	14	10/16
Microtus orcadensis	Orkney Vole	16	—	5	—	13	4	1/0/3
Microtus agrestis	Field Vole	20	—	3	1	18	—	0/3/1
Apodemus sylvaticus	Field Mouse	28	—	63	4	8	32	14/22/11
Micromys minutus	Harvest Mouse	47	—	9	3	24	10	9/10
Acomys cahirinus	Arabian Spiny Mouse	94	—	171	44	24	114	1/45/37
Acomys russatus	Golden Spiny House (Black form)	23	—	46	13	9	—	12/12/23
Lemniscomys barbarus	Zebra Mouse	1	—	—	—	1	—	—
Arvicanthus niloticus	Nile Rat	12	—	—	—	6	3	0/3
Rattus rattus	Black Rat	50	—	162	13	—	119	0/0/80
Glis glis	Fat Dormouse	1	—	—	—	1	—	—
Muscardinus avellanarius	Common Dormouse	—	10	—	—	—	—	4/5/1
Jaculus jaculus	Arabian Jerboa	7	—	2	2	3	—	2/2
Hystrix indica × *H. cristata*	Hybrid Indian × Crested Porcupine	2	—	—	—	—	—	1/1
Atherurus africanus	African Brush-tailed Porcupine	5	—	2	1	—	—	3/2/1
Kerodon rupestris	Rock Cavy	9	—	11	4	2	—	7/3/4
Dolichotis patagonum	Mara	5	—	—	—	2	—	3/0
Cuniculus paca	Spotted Paca	1	—	—	—	—	1	—
Dasyprocta aguti	Orange-rumped Agouti	10	1	8	3	6	1	4/5
Myoprocta pratti	Green Acouchi	12	—	—	—	4	2	5/1
Chinchilla laniger	Chinchilla	14	—	11	2	—	7	9/7
Geocapromys brownii	Jamaican Hutia	1	—	—	—	1	—	—

		1	2	3	4	5	6	7
Octodon degus	Degu	8	—	9	—	—	—	5/4/8
Proechimys guairae	Casiragua	5	—	—	—	2	3	—
Heterocephalus glaber	Naked Mole Rat	61	—	17	12	6	60	—
Carnivora								
Canis lupus	Grey Wolf	7	—	—	—	1	—	1/5
Fennecus zerda	Fennec Fox	2	—	—	—	—	—	1/1
Ailuropoda melanoleucus	Giant Panda	1	—	—	—	—	1	—
Ailurus fulgens	Red Panda	2	—	—	—	1	—	1/0
Potos flavus	Kinkajou	3	—	1	—	—	1	2/1
Mustela nivalis	Weasel	1	—	—	—	—	—	1/0
Mustela putorius	Polecat Ferret	4	—	—	—	—	—	2/2
Amblonyx cinerea	Oriental Small-clawed Otter	2	—	—	—	—	—	1/1
Genetta tigrina	Blotched Genet	3	—	—	—	1	—	2/0
Arctogalidia trivirgata	Small-toothed Palm Civet	2	—	—	—	—	—	0/2
Paguma larvata	Masked Palm Civet	1	—	—	—	1	—	—
Suricata suricatta	Suricate Meerkat	11	—	—	—	2	1	5/3
Helogale parvula	Dwarf Mongoose	16	—	—	—	—	—	8/5/3
Cynictis penicillata	Yellow Mongoose	3	—	—	—	—	—	1/2
Felis caracal	Caracal Lynx	4	—	—	—	1	—	1/2
Felis pardalis	Ocelot	2	1	—	—	—	1	1/1
Felis serval	Serval	3	—	—	—	—	1	1/1
Felis wiedi	Margay	1	1	—	—	—	—	1/1
Panthera leo	Lion	4	—	—	—	—	1(1)	1/2
Panthera tigris	Tiger (Sumatran form)	4	—	—	—	—	—	1/3
Panthera pardus	Leopard	2	—	—	—	—	—	1/1
Panthera pardus saxicolor	Persian Leopard	2	—	—	—	—	—	1/1
Neofelis nebulosa nebulosa	Clouded Leopard	—	4	—	—	—	—	2/2
Panthera onca	Jaguar	3	—	—	—	1	—	1/1
Pinnipedia								
Zalophus californianus	Californian Sealion	6	—	1	—	—	2(2)	1/4
Tubulidentata								
Orycteropus afer	Aardvark	3	—	1	—	1	—	1/2
Proboscidea								
Elephas maximus	Asian Elephant	2	1	—	—	—	—	0/3
Hyracoidea								
Heterohyrax brucei	Bush Hyrax	4	—	—	—	2	—	1/1
Procavia capensis	Rock Hyrax	5	—	—	—	5	—	—
Perissodactyla								
Equus zebra hartmanni	Hartmann's Mountain Zebra	3	—	—	—	—	—	1/2
Tapirus terrestris	Brazilian Tapir	3	—	—	—	—	—	1/2
Diceros bicornis	Black Rhinoceros	2	1(1)	1	—	—	—	1/3
Artiodactyla								
Choeropsis liberiensis	Pygmy Hippopotamus	1	—	—	—	—	1(1)	—
*Lama glama**	Llama	5	—	—	—	—	—	5/0
*Lama guanicoe**	Guanaco	2	—	—	—	1	—	1/0
Lama paca	Alpaca	1	—	—	—	—	1	—
Vicugna vicugna	Vicuna	5	—	1	—	—	1	3/2
*Camelus bactrianus**	Bactrian Camel	5	1	—	—	1	—	0/5
*Pudu pudu**	Pudu	5	—	2	—	1	—	2/4
Rangifer tarandus	Reindeer	3	—	2	1	—	1(1)	1/2
Okapia johnstoni	Okapi	4	—	—	—	1	—	0/3
*Giraffa camelopardalis**	Giraffe	6	—	1	—	—	1	3/3
*Tragelaphus eurycerus**	Bongo	6	—	—	—	—	1	2/3
*Tragelaphus strepsiceros**	Greater Kudu	5	—	2	—	2	—	2/3
*Bubalus depressicornis**	Anoa	2	—	—	—	—	—	1/1
*Bos gaurus**	Gaur	5	1	1	—	—	3(3)	2/2
Bison bison	American Bison	3	—	1	—	—	1	1/2
*Hippotragus equinus**	Roan Antelope	7	1	—	—	2	6(5)	—
*Hippotragus niger**	Sable Antelope	—	4	—	—	1	—	1/2
*Oryx leucoryx**	Arabian Oryx	5	—	3	—	1	1(1)	3/3
*Damaliscus dorcas**	Bontebok	2	—	—	—	—	2(2)	—
*Antilope cervicapra**	Blackbuck	17	—	7	2	—	2(2)	4/16
Ovis canadensis	Bighorn Sheep	11	—	5	—	1	—	5/10

		1	2	3	4	5	6	7
Domestic								
Pig:	Gloucester Old Spot	2	—	5	—	—	5	1/1
	Miniature	3	—	—	—	—	—	1/2
Cattle:	Friesian	3	1	1	—	1	2	0/2
	Jersey	1	—	—	—	—	1	—
Goat:	Common	6	—	2	—	—	1	0/7
	Windsor White	1	1(1)	—	—	—	1(1)	1/0
	Nubian	1	—	—	—	—	—	0/1
Sheep:	Dorset Down	8	—	4	—	2	—	0/10
	Black Welsh Mountain	1	—	—	—	—	—	1/0
	Jacob's	1	—	—	—	—	—	1/0
Rabbit		15	8	39	4	2	25	7/10/14
Guineapig		10	3	28	2	3	14	4/8/10
Donkey		1	—	—	—	—	—	1/0
Pony:	Cream	4	—	—	—	—	—	2/2
	Shetland	3	—	—	—	—	—	0/3
Total Mammals:		**1255**	**117(4)**	**879**	**144**	**328**	**537(20)**	**1242**
BIRDS								
Casuariiformes								
Casuarius bennetti	Bennett's Cassowary	1	—	—	—	—	—	0/1
Casuarius unappendiculatus	One-wattled Cassowary	1	—	—	—	—	1	—
Dromaius novaehollandiae	Emu	2	1(1)	1	—	—	—	3/1
Apterygiformes								
Apteryx australis mantelli	North Island Brown Kiwi	2	—	—	—	—	—	2/0
Sphenisciformes								
Spheniscus demersus	Blackfooted Penguin	36	—	4	1	2	—	16/13/8
Spheniscus humboldti	Humboldt's Penguin	2	—	—	—	—	—	1/1
Pelecaniformes								
Pelecanus onocrotalus	Eastern White Pelican	6	—	—	—	—	—	2/1/3
Pelecanus crispus	Dalmatian Pelican	1	—	—	—	—	—	0/1
Pelecanus occidentalis	Brown Pelican	5	—	—	—	1	—	0/0/4
Morus bassanus	Gannet	3	2	—	—	1	—	1/0/3
Phalacrocorax carbo	Cormorant	5	1	—	—	—	—	1/5
Phalacrocorax aristotelis	Shag	2	1	—	—	—	—	2/1
Ciconiiformes								
Nycticorax nycticorax	Night Heron	3	—	—	—	—	—	0/1/2
Ardeola ibis	Cattle Egret	6	—	—	—	1	—	1/3/1
Butorides striatus	Striated Heron	1	—	—	—	—	—	0/0/1
Ardea cinerea	Grey Heron	4	—	—	—	—	—	0/0/4
Ciconia abdimii	Abdim's Stork	27	—	3	1	3	—	4/4/18
Ephippiorhynchus asiaticus	Black-necked Stork	2	—	—	—	1	—	0/1
Leptoptilos crumeniferus	Marabou Stork	—	2	—	—	—	—	1/1
Threskiornis aethiopicus	Sacred Ibis	31	—	14	7	1	2	14/14/7
Eudocimus ruber	Scarlet Ibis	5	—	—	—	—	—	3/2
Phoenicopterus chilensis	Chilean Flamingo	41	—	—	—	2	—	6/3/30
Anseriformes								
Dendrocygna bicolor	Fulvous Whistling Duck	1	2	—	—	—	—	1/1/1
Dendrocygna viduata	White-faced Tree Duck	9	4	2	—	1	—	4/4/6
Dendrocygna arborea	Cuban Tree Duck	2	—	—	—	1	—	0/1
Anser canagicus	Emperor Goose	1	—	—	—	—	1(1)	—
Branta sandvicensis	Hawaiian Goose	5	—	2	—	—	—	1/4/2
Branta bernicla orientalis	Brent Goose	9	2	—	—	2	2(2)	4/3
Cereopsis novaehollandiae	Cape Barren Goose	3	—	—	—	—	1	1/1
Aix sponsa	Carolina Duck	4	3	—	—	2	—	3/2
Aix galericulata	Mandarin Duck	2	2	—	—	—	—	2/2
Callonetta leucophrys	Ringed Teal	17	1	—	—	1	—	10/7
Chenonetta jubata	Maned Goose	2	—	—	—	—	—	1/1
Anas penelope	Wigeon	8	—	—	—	2	2	2/2
Anas americana	American Wigeon	—	2	—	—	—	—	1/1
Anas sibilatrix	Chiloe Wigeon	14	—	—	—	3	1	6/3/1
Anas sibilatrix × *Aythya fuligula*	Chiloe Wigeon × Tufted Duck	2	—	—	—	—	—	0/0/2
Anas strepera	Gadwall	2	—	—	—	—	—	1/1
Anas crecca	Teal	2	2	—	—	—	—	2/2
Anas flavirostris oxyptera	Sharp-winged Teal	2	—	—	—	—	1	0/0/1

		1	2	3	4	5	6	7
Anas platyrhynchus laysanensis	Laysan Duck	2	—	—	—	1	—	1/0
Anas acuta	Pintail	3	1	—	—	—	—	2/2
Anas bahamensis	Bahama Pintail	2	2	—	—	—	—	1/3
Anas versicolor puna	Puna Teal	5	—	—	—	1	—	1/2/1
Anas hottentota	Hottentot Teal	—	2	—	—	—	—	1/1
Anas querquedula	Garganey	3	—	—	—	2	—	1/0
Anas platalea	Argentine Red Shoveler	—	2	—	—	—	—	1/1
Anas clypeata	Shoveler	2	3	—	—	—	1	2/2
Marmaronetta angustirostris	Marbled Teal	4	—	—	—	—	—	2/2
Netta rufina	Red-crested Pochard	3	1	—	—	—	1	1/2
Aythya valisineria	Canvasback	4	—	—	—	—	—	2/2
Aythya ferina	European Pochard	3	1	—	—	1	—	1/2
Aythya fuligula	Tufted Duck	7	—	—	—	1	—	1/5
Somateria mollissima	Eider Duck	16	—	—	—	2	—	7/7
Bucephala clangula	Goldeneye	1	1	—	—	—	—	1/1
Mergus albellus	Smew	2	1	—	—	1	—	1/1
Mergus merganser	Goosander	5	—	1	1	—	—	1/4
Oxyura jamaicensis jamaicensis	North American Ruddy Duck	4	3	—	—	1	—	3/3
Falconiformes								
Milvus migrans parasitus	Black Kite (Yellow-billed race)	—	1	—	—	—	—	0/0/1
Milvus migrans migrans	Black Kite	1	—	—	—	—	—	0/1
Haliastur indus	Brahminy Kite	1	—	—	—	—	—	0/1
Neophron percnopterus percnopterus	Egyptian Vulture	1	—	—	—	—	—	1/0
Terathopius ecaudatus	Bateleur Eagle	3	—	1	—	1	—	1/1/1
Polyboroides typus	Harrier Hawk	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	1/1
Polyborus plancus plancus	Common Caracara	2	—	—	—	1	—	1/0
Polihierax semitorquatus	African Pygmy Falcon	2	—	3	3	—	—	1/1
Galliformes								
Penelope purpurascens	Crested Guan	2	—	—	—	—	—	1/1
Crax fasciolata	Bare-faced Curassow	2	—	—	—	—	—	1/1
Alectoris rufa	Red-legged Partridge	2	—	—	—	1	1	—
Francolinus francolinus	Black Francolin	4	—	—	—	1	—	2/1
Francolinus pondicerianus	Indian Grey Francolin	4	—	12	—	—	6	2/3/5
Rollulus rouloul	Crested Wood Partridge	4	—	—	—	—	—	2/2
Bambusicola thoracica	Chinese Bamboo Partridge	2	—	—	—	—	—	1/1
Tragopan satyra	Satyr Tragopan	2	—	8	3	1	4	1/1
Pucrasia macrolopha	Koklass Pheasant	2	1	6	5	2	1	0/1
Lophophorus impeyanus	Impeyan Pheasant	2	—	5	1	—	4	1/1
Gallus sonneratii	Sonnerat's Jungle Fowl	2	—	—	—	—	—	1/1
Lophura leucomelana leucomelana	Nepal Kalij Pheasant	1	—	—	—	—	—	1/0
Lophura imperialis	Imperial Pheasant	1	—	—	—	1	—	—
Lophura swinhoii	Swinhoe's Pheasant	2	—	3	—	—	3	1/1
Lophura ignita ignita	Bornean Crested Fireback	2	—	—	—	—	—	1/1
Lophura diardi	Siamese Fireback Pheasant	2	—	—	—	—	—	1/1
Crossoptilon crossoptilon	White Eared Pheasant	2	—	—	—	—	—	1/1
Crossoptilon auritum	Blue Eared Pheasant	2	—	—	—	—	—	1/1
Catreus wallichi	Cheer Pheasant	2	—	7	2	1	4	1/1
Syrmaticus elliotii	Elliot's Pheasant	1	—	—	—	—	—	1/0
Syrmaticus humiae	Hume's Bar-tailed Pheasant	2	—	3	—	—	3	1/1
Syrmaticus mikado	Mikado Pheasant	2	1	—	—	1	—	1/1
Syrmaticus soemmerringi scintillans	Scintillating Copper Pheasant	1	—	—	—	—	—	1/0
Syrmaticus reevesi	Reeves's Pheasant	2	—	—	—	—	—	1/1
Chrysolophus pictus	Golden Pheasant	2	—	5	5	—	—	1/1
Polyplectron bicalcaratum	Grey Peacock Pheasant	2	—	3	3	—	—	1/1
Pavo cristatus	Common Peafowl	2	—	3	—	—	3(3)	1/1
Afropavo congensis	Congo Peafowl	4	—	5	5	—	—	1/3
Acryllium vulturinum	Vulturine Guineafowl	4	3	4	—	—	—	3/1/7
Gruiformes								
Grus japonensis	Red-crowned Crane	2	1(1)	—	—	—	1	1/1
Grus vipio	White-naped Crane	2	—	—	—	—	—	1/1
Grus antigone	Sarus Crane	2	—	—	—	—	—	1/1
Grus rubicunda	Brolga	1	—	—	—	—	1(1)	—
Bugeranus carunculatus	Wattled Crane	2	—	—	—	—	—	1/1
Anthropoides virgo	Demoiselle Crane	6	—	—	—	1	—	2/3
Anthropoides paradisea	Stanley Crane	2	—	—	—	—	—	1/1
Balearica pavonina	West African Crowned Crane	2	—	—	—	1	1(1)	—
Balearica regulorum	South African Crowned Crane	5	—	2	—	—	1	2/2/2

		1	2	3	4	5	6	7
Laterallus leucopyrrhus	White-breasted Crake	2	—	—	—	—	—	1/1
Lissotis melanogaster melanogaster	Black-bellied Bustard	1	—	—	—	—	—	1/0
Rallidae								
Rallus aquaticus	Water Rail	—	2	—	—	—	—	1/1
Charadriiformes								
Haematopus ostralegus	Oystercatcher	4	—	—	—	—	—	1/3
Himantopus himantopus	Black-winged Stilt	1	—	—	—	—	—	0/1
Recurvirostra avosetta	Avocet	4	9	—	—	5	—	3/2/3
Burhinus oedicnemus	Stone Curlew	9	—	3	1	—	—	4/6/1
Vanellus vanellus	Lapwing	—	2	—	—	1	—	0/1
Glareola pratincola	Collared Pratincole	1	—	—	—	—	—	1/0
Charadrius hiaticula	Ringed Plover	1	—	—	—	—	—	0/0/1
Numenius arquata	Curlew	2	—	—	—	—	—	1/1
Tringa totanus	Redshank	1	2	—	—	1	—	0/0/2
Arenaria interpres	Turnstone	3	—	—	—	—	—	0/0/3
Philomachus pugnax	Ruff	2	—	—	—	—	—	0/2
Larus cirrocephalus poiocephalus	Grey-headed Gull	21	—	—	—	—	—	7/7/7
Larosterna inca	Inca Tern	4	—	—	—	—	—	1/1/2
Uria aalge	Guillemot	1	—	—	—	—	—	0/0/1
Columbiformes								
Pterocles alchata	Pintailed Sandgrouse	—	8	—	—	—	—	0/0/8
Columba guinea	Speckled Pigeon	24	—	5	—	4	—	4/4/17
Columba picazuro	Picazuro Pigeon	2	—	—	—	—	1	0/0/1
Streptopelia vincacea	Vinaceous Dove	2	—	—	—	—	—	1/1
Streptopelia tranquebarica humilis	Dwarf Turtle Dove	1	—	—	—	—	—	1/0
Streptopelia chinensis chinensis	Chinese Necklace Dove	3	—	—	—	1	—	0/0/2
Turtur tympanistris	Tambourine Dove	1	—	—	—	—	—	0/1
Oena capensis	Cape Dove	1	—	—	—	1	—	—
Phaps elegans	Brush Bronzewing	1	—	—	—	—	—	0/1
Ocyphaps lophotes	Crested Pigeon	7	—	—	—	1	—	1/1/4
Geopelia cuneata	Diamond Dove	1	—	—	—	—	—	1/0
Zenaida auriculata	Violet-eared Dove	2	—	—	—	—	—	0/2
Columbina cruziana	Gold-billed Ground Dove	1	—	—	—	1	—	—
Geotrygon versicolor	Mountain Witch Dove	2	—	—	—	1	—	0/0/1
Gallicolumba luzonica	Blood-breasted Pigeon	1	—	—	—	1	—	—
Ducula badia cuprea	Jerdon's Imperial Pigeon	6	—	—	—	4	—	0/1/1
Ducula bicolor	Pied Imperial Pigeon	1	—	—	—	—	—	0/0/1
Psittaciformes								
Trichoglossus euteles	Perfect Lorikeet	1	—	—	—	—	1	—
Eolophus roseicapillus	Roseate Cockatoo	2	—	—	—	—	—	1/1
Cacatua leadbeateri	Leadbeater's Cockatoo	1	—	—	—	—	1	—
Cacatua galaerita	Greater Sulphur-crested Cockatoo	—	1	—	—	—	—	0/0/1
Cacatua alba	White-crested Cockatoo	—	1	—	—	—	—	0/1
Cacatua tenuirostris pastinator	Western Slender-billed Cockatoo	3	—	1	1	1	—	1/1
Nymphicus hollandicus	Cockatiel	15	1	18	2	14	6	4/3/5
Nestor notabilis	Kea	1	1	—	—	—	—	1/1
Polytelis swainsoni	Barraband Parrakeet	5	3	—	—	2	—	1/5
Polytelis anthopeplus	Rock Peplar	11	—	6	—	5	—	4/3/5
Polytelis alexandrae	Princess of Wales' Parrakeet	4	—	1	—	—	—	1/1/3
Platycercus elegans	Pennant's Parrakeet	—	3	—	—	2	—	0/1
Platycercus eximius eximius	Eastern Rosella Parrakeet	1	1	—	—	1	—	1/0
Melopsittacus undulatus	Budgerigar	12	1	9	3	3	9	5/2
Psittacus erithacus	Grey Parrot	2	—	—	—	—	—	1/1
Poicephalus rueppellii	Ruppell's Parrot	2	—	—	—	—	—	1/1
Loriculus vernalis	Vernal Hanging Parrot	2	—	—	—	—	—	1/1
Loriculus galgulus	Blue-crowned Hanging Parrot	1	—	—	—	—	1	—
Psittacula krameri manillensis	Indian Ring-necked Parrakeet	7	—	4	—	—	3	3/2/3
Anodorhynchus hyacinthinus	Hyacinthine Macaw	3	—	—	—	—	1	1/1
Ara ambigua	Buffon's Macaw	2	—	—	—	1	1	—
Ara chloroptera	Green-winged Macaw	2	—	—	—	—	—	1/1
Aratinga solstitialis	Sun Conure	5	—	—	—	2	—	2/1
Cyanoliseus patagonus byroni	Greater Patagonian Conure	4	—	—	—	—	—	2/2
Brotogeris versicolurus chiriri	Canary-winged Parrakeet	1	—	—	—	—	—	0/0/1
Brotogeris pyrrhopterus	Orange-flanked Parrakeet	2	—	—	—	—	—	1/1
Amazona ochrocephala	Yellow-fronted Amazon Parrot	1	—	—	—	—	—	1/0
Amazona amazonica	Orange-winged Amazon Parrot	2	—	—	—	—	1	0/1

		1	2	3	4	5	6	7
Cuculiformes								
Tauraco corythaix corythaix	Knysna Turaco	1	—	—	—	—	—	0/1
Tauraco erythrolophus	Red-crested Turaco	3	—	—	—	—	—	1/2
Tauraco hartlaubi	Hartlaub's Turaco	3	—	1	1	—	—	2/1
Tauraco leucotis	White-cheeked Turaco	7	1	1	—	2	—	2/3/2
Eudynamys scolopacea chinensis	Chinese Koel	1	—	—	—	—	—	0/0/1
Strigiformes								
Tyto alba	Barn Owl	4	—	3	1	—	2	1/1/2
Otus bakkamoena	Collared Scops Owl	2	—	—	—	—	—	1/1
Otus leucotis	White-faced Scops Owl	9	—	7	—	—	3	3/6/4
Bubo virginianus	Great Horned Eagle Owl	2	—	1	—	—	—	1/1/1
Bubo bubo bubo	European Eagle Owl	2	1	—	—	1	—	1/1
Bubo bubo bengalensis	Bengal Eagle Owl	—	1	—	—	—	—	1/0
Bubo bubo turcomanus	Turkmenian Eagle Owl	2	—	—	—	—	—	1/1
Bubo capensis mackinderi	Kenya Eagle Owl	2	—	—	—	—	—	1/1
Bubo africanus africanus	Spotted Eagle Owl	2	—	3	—	—	—	3/2
Bubo africanus cinerascens	Abyssinian Spotted Eagle Owl	2	—	—	—	—	—	1/1
Bubo vosseleri	Nduk Eagle Owl	3	—	—	—	1	—	2/0
Ketupa ketupu	Javan Fish Owl	2	—	—	—	—	2	—
Scotopelia bouvieri	Vermiculated Fishing Owl	2	—	—	—	1	—	1/0
Pulsatrix perspicillata	Spectacled Owl	2	—	—	—	—	—	1/1
Nyctea scandiaca	Snowy Owl	2	—	—	—	—	—	1/1
Ninox novaeseelandiae	Boobook Owl	2	—	2	—	—	2	1/1
Athene noctua	Little Owl	2	—	—	—	1	1	—
Athene brama	Spotted Owlet	4	—	—	—	1	1	1/1
Strix hylophila	Rusty Barred Owl	1	1	—	—	—	1	0/1
Strix uralensis	Ural Owl	6	—	—	—	—	—	3/3
Strix nebulosa lapponica	Great Grey Owl	2	—	—	—	—	—	1/1
Asio otus	Long-eared Owl	2	—	—	—	—	—	1/1
Asio flammeus	Short-eared Owl	2	—	—	—	1	—	1/0
Coraciiformes								
Dacelo novaeguinea	Kookaburra	2	—	5	—	—	—	2/4/1
Momotus momota	Blue-crowned Motmot	2	—	—	—	1	—	0/1
Coracia caudata	Lilac-breasted Roller	1	1	—	—	—	—	0/0/2
Tockus alboterminatus	Crowned Hornbill	1	—	—	—	—	—	0/1
Tockus erythrorhynchus	Red-billed Hornbill	3	1	—	—	—	1	2/1
Tockus deckeni jacksoni	Jackson's Hornbill	1	—	—	—	1	—	—
Penelopides panini	Tarictic Hornbill	5	2	—	—	—	1	2/4
Aceros undulatus	Wreathed Hornbill	1	—	—	—	—	—	0/1
Anthracoceros malayanus	Black Hornbill	1	—	—	—	—	—	0/1
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
Tricholaema lacrymosum	Spotted-flanked Barbet	1	—	—	—	—	—	1/0
Lybius guifsobalito	Black-billed Barbet	1	—	—	—	1	—	—
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	1	4	—	—	—	2(2)	1/2
Ramphastos tucanus	Red-billed Toucan	2	—	—	—	—	—	1/1
Ramphastos swainsonii	Swainson's Toucan	1	—	—	—	—	—	0/1
Melanerpes candidus	White Woodpecker	2	—	—	—	—	—	1/1
Picoides major	Great Spotted Woodpecker	1	—	—	—	—	—	0/1
Passeriformes								
Procnais nudicollis	Naked-throated Bellbird	1	—	—	—	—	—	1/0
Motacilla alba	Pied Wagtail	1	—	—	—	1	—	—
Pycnonotus leucogenys	White-eared Bulbul	1	—	—	—	—	1	—
Pycnonotus cafer bengalensis	Red-vented Bulbul	2	—	—	—	—	—	0/0/2
Hypsipetes madagascariensis	Black Bulbul	1	—	—	—	—	—	1/0
Chloropsis aurifrons	Golden-fronted Leafbird	2	—	—	—	2	—	—
Irena puella	Fairy Bluebird	2	—	—	—	1	—	0/1
Turdus olivaceus	African Thrush	4	—	—	—	—	—	1/1/2
Garrulax albogularis	White-throated Jay Thrush	1	—	—	—	—	—	0/0/1
Garrulax leucolophus	White-crested Laughing Thrush	4	—	—	—	1	—	2/1
Garrulax pectoralis	Necklaced Laughing Thrush	1	—	—	—	—	—	0/0/1
Garrulax chinensis	Black-throated Laughing Thrush	3	3	—	—	1	—	3/2

		1	2	3	4	5	6	7
Garrulax cinerasceus	Moustached Laughing Thrush	1	—	—	—	—	—	0/1
Garrulax sannio	White-browed Laughing Thrush	2	—	—	—	—	—	1/1
Leiothrix lutea	Pekin Robin	8	—	—	—	—	—	2/2/4
Malurus cyanus	Superb Blue Wren	1	—	—	—	1	—	—
Zosterops spp.	White-eye spp.	—	6	—	—	—	—	0/0/6
Zosterops flava	Javan White-eye	1	—	—	—	—	—	0/0/1
Zosterops simplex	Chinese White-eye	2	—	—	—	1	—	0/0/1
Emberiza rutila	Chestnut Bunting	1	—	—	—	—	—	1/0
Sicalis flaveola	Saffron Finch	5	—	8	3	2	—	1/1/6
Volatinia jacarini	Jacarini Finch	1	—	—	—	—	—	0/1
Sporophila torqueola	White-collared Seedeater	2	—	—	—	—	—	0/0/2
Sporophila luctuosa	Black & White Seedeater	2	—	—	—	—	—	1/1
Gubernatrix cristata	Green Cardinal	1	—	—	—	—	—	0/1
Paroaria coronata	Red-crested Cardinal	2	—	—	—	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	—	—	—	—	—	1/0
Gnorimopsar chopi	Chopi Grackle	—	4	—	—	1	—	1/2
Molothrus bonariensis	Shiny Cowbird	2	—	—	—	—	—	2/0
Serinus mozambicus	Green Singing Finch	6	—	—	—	1	—	3/2
Serinus flaviventris	St. Helena Seedeater	1	—	—	—	—	—	1/0
Carduelis carduelis	Goldfinch	1	—	—	—	1	—	—
Carduelis chloris	Greenfinch	2	—	—	—	2	—	—
Carpodacus mexicanus	Mexican Rose Finch	—	3	—	—	—	—	2/1
Pytilia phoenicoptera	Red-winged Pytilia	1	—	—	—	—	—	1/0
Lagonosticta rufopicta	Bar-breasted Fire Finch	1	—	—	—	—	—	1/0
Uraeginthus bengalus	Red-cheeked Cordon Bleu	1	—	—	—	1	—	—
Estrilda melpoda	Orange-cheeked Waxbill	2	—	—	—	—	—	1/0/1
Estrilda troglodytes	Red-eared Waxbill	4	—	—	—	—	—	1/2/1
Amandava amandava	Avadavat	1	—	—	—	—	—	1/0
Amandava amandava punicea	Strawberry Finch	2	—	—	—	—	—	1/1
Amandava formosa	Green Avadavat	2	—	—	—	—	—	1/1
Amandava subflava	Golden-breasted Waxbill	8	—	—	—	—	—	3/3/2
Neochima ruficauda	Star Finch	2	—	—	—	1	—	0/1
Poephila guttata	Zebra Finch	2	—	—	—	—	—	1/1
Poephila bichenovii	Bicheno's Finch	2	—	—	—	1	—	0/1
Poephila acuticauda hecki	Heck's Grass Finch	5	—	—	—	—	—	2/2/1
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	—	—	—	—	—	0/0/1
Lonchura maja	White-headed Mannikin	2	—	—	—	1	—	0/0/1
Lonchura pallida	Pallid Finch	1	—	—	—	—	—	1/0
Padda oryzivora	Javan Finch	3	—	—	—	—	—	1/1/1
Amadina fasciata	Cut-throat Finch	2	—	—	—	—	—	0/1/1
Ploceus cucullatus	Spotted-backed Weaver	1	—	—	—	—	—	1/0
Quelea quelea	Red-beaked Weaver	2	—	—	—	—	—	1/0/1
Euplectes afer	Napoleon Weaver	1	—	—	—	—	—	1/0
Vidua chalybeata	Combassou	4	—	—	—	1	—	2/1
Lamprotornis purpureus	Purple Glossy Starling	7	—	—	—	1	—	4/2
Lamprotornis chalybaeus	Green Glossy Starling	5	—	—	—	1	—	4/0
Spreo superbus	Superb Glossy Starling	6	—	—	—	1	—	3/2
Creatophora cinerea	Wattled Starling	6	—	—	—	2	—	2/2
Sturnus roseus	Rose-coloured Starling	4	—	—	—	—	—	3/1
Sturnus contra	Asian Pied Starling	1	—	—	—	—	—	1/0
Sturnus vulgaris	Common Starling	1	—	—	—	—	—	1/0
Leucopsar rothschildi	Rothschild's Grackle	9	2	—	—	1	1	4/4/1
Acridotheres cristatellis cristatellis	Chinese Crested Mynah	3	—	—	—	—	—	2/1
Gracula religiosa religiosa	Javan Hill Mynah	1	1	—	—	—	—	1/1
Gracula religiosa intermedia	Nepal Hill Mynah	5	—	—	—	—	—	0/1/4
Cyanocorax cyanopogon	Pileated (White-naped) Jay Thrush	1	1	—	—	—	—	1/1
Corvus corax corax	Raven	2	—	—	—	—	—	1/1
Corvus albicollis	White-necked Raven	2	—	—	—	1	—	0/1
Domestic								
	Common Duck	4	—	1	—	2	—	1/1/1
	Old English Game Bantam	11	—	—	—	1	6(2)	1/3
	Domestic Chicken	2	—	—	—	—	—	0/2
Total: Birds		**955**	**117(2)**	**176**	**49**	**140**	**96(12)**	**963**

REPTILES

		1	2	3	4	5	6	7
Testudines								
Sternotherus odoratus	Stinkpot	3	—	—	—	—	1	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	4	2	—	—	1	—	0/3/2
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	—	10	—	—	1	—	3/6
Testudo hermanni	Hermann's Tortoise	1	3	—	—	—	—	2/2
Geochelone carbonaria	Red-footed Tortoise	2	—	—	—	1	—	1/0
Eretmochelys imbricata	Hawksbill Turtle	2	—	—	—	—	—	0/1/1
Chelus fimbriatus	Matamata	1	—	—	—	—	—	0/1
Chelodina longicollis	Long-necked Terrapin	6	—	—	—	—	—	2/4
Trionyx hurum	Peacock Soft-shelled Turtle	2	—	—	—	—	—	1/1
Crocodylia								
Alligator mississippiensis	American Alligator	3	—	—	—	—	—	1/2
Alligator sinensis	Chinese Alligator	3	—	—	—	—	—	1/2
Sauria								
Sp. inc.	Gecko	2	1	—	—	—	2	0/0/1
Teratoscincus scincus	Turkestan Gecko	2	—	—	—	2	—	—
Stenodactylus sthenodactylus	Elegant Gecko	12	—	—	—	1	—	0/0/11
Hemitheconyx caudicinctus	Fat-tailed Gecko	29	—	3	—	4	—	3/13/12
Chondrodactylus angulifer	Namib Sand Gecko	46	—	15	2	16	19	7/11/6
Phyllurus platurus	Leaf-tailed Gecko	2	—	—	—	—	2	—
Tropiocolotes steudneri	Steudner's Gecko	8	—	—	—	—	8	—
Cyrtodactylus pulchellus	Malayan Bent-toed Gecko	9	—	—	—	4	—	0/0/5
Ptyodactylus hasselquistii	Fan-footed Gecko	7	—	—	—	2	5	—
Diplodactylus ciliaris	Spiny-tailed Gecko	3	—	—	—	1	2	—
Gekko gecko	Tokay Gecko	5	—	2	1	1	3	1/1
Tarentola mauritanica	Moorish Gecko	1	—	—	—	—	1	—
Coleonyx variegatus	Western Banded Gecko	—	10	2	—	1	—	3/6/2
Eublepharis macularius	Leopard Ground Gecko	26	—	9	—	1	13(5)	6/12/3
Coleonyx elegans elegans S Gray	Mexican Banded Gecko	—	2	—	—	—	2	—
Anolis richardi	Richard's Anole	4	—	—	—	1	1	0/0/2
Sp. inc.	Lizard	—	2	—	—	—	2	—
Corythophanes cristatus	Abbess Lizard	—	9	—	—	7	—	0/0/2
Laemanctus longipes deborrei	Casque-headed Lizard	1	12	—	—	12	—	0/0/1
Basiliscus vittatus	Banded Basilisk	—	19	6	—	3	17	0/0/5
Basiliscus plumifrons	Plumed Basilisk	2	—	3	—	—	2	1/1/1
Liolaemus multiformis	Andean Smooth-throated Lizard	4	—	—	—	1	3	—
Cyclura cornuta	Rhinoceros Iguana	10	—	—	—	—	3	3/2/2
Dipsosaurus dorsalis	Desert Iguana	—	10	—	—	5	—	0/0/5
Sauromalus obesus	Chuckwalla	2	10	7	—	7	—	0/2/10
Callisaurus draconoides	Zebra-tailed Lizard	—	5	—	—	4	1	—
Uta stansburiana stansburiana	Northern Side-blotched Lizard	—	5	3	—	6	2	—
Sceloporus orcutti	Granite Spiny Lizard	—	5	—	—	2	—	0/0/3
Sceloporus magister S Hallowell	Desert Spiny Lizard	—	10	4	—	10	—	0/0/4
Amphibolurus vitticeps	Inland Bearded Dragon	—	8	—	—	—	—	1/1/6
Physignathus lesueurii	Lesueur's Water Dragon	6	—	—	—	—	—	1/4/1
Physignathus cocincinus	Cochin China Water Dragon	3	—	—	—	2	1	—
Uromastyx hardwickii	General Hardwick's Dabb Lizard	5	—	—	—	—	—	0/0/5
Chamaeleo dilepis	Flap-necked Chameleon	7	—	—	—	1	—	0/1/5
Xantusia vigilis S Baird	Desert Night Lizard	—	10	—	—	—	10	—
Egernia striolata	Australian Tree Skink	13	—	3	—	5	2	1/1/7
Sphenomorphus quoyii	Golden Water Skink	3	—	2	2	—	1	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	—	—	—	—	—	1/0
Tiliqua nigrolutea	Blotched Blue-tongued Skink	2	—	—	—	—	—	0/0/2
Mabuya brevicollis	Short-necked Skink	1	—	—	—	—	—	1/0
Leiolopisma telfairii	Round Island Skink	5	—	—	—	—	—	1/0/4
Eumeces skiltonianus	Western Skink	—	5	—	—	5	—	—
Chalcides ocellatus	Eyed Skink	3	—	13	—	—	13	1/1/1
Gerrhosaurus major	Greater Plated Lizard	3	2	—	—	1	—	3/1
Lacerta sp.	Lizard	1	—	—	—	1	—	—
Lacerta agilis	Sand Lizard	2	—	—	—	1	—	0/1
Lacerta lepida	Eyed Lizard	4	—	2	2	—	—	2/2

		1	2	3	4	5	6	7
Lacerta vivipara	Common Lizard	5	—	—	—	4	—	1/0
Podarcis lilfordi	Lilford's Wall Lizard	1	—	—	—	1	—	—
Algyroides nigropunctatus	Corfu Lizard	2	—	—	—	1	1	—
Cnemidophorus tigris	Whip-tailed Lizard	—	10	—	—	3	—	0/0/7
Trogonophis wiegmanni	Wiegmann's Burrowing Lizard	1	—	—	—	—	—	0/0/1
Varanus griseus	Grey Monitor	1	—	—	—	—	—	0/0/1
Varanus exanthematicus albigularis	Bosc's Monitor	—	1	—	—	—	—	0/0/1
Heloderma suspectum	Gila Monster	5	—	—	—	—	—	2/3
Gerrhonotus multicarinatus	Southern Alligator Lizard	—	5	2	—	1	—	0/0/6
Ophisaurus apodus	European Glass Snake	2	—	—	—	—	—	0/0/2
Anguis fragilis	Slow-worm	2	1	—	—	1	—	1/0/1
Cordylus giganteus	Sungazer	—	7	—	—	—	—	0/0/7
Cordylus warreni breyeri	Breyer's Girdled Lizard	2	—	—	—	1	—	1/0
Pseudocordylus microlepidotus	Small-scaled Girdled Lizard	2	—	—	—	1	—	0/1
Serpentes								
Liasis fuscus	Australian Water Python	3	3	—	—	—	1	2/3
Liasis childreni	Children's Python	7	—	—	—	—	7	—
Liasis boa	Blue-ring Boa	2	—	—	—	—	1	1/0
Morelia spilotus spilotus	Diamond Python	5	—	—	—	—	4	1/0
Morelia spilotus variegatus	Carpet Python	3	1	—	—	2	—	1/1
Python molurus bivittatus	Malaysian Rock Python	3	2	—	—	1	—	1/3
Python regius	Royal Python	2	2	—	—	—	1	1/0/2
Eunectes notaeus	Yellow Anaconda	3	—	—	—	—	—	1/2
Boa constrictor	Boa Constrictor	9	3	—	—	2	2	2/6
Sp. inc.	Snake	—	2	—	—	1	1	—
Lichanura roseofusca	Rosy Boa	—	3	—	—	3	—	—
Natrix natrix helvetica	Grass Snake	—	3	—	—	1	2	—
Thamnophis sirtalis parietalis	Red-sided Garter Snake	1	—	—	—	—	1	—
Boaedon fuliginosus	African House Snake	1	—	—	—	—	1	—
Drymarchon corais melanurus	South American Corais Snake	1	—	—	—	—	1	—
Drymarchon corais couperi	Eastern Indigo Snake	2	1	—	—	—	2	0/0/1
Elaphe guttata	Corn Snake	2	2	—	—	—	2	1/1
Elaphe obsoleta obsoleta	Black Rat Snake	2	—	—	—	1	—	1/0
Elaphe obsoleta quadrivittata	Yellow Rat Snake	—	1	—	—	—	—	0/0/1
Elaphe obsoleta spiloides	Gray Rat Snake	—	3	—	—	1	—	0/0/2
Elaphe longissima	Aesculapian Snake	—	3	—	—	—	3	—
Coluber najadum	Dahl's Whip Snake	1	—	—	—	—	—	1/0
Pituophis melanoleucus melanoleucus	Northern Pine Snake	3	—	—	—	—	—	2/1
Pituophis melanoleucus sayi	Bull Snake	—	2	—	—	—	—	0/0/2
Arizona elegans elegans	Kansas Glossy Snake	2	1	—	—	1	2	—
Hydrodynastes gigas	Boipevassu Snake	1	7	—	—	—	3	1/0/4
Coronella austriaca	Smooth Snake	1	—	—	—	—	—	1/0
Lampropeltis getulus holbrooki	Speckled King Snake	1	2	—	—	1	—	0/0/2
Lampropeltis getulus californiae	Californian King Snake	4	1	13	—	1	15	1/1
Lampropeltis triangulum sinaloae	Sinaloan Milk Snake	9	—	4	—	—	9	2/2
Lampropeltis triangulum hondurensis	Honduras King Snake	3	2	3	—	—	4	1/1/2
Lampropeltis triangulum annulata	Mexican Milk Snake	4	—	—	—	—	1	1/2
Lampropeltis triangulum campbelli	Pueblan King Snake	3	—	—	—	—	—	1/2
Lampropeltis pyromelana pyromelana	Arizona Mountain King Snake	4	—	—	—	1	3	—
Lampropeltis mexicana alterna	Grey-banded King Snake	3	—	—	—	1	2	—
Sibon nebulata nebulata	Clouded Snail-eating Snake	—	4	—	—	3	—	0/0/1
Psammophis subtaeniatus	Peter's Long-lined Snake	2	—	—	—	—	—	0/0/2
Dispholidus typus	Boomslang	1	—	—	—	1	—	—
Oxyuranus scutellatus scutellatus	Taipan	2	1	—	—	—	—	1/2
Notechis scutatus scutatus	Tiger Snake	—	2	—	—	—	—	1/1
Walterinnesia aegyptia	Innes' Cobra	3	—	—	—	—	—	1/2
Naja melanoleuca	Black & White Cobra	1	—	—	—	—	—	1/0
Naja mossambica pallida	Mozambique Spitting Cobra	2	—	—	—	—	—	1/1
Naja naja kaouthia	Indian Cobra	2	—	—	—	—	—	1/1
Dendroaspis viridis	Hallowell's Green Mamba	1	—	—	—	—	—	1/0
Dendroaspis polylepis	Black Mamba	1	—	—	—	1	—	—
Vipera berus	Adder	3	—	—	—	—	—	0/1/2
Vipera palaestinae	Palestine Viper	1	—	—	—	—	1	—
Vipera ammodytes meridionalis	Long-nosed Viper	3	—	—	—	—	—	2/1
Vipera russelli siamensis	Russell's Viper	—	2	6	1	2	—	0/1/4
Bitis arietans arietans	Puff Adder	1	—	—	—	—	—	0/1
Bitis gabonica gabonica	Gaboon Viper	2	2	—	—	—	—	1/3
Echis carinatus sochureki	Carpet Viper	7	—	13	—	1	3	1/2/13
Agkistrodon contortrix mokeson	Northern Copperhead	2	—	—	—	1	1	—
Agkistrodon hypnale hypnale	Hump-nosed Viper	—	1	—	—	1	—	—
Calloselasma rhodostoma	Malayan Pit Viper	20	1	16	—	3	4	1/2/27
Trimeresurus purpureomaculatus	Mangrove Pit Viper	—	6	—	—	1	—	0/0/5
Sistrurus catenatus tergeminus	Western Massasauga	3	—	—	—	—	1	1/1

		1	2	3	4	5	6	7
Crotalus durissus culminatus	Neotropical Rattlesnake	4	—	—	—	—	—	2/2
Crotalus vegrandis	Uracoan Rattlesnake	3	—	—	—	—	3	—
Crotalus atrox	Western Diamond-back Rattlesnake	1	2	—	—	—	1	0/0/2
Crotalus cerastes	Sidewinder	—	1	—	—	—	1	—
	Total: Reptiles	**446**	**233**	**131**	**8**	**154**	**200(5)**	**448**
AMPHIBIANS								
Caudata								
Ambystoma maculatus	American Spotted Salamander	1	3	—	—	2	—	0/0/2
Ambystoma mexicanum	Axolotl	25	7	50	50	5	—	0/0/27
Andrias japonicus	Japanese Giant Salamander	1	—	—	—	—	—	0/0/1
Cynops pyrrhogaster	Japanese Newt	2	—	—	—	—	—	0/1/1
Pleurodeles waltl	Spanish Ribbed Newt	3	—	1	—	—	—	0/0/4
Salamandra salamandra	Fire Salamander	12	2	106	—	—	100	0/0/20
Taricha granulosa	Rough-skinned Californian Newt	1	2	—	—	1	—	0/0/2
Triturus alpestris	Alpine Newt	2	—	—	—	1	—	0/0/1
Triturus cristatus	Crested Newt	7	—	—	—	—	—	3/4
Triturus marmoratus	Marbled Newt	1	—	—	—	1	—	—
Triturus wolterstorfii	Dog-faced Newt	—	25	—	—	—	—	0/0/25
Tylototriton verrucosus	Chinese Salamander	—	6	—	—	2	—	0/0/4
Anura								
Bombina orientalis	Oriental Fire-belly Toad	10	6	—	—	7	—	2/5/2
Bufo bufo	Common Toad	6	—	—	—	—	—	2/0/4
Bufo calamita	Natterjack Toad	2	—	—	—	—	—	2/0
Bufo marinus	Cane Toad	4	1	—	—	—	—	1/0/4
Bufo rubropunctatus	Red-spotted Toad	—	5	—	—	3	—	0/0/2
Bufo sp.	Running Toad	—	5	—	—	4	—	0/0/1
Bufo terrestris	Southern Toad	1	—	—	—	—	—	0/0/1
Bufo viridis	Green Toad	5	—	—	—	—	—	2/2/1
Dendrobates auratus	Poison Arrow Frog	2	—	—	—	1	—	0/0/1
Hyla arborea	European Tree Frog	3	—	—	—	3	—	—
Hyla avivoca	Bird-voiced Tree Frog	—	4	—	—	2	—	0/0/2
Hyla cinerea	American Green Tree Frog	2	6	—	—	5	—	1/0/2
Hyla rubra	Daudin's Banana Frog	5	1	—	—	—	—	1/1/4
Hyla septentrionalis	Cuban Tree Frog	1	5	—	—	5	—	0/0/1
Hyla spp.	Tropical Tree Frog	—	8	—	—	4	—	0/0/4
Hymenochirus boettgeri	Dwarf Clawed Frog	—	10	—	—	—	—	0/0/10
Kaloula pulchra	Malayan Bullfrog	1	1	—	—	1	—	0/0/1
Kaloula sp.	Malayan Bullfrog	—	2	—	—	1	—	0/0/1
Litoria caerula	White's Tree Frog	4	2	—	—	3	—	0/0/3
Mantella aurantiaca	Golden Mantella	—	5	—	—	2	—	0/0/3
Ooeidozyga lima	Javan Rice Frog	—	10	—	—	10	—	—
Pipa pipa	Surinam Toad	3	—	—	—	—	—	1/0/2
Rana catesbeiana	American Bullfrog	5	2	—	—	3	—	0/0/4
Rana erythrea	Gold-lined Frog	1	—	—	—	1	—	—
Rana pipiens	Leopard Frog	—	4	—	—	2	—	0/0/2
Rana ridibunda	Marsh Frog	5	7	—	—	5	—	0/2/5
Rana temporaria	Common Frog	9	1	—	—	2	—	3/3/2
Xenopus laevis	Clawed Frog	5	—	—	—	—	—	0/0/5
Xenopus tropicalis	Clawed Frog	9	—	—	—	—	—	0/0/9
	Total: Amphibians	**138**	**130**	**157**	**50**	**76**	**100**	**199**

WHIPSNADE WILD ANIMAL PARK

MAMMALS								
Marsupialia								
Macropus rufogriseus	Red-necked Wallaby	541	5(1)	212	—	47	193	7/14/497
Primates								
Saimiri sciureus	Squirrel Monkey (Black-capped form)	14	—	3	—	1	—	3/7/6
Callithrix jacchus	Common Marmoset	7	—	—	—	—	1	2/1/3
Pan troglodytes	Chimpanzee	9	—	—	—	—	—	4/5

		1	2	3	4	5	6	7
Rodentia								
Cynomys ludovicianus	Prairie Marmot	82	—	—	—	2	2	0/0/78
Dolichotis patagonum	Mara	14	—	9	1	6	—	3/6/7
Cetacea								
Tursiops truncatus	Bottle-nosed Dolphin	—	2	—	—	—	2	—
Carnivora								
Canis lupus	Grey Wolf	20	—	6	—	3	1	8/14
Fennecus zerda	Fennec Fox	2	—	—	—	1	—	0/1
Ursus arctos	Brown Bear	5	—	—	—	—	—	2/3
Ailurus fulgens	Red Panda	2	—	—	—	—	—	1/1
Nasua nasua	Ring-tailed Coati	8	—	—	—	1	—	1/6
Panthera leo	Lion	3	1(1)	—	—	1	1	1/1
Panthera tigris	Tiger (Siberian form)	6	—	—	—	—	2	1/3
Panthera onca	Jaguar	3	—	—	—	—	1	1/1
Acinonyx jubatus	Cheetah	15	2	—	—	2	1	5/9
Pinnipedia								
Zalophus californianus	Californian Sealion	2	5(2)	—	—	—	1	2/4
Phoca vitulina	Common Seal	1	—	—	—	—	—	1/0
Halichoerus grypus	Grey Seal	1	—	—	—	—	—	0/1
Proboscidea								
Elephas maximus	Asian Elephant	1	—	—	—	—	—	0/1
Loxodonta africana	African Elephant	2	—	—	—	1	—	0/1
Perissodactyla								
Equus grevyi*	Grevy's Zebra	6	4	4	—	4	—	3/7
*Equus hemionus**	Asiatic Wild Ass (persian form)	8	—	—	—	—	2	1/5
*Equus przewalskii**	Przewalski's Horse	8	—	3	—	—	2	3/6
Rhinoceros unicornis	Indian Rhinoceros	2	—	1	—	—	—	2/1
Ceratotherium simum	White Rhinoceros	10	3	1	—	1	4	2/7
Diceros bicornis	Black Rhinoceros	2	—	—	—	—	2(1)	—
Artiodactyla								
*Phacochoerus aethiopicus**	Wart Hog	1	—	—	—	—	—	1/0
*Tayassu tajacu**	Collared Peccary	7	1	—	—	—	5	1/2
Hippopotamus amphibius	Hippopotamus	2	—	—	—	—	—	1/1
Choeropsis liberiensis	Pygmy Hippopotamus	4	2(1)	—	—	1	—	1/4
*Lama guanicoe**	Guanaco	9	—	1	—	—	—	2/8
*Camelus bactrianus**	Bactrian Camel	12	—	5	1	—	—	5/11
Camelus dromedarius	Arabian Camel	3	—	—	—	1	—	0/2
Muntiacus reevesi	Reeves's Muntjac	15	5	1	1	4	1	7/6/2
Dama dama	Fallow Deer	46	—	12	—	1	2	15/22/18
*Axis axis**	Axis Deer	31	—	14	3	4	—	16/20/2
*Axis porcinus**	Hog Deer	33	—	13	7	6	—	15/18
*Cervus duvaucelî**	Barasingha	19	—	7	1	—	—	13/12
*Cervus nippon**	Sika Deer (Formosa form)	55	—	15	4	2	17	19/27/1
Cervus elaphus	Red Deer	37	27	11	—	5	15	1/54
*Elaphurus davidianus**	Pere David's Deer	38	—	7	2	5	1	6/29/2
Rangifer tarandus	Reindeer	13	3(1)	7	4	3	2	4/10
Hydropotes inermis	Chinese Water Deer	166	—	280	—	14	149	0/0/283
*Giraffe camelopardalis**	Giraffe	4	1	—	—	—	1	1/3
*Tragelaphus angasi**	Nyala	2	5	2	1	1	1	2/4
*Tragelaphus speke**	Sitatunga	10	—	7	3	—	—	7/7
*Tragelaphus strepsiceros**	Greater Kudu	1	—	—	—	—	—	1/0
*Boselaphus tragocamelus**	Nilgai	27	2	26	1	9	23	2/20
*Bos gaurus**	Gaur	—	3(3)	—	—	—	1	1/1
Bos grunniens	Yak	16	—	4	2	4	2	4/8
*Syncerus caffer**	African Buffalo	6	—	1	—	—	2	2/3
Bison bonasus	European Bison	11	—	2	—	2	—	3/8
*Hippotragus equinus**	Roan Antelope	6	5(5)	—	—	1	2	3/5
*Kobus ellipsiprymnus**	Common Waterbuck	9	—	6	1	2	1	5/6
*Oryx gazella**	Gemsbok	3	2	—	—	—	1	1/3
*Oryx tao**	Scimitar-horned Oryx	13	—	5	—	2	2	3/11
*Oryx leucoryx**	Arabian Oryx	2	1(1)	—	—	—	1	2/0
*Damaliscus dorcas**	Bontebok	—	5(2)	—	—	1	—	1/3
*Damaliscus dorcas**	Blesbok	1	—	—	—	—	1	—
*Antilope cervicapra**	Blackbuck	8	2(2)	—	—	4	—	6/0
*Gazella thomsoni**	Thomson's Gazelle	9	—	4	1(1)	1	—	5/6
Ovibos moschatus	Musk Ox	4	1	—	—	—	—	1/4
Ovis musimon	Mouflon	41	3	25	8	9	—	19/23/10

		1	2	3	4	5	6	7
Domestic								
	Ponies	5	—	—	—	—	—	3/2
	Pygmy Donkey	2	—	—	—	—	—	1/1
	Ankole Cattle	1	—	—	—	—	—	1/0
	Windsor White Goat	13	1(1)	6	—	—	4(1)	5/11
	Domestic Goat	1	—	—	—	—	1	—
	Total: Mammals	**1460**	**91(20)**	**700**	**41(1)**	**152**	**450(2)**	**1608**
BIRDS								
Rheiformes								
Rhea americana	Common Rhea	4	—	—	—	—	—	2/1/1
Casuariiformes								
Casuarius casuarius	Australian Cassowary	2	—	1	—	—	—	2/1
Dromaius novaehollandiae	Emu	8	—	4	2	—	1(1)	2/2/5
Tinamiformes								
Nothoprocta perdicaria	Chilean Tinamou	3	7	—	—	2	—	0/0/8
Sphenisciformes								
Aptenodytes patagonica	King Penguin	12	—	1	—	—	—	4/4/5
Eudyptes crestatus	Rockhopper Penguin	8	—	1	—	—	—	5/3/1
Spheniscus humboldti	Humboldt's Penguin	45	—	25	3	3	18	16/16/14
Ciconiiformes								
Ciconia ciconia	White Stork	8	4	—	—	1	—	3/3/5
Phoenicopterus ruber roseus	Greater Flamingo	34	—	4	—	2	—	8/16/12
Phoenicopterus ruber ruber	Rosy Flamingo	62	—	3	—	2	12	23/25/3
Anseriformes								
Cygnus atratus	Black Swan	16	—	3	1(1)	4	—	3/8/3
Cygnus melanocoryphus	Black-necked Swan	1	1	—	—	—	—	1/1
Cygnus cygnus	Whooper Swan	3	—	3	—	—	4	1/1
Coscoroba coscoroba	Coscoroba Swan	—	2	—	—	—	—	1/1
Anser anser	Greylag Goose	4	—	—	—	2	—	1/0/1
Anser indicus	Bar-headed Goose	69	—	4	—	4	32	15/19/3
Anser caerulescens caerulescens	Lesser Snow Goose	11	—	—	—	—	3	1/2/5
Anser caerulescens atlanticus	Greater Snow Goose	3	—	—	—	—	3	—
Anser canagicus	Emperor Goose	11	1(1)	1	1	—	—	4/5/3
Branta sandvicensis	Hawaiian Goose	2	—	—	—	—	—	1/1
Branta leucopsis	Barnacle Goose	46	—	3	—	1	2	8/4/34
Branta bernicla orientalis	Brent Goose	2	2(2)	—	—	—	1	1/2
Branta ruficollis	Red-breasted Goose	18	—	1	—	1	5	10/2/1
Cereopsis novaehollandiae	Cape Barren Goose	7	—	10	1	—	1	6/4/5
Alopochen aegyptiacus	Egyptian Goose	11	—	10	—	1	8	2/2/8
Tadorna cana	South African Shelduck	13	—	—	—	3	—	4/4/2
Tadorna variegata	New Zealand Shelduck	4	—	—	—	—	1	2/1
Tadorna tadorna	Shelduck	10	—	—	—	—	—	5/3/2
Plectropterus gambensis	Spur-winged Goose	2	—	—	—	—	—	1/1
Aix sponsa	Carolina Duck	11	—	6	—	—	2	9/6
Aix galericulata	Mandarin Duck	13	—	—	—	1	1	4/7
Chenonetta jubata	Maned Goose	2	—	—	—	—	—	2/0
Anas penelope	Wigeon	2	—	—	—	—	—	1/1
Anas sibilatrix	Chiloe Wigeon	13	—	—	—	1	—	4/5/3
Anas falcata	Falcated Teal	4	—	2	—	1	1	2/2
Anas strepera	Gadwall	4	—	—	—	—	—	2/2
Anas crecca	Teal	3	—	—	—	—	—	1/2
Anas specularioides	Crested Duck	6	—	—	—	—	—	2/3/1
Anas acuta	Pintail	4	—	—	—	—	—	2/2
Anas bahamensis	Bahama Pintail	3	—	—	—	1	—	1/1
Anas querquedula	Garganey	4	—	—	—	—	1	2/1
Anas clypeata	Shoveler	4	—	—	—	—	—	2/2
Netta rufina	Red-crested Pochard	10	—	—	—	—	—	6/4
Aythya ferina	Pochard	3	—	—	—	—	—	2/1
Aythya fuligula	Tufted Duck	2	—	—	—	—	1	0/1
Aythya marila	Greater Scaup	6	—	—	—	—	—	2/4
Somateria mollissima	Eider Duck	10	—	1	1	—	—	3/7
Bucephala islandica	Barrow's Goldeneye	2	—	—	—	—	—	0/2
Oxyura jamaicensis jamaicensis	North American Ruddy Duck	5	—	—	—	2	3	—
Oxyura vittata	Argentine Ruddy Duck	3	—	—	—	2	—	1/0

		1	2	3	4	5	6	7
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
Falco tinnunculus	Kestrel	—	1	—	—	—	—	1/0
Galliformes								
Meleagris gallopavo	North American Turkey	4	—	—	—	—	4	—
Crax fasciolata	Bare-faced Curassow	1	—	—	—	—	1	—
Alectoris rufa	Red-legged Partridge	4	—	—	—	—	4	—
Francolinus erckelii	Erckel's Francolin	2	—	—	—	1	—	1/0
Lophophorus impeyanus	Impeyan Pheasant	5	—	—	—	—	1	1/2/1
Gallus gallus	Red Jungle Fowl	49	7	—	—	—	9	24/19/4
Lophura swinhoii	Swinhoe's Pheasant	3	—	—	—	—	—	2/1
Crossoptilon mantchuricum	Brown Eared Pheasant	5	—	—	—	2	—	2/1
Crossoptilon auritum	Blue Eared Pheasant	2	—	—	—	—	—	1/1
Catreus wallichi	Cheer Pheasant	1	—	—	—	1	—	—
Syrmaticus mikado	Mikado Pheasant	2	—	1	—	—	—	2/1
Chrysolophus pictus	Golden Pheasant	1	—	—	—	—	—	1/0
Chrysolophus amherstiae	Lady Amherst's Pheasant	1	—	—	—	—	—	0/1
Pavo cristatus	Common Peafowl	138	6(3)	30	—	8	6	0/0/160
Numida meleagris	Helmeted Guineafowl	8	—	—	—	6	1	0/0/1
Gruiformes								
Grus monacha	Hooded Crane	2	—	—	—	—	1	0/1
Grus canadensis	Sandhill Crane	3	—	—	—	1	1	0/1
Grus japonensis	Red-crowned Crane	5	2	1	—	—	4(1)	2/2
Grus vipio	White-naped Crane	4	—	2	—	—	2	2/2
Grus rubicunda	Brolga	2	1(1)	—	—	—	—	1/2
Bugeranus carunculatus	Wattled Crane	4	—	—	—	—	—	2/2
Anthropoides virgo	Demoiselle Crane	5	—	—	—	2	—	1/2
Anthropoides paradisea	Stanley Crane	3	4	—	—	1	2	2/2
Balearica pavonina	West African Crowned Crane	—	1(1)	—	—	—	1	—
Balearica regulorum	South African Crowned Crane	10	—	—	—	1	—	4/4/1
Choriotis kori	Kori Bustard	2	—	—	—	—	—	1/1
Psittaciformes								
Pseudeos fuscata	Dusky Lory	2	—	—	—	—	—	1/1
Eolophus roseicapillus	Roseate Cockatoo	15	—	—	—	1	—	6/8
Cacatua leadbeateri	Leadbeater's Cockatoo	1	—	—	—	—	—	1/0
Cacatua galerita	Greater Sulphur-crested Cockatoo	2	—	—	—	—	—	1/1
Cacatua sanguinea	Bare-eyed Cockatoo	2	—	—	—	—	—	1/1
Alisterus scapularis	King Parrot	3	—	—	—	1	—	1/1
Platycercus eximius cecilae	Golden-mantled Rosella	2	—	—	—	—	—	1/1
Psittacus erithacus	Grey Parrot	2	—	—	—	1	—	0/1
Ara macao	Scarlet Macaw	2	—	1	—	—	—	2/1
Ara chloroptera	Green-winged Macaw	2	—	—	—	—	—	1/1
Cyanoloseus patagonum	Patagonian Conure	—	1	—	—	—	—	1/0
Myiopsitta monachus cotorra	Quaker Parrakeet	—	2	—	—	—	—	1/1
Strigiformes								
Tyto alba	Barn Owl	4	—	—	—	—	—	2/1/1
Nyctea scandiaca	Snowy Owl	3	—	—	—	1	—	1/1
Athene noctua	Little Owl	2	—	—	—	—	—	0/0/2
Strix aluco sylvatica	Tawny Owl	2	—	—	—	—	—	1/1
Coraciiformes								
Dacelo novaeguineae	Laughing Kookaburra	1	1	—	—	—	1	0/1
Piciformes								
Baillonius bailloni	Saffron Toucanet	—	2(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	—	—	—	—	4/4
Domestic	Old English Game Bantam	3	2(2)	—	—	—	3	2/0
	Birmingham Roller Pigeon	—	20	—	—	—	—	8/12
	Tumbler Pigeon	—	11	—	—	3	—	2/0/6
	Total: Birds	**857**	**86(12)**	**118**	**9(1)**	**64**	**141(2)**	**847**

		1	2	3	4	5	6	7
REPTILES								
Testudines								
Testudo graeca	Spur-thighed Tortoise	35	12	23	—	3	43	4/11/9
Testudo hermanni	Hermann's Tortoise	23	2	3	—	—	8	4/11/5
Sauria								
Eublepharis macularius	Leopard Ground Gecko	—	5(5)	—	—	1	—	0/4
Basiliscus plumifrons	Plumed Basilisk	4	7	—	—	2	—	0/0/9
Iguana iguana	Common Iguana	2	1	—	—	1	—	1/1
Agama stellio	Starred Agama	1	—	—	—	1	—	—
Eumeces schneiderii	Schneider's Skink	4	—	—	—	—	—	0/0/4
Scincus scincus	Sand Fish	6	—	—	—	—	—	0/0/6
Serpentes								
Python molurus molurus	Indian Python	1	—	—	—	—	—	0/0/1
Python regius	Royal Python	1	1	—	—	—	—	0/0/2
Epicrates subflavus	Jamaican Boa	1	—	—	—	—	—	0/1
Boa constrictor	Boa Constrictor	1	—	—	—	—	—	0/0/1
Malpolon moilensis	Moila Snake	1	—	—	—	—	—	0/0/1
	Total: Reptiles	**80**	**28(5)**	**26**	**—**	**8**	**51**	**75**
AMPHIBIANS								
Anura								
Bufo marinus	Cane Toad	2	—	—	—	—	—	0/0/2
Ceratophrys cornuta	Horned Toad	1	2	—	—	1	—	1/1
Atelopus spp.	Harlequin Frog	2	—	—	—	—	—	0/0/2
Dendrobates auratus	Black/Green Poison Arrow Frog	4	—	—	—	—	—	0/0/4
Dendrobates pumilio	Strawberry Poison Arrow Frog	2	—	—	—	—	—	0/0/2
Agalychnis callidryas	Red-eyed Tree Frog	2	—	—	—	2	—	—
Hyla septentrionalis	Cuban Tree Frog	4	—	—	—	—	—	0/0/4
	Total: Amphibians	**17**	**2**	**—**	**—**	**3**	**—**	

SUMMARY

London Zoo

	1	2	3	4	5	6	7	Number of Species (excluding domestic)
Mammals	1255	117(2)	879	144	328	537(20)	1242	128
Birds	955	117(2)	176	49	140	96(12)	963	269
Reptiles	446	233	131	8	154	200(5)	448	95
Amphibians	138	130	157	50	76	100	199	34
Total	**2794**	**597(4)**	**1343**	**251**	**698**	**933(37)**	**2852**	**526**

Estimated number of fishes and invertebrates in the Collection at 31 December 1988:

Fishes	Approx 2,300	250 species
Invertebrates (excluding some common species)	Approx 3,500	115 species

Whipsnade Wild Animal Park

Mammals	1460	91(20)	700	41(1)	153	499(2)	1608	61
Birds	857	86(12)	118	9(1)	64	141(2)	847	93
Reptiles	80	28(5)	26	—	8	51	75	12
Amphibians	17	2	—	—	3	—	16	6
Total	**2414**	**207(37)**	**844**	**50(2)**	**228**	**641(4)**	**2546**	**172**

Estimated number of fishes and invertebrates in the Collection at 31 December 1988:

Fishes	Approx 114	17 species
Invertebrates (excluding some common species)	Approx 169	13 species

Grand Total Zoological Society of London	**5208**	**804**	**2187**	**301**	**926**	**1574**	**5398**	**625***

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

ADVISORY AND CONSULTANT SERVICES

Animal Management and Conservation

Al-Areen Wildlife Park, Bahrain: Advice on and assistance with animal management. Secondment of specialised staff.

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.

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): Collaborative project on reintroduction of Père David's Deer to the wild.

HM Customs: Housing and advice on identification of reptiles.

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

New Zealand Department of Conservation: Technical advice on Kakapo breeding programme; semen cryopreservation protocols.

Government of Oman: Assistance with the development of future plans relating to the reintroduction 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.

Puerto Rican Plain Pigeon Research Programme, University of Puerto Rico: Technical advice on artificial breeding programmes.

San Francisco Zoo: Technical advice on artificial breeding programmes in birds of prey.

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: Collaborative project on reintroduction and monitoring of Scimitar-horned Oryx.

Comparative Medicine and Physiology

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

American Institute of Cancer Research (with Clinical Trial Service Unit, Oxford): Collaborative project on nutrition and dietary fats of food samples from China.

Cell Systems Ltd, Cambridge: Collaborative research on cryomicroscopy of spermatozoa.

Charing Cross and Westminster Hospital Medical School, London: Collaborative research on antifertility effects of GnRH antagonists.

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

Compass Services, London: Computer analysis of nutrients in food.

Dalgety Plc, Cambridge: Collaborative research on chemical communication in mammals.

Dvur Kralove Zoo, Czechoslovakia: Advice on reproductive assessment and breeding strategies in the Rhinoceros.

Flinders Medical Centre, Australia: Collaborative studies on trophoblast antigens in primate embryos.

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

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, Berlin: Collaborative research on morphological and ultrastructural aspects of granulosa cell differentiation.

Institute of Biochemistry, Veterinary University, Vienna: Collaborative studies on reproductive assessment through faecal steroid analysis.

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 subordinate Marmoset Monkeys and Naked Mole Rats.

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

Mammal Research Institute, University of Pretoria, RSA: Advice on and provision of reagents for urinary steroid assays.

MRC Reproductive Biology Unit, Edinburgh: Collaborative research on the neuroendocrine control of reproduction in the Marmoset Monkey.

Middlesex Hospital, London: Collaborative research on analysis of sperm function and molecular biology of sperm.

Ministry of Agriculture, Fisheries and Food: Laboratory examinations for diagnosis of botulism.

Ministry of Defence: Advice on dietary recommendations and ration scale for HM ships and shore-bases, and for Commandos in training.

Moredun Institute, Edinburgh: Collaborative studies on incidence of malignant catarrhal fever.

National Institute for Medical Research, London: Collaborative development of miniature electronic infusion device and collaborative studies on genetic fingerprinting in Naked Mole Rats.

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

Overseas Development Administration: Botulism consultancy.

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*, advice on dietary fats and nutrition in pregnancy.

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

Royal Holloway and Bedford New College, London (Department of Psychology): Joint development if implantable electronic delivery systems.

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

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

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

St Thomas's Hospital, London (Department of Chemical Pathology): Computer analysis of nutrients in food.

Specialist Diets Services, Witham: Collaborative studies on zoo animal diets.

University of Cambridge (Engineering Laboratory): Collaboration on the development of computer systems for the analysis of sperm motility; (Department of Genetics): Collaborative studies on genetic variation in Scimitar-horned Oryx.

University of Cape Town, RSA: Collaborative studies on the natural suppression of reproduction in Naked Mole Rats.

University College, London: Collaborative research on the hormonal basis of maternal behaviour in primates.

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 Leicester School of Medicine: Collaborative studies on endometrial proteins in primates.

University of Nottingham (Department of Genetics): Collaborative research on genetic variation in some exotic bird species.

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

University of Reading (Department of Psychology): Collaborative research on hormonal indicators of stress in endangered South American primates.

University of Sydney, Australia (Department of Veterinary Physiology): Collaborative study on the role of the saturation index in early pregnancy in the Marmoset Monkey.

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: Assessment of reproductive status in Elephants.

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

National Federation of Zoological Gardens of Great Britain and Ireland: Investigations into mortality in the Rothschild's Mynah as part of national breeding programme.

National Zoo, Washington DC, Mr I Keymer, Norfolk, and University of Zimbabwe: Collaboration on Black Rhinoceros histopathology.

RSPCA Seal Assessment Centre, Docking: Clinical haematology; secondment of specialist staff.

Consultant Veterinary Advice, Treatment of referred cases, 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 rôle 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)

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 British Wild Animal Keepers: Mr V J A Manton (Vice President)

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

Australian Research Grants Board: Professor J P Hearn (Assessor)

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); Mr V J A Manton (Veterinary Adviser)

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

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

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

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

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

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

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

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

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

European Association for Aquatic Mammals: Mr V J A Manton (Member, Executive Council; Editor *Aquatic Mammals*)

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

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)

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

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

Hawk Trust: Dr J K Kirkwood (Scientific Sub-Committee)

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

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

Horniman Museum Advisory Committee: Mr M K Boorer (Member)

International Air Transport Association: Mr V J A Manton (Member, Live Animals Board)

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

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

International Primatological Society: Professor J P Hearn (President)

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

International Union for the Conservation of Nature and Natural Resources (Species Survival Commission): Dr C Andrews (Chairman, Freshwater Fish Specialist Group); Professor J P Hearn (Member, Genome Preservation and Primate Specialist Groups); Mr D M Jones (Member, Asiatic Elephant and Captive Breeding Specialist Groups); Dr A S I Loudon (Member, Deer Specialist Group); Mr V J A Manton (Member, Cat and European Bison Specialist Groups); 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); Mr D M Jones (Deer Liaison Group)

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

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 (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; Dr P M Summers (Council of Management)
Journal of Virological Methods: Dr A Voller (Editorial Board)
Kenya Rhino Project: Dr R A Brett (National Management Committee)
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); Mr V J A Manton (Vice President – Society)
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, Simian Virus Committee)
Medicina: Dr A Voller (Editorial Board)
Metropolitan Police Firearms Unit: Dr J K Kirkwood; Mr R A Kock; Miss F M D Gulland (Veterinary Advisers)
National Federation of Zoological Gardens of Great Britain and Ireland: Mr M K Boorer (Member, Education Working Group); Mr D M Jones (Treasurer); Mr V J A Manton; Mr P J S Olney (Members, Conservation and Animal Management Committee)
National Hospital for Nervous Diseases, London: Professor G H du Boulay (Honorary Consultant; Trustee, Queen Square Development Foundation)
National Museums of Kenya: Professor J P Hearn (Member, International Scientific Advisory Board, Institute of Primate Research)
National Trust: Mr V J A Manton (Chairman, Whipsnade Advisory Committee)
Neuroradiology: Professor G H du Boulay (Editor-in-Chief)
Primate Society of Great Britain: Professor J P Hearn (Council; Member, Primate Breeding and Welfare Committee); 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 (Council of Management)
Roehampton Institute of Higher Education: Dr P M Summers (Visiting Lecturer in Biology)
Royal Society of Medicine: Dr G R Smith (Council Member, Section of Comparative Medicine)
Royal Society for the Prevention of Cruelty to Animals: Mr V J A Manton; Mr P J S Olney (Members, Wild Animals Advisory Committee)
Society for the Study of Fertility: Professor A P F Flint (Business Secretary)
XIV Symposiumm Neuroradiologicum 1990: Professor G H du Boulay (President)
Tropenmedizin und Parasitologie: Dr A Voller (Editorial Board)
University of Bristol: Dr J K Kirkwood (Visiting Lecturer, Department of Animal Husbandry)
University of Florida Interdisciplinary Center for Biotechnology: Professor A P F Flint (Visiting Professor – inaugural visitor)
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); Professor J P Hearn (Visiting Professor in Biology, University College; Member, Board of Studies in Biology); Dr J K Hodges; Dr A S I Loudon; Dr H D M Moore; Dr G E Webley (Course Lecturers, Department of Biology, University College); Dr W V Holt; Dr G E Webley (Honorary Lecturers, King's College [KQC]); Mr D M Jones (Member, Board of Studies in Biology); Dr J K Kirkwood; Mr R A Kock (Visiting Lecturers, Department of Medicine, Royal Veterinary College); 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 (Special Professor of Molecular Biology)
Vaccine: Dr A Voller (Editorial Board)
Veterinary Deer Society: Mr R A Kock (Treasurer)
Wildfowl Trust: Dr J K Kirkwood (Scientific Advisory Committee)
Wildlife Link: Mr M K Boorer (Member); Mr D M Jones (Member; Zoological Society representative)

World Health Organization: Professor J P Hearn (Member, Committee on Research Development; Adviser in Reproductive Physiology and in Primate Biology, Special Program of Research in Human Reproduction); Dr A Voller (Member, Expert Advisory Panel on Parasitology; Member, WHO/IUIS Sub-committee on Standardization of Reagents for Enzyme Immunoassays)

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

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

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

AMENDMENTS TO THE CHARTER AND BYELAWS

The following amendments to the Charter and Byelaws were agreed in a postal ballot of Fellows and approved by the Privy Council on 26 July 1988.

1. Article 3 – delete the existing Article 3 of the Charter and substitute therefor the following new Article 3 in its place:

3 (a) The objects of the Society shall be the advancement of zoology and animal physiology and the introduction of new and curious subjects of the animal kingdom.

(b) In furtherance of the foregoing objects but not further or otherwise the Society shall have power:

(i) subject to such consents as may be required by law from time to time to sell, let, licence occupation or use of, mortgage, dispose of and in any way turn to account or otherwise deal in all or any part of the property or assets of the Society for or without any consideration and subject to such terms and conditions as may be thought fit and to maintain, construct, alter, pull down and convert such buildings as may be necessary or convenient to the work of the Society.

(ii) to confer, consult, associate or co-operate with any other educational institution, society or association or body whether resident in the UK or not for the sole purpose of furthering the foregoing objects by the pursuit of common objects in zoology and animal physiology and related subjects and to enter into any arrangement or agreement or join in any venture in connection with any such body for such purpose.

(iii) to advertise in such manner as may be thought expedient with a view to promoting the objects of the Society.

2. Article 6 – add the following words to Article 6 of the Charter:

Notwithstanding the foregoing the Council may delegate to any company the share capital of which shall be wholly-owned by the Society all or any of its functions relating to the management and administration of any of the Society's property and assets. Any such delegation may be made subject to any conditions the Council may impose and either collaterally with or to the exclusion of the Council's own powers in this behalf and may be revoked or altered by the Council. Upon making such delegation the members of the Council shall be entirely exonerated from any liability for any loss to the assets of the Society arising as a result of such delegation and shall be entitled to leave the exercise of the powers which they have so delegated to such company.

3. Byelaw 58 – delete the existing Byelaw 58 and substitute therefor the following new Byelaw:

58 (i) Funds of the Society may be invested in the purchase of or subscription for or at interest upon the security of such stocks, funds, shares, securities or other investments or property of whatsoever nature and wheresoever situate (whether producing income or not) including the purchase of freehold or leasehold land or other immovable property or chattels as the Society thinks fit to the intent that the Society shall have full and unrestricted powers of investing, transposing and realising its assets.

(ii) The Society shall have power at any time or from time to time to incorporate in the United Kingdom a company or companies whether or not the same shall have charitable status, the shares of which will be wholly-owned by the Society, the objects of such company or companies being to carry out any purpose or business related to the purposes of the Society or any of them and the Society shall have power to employ the whole or any part or parts of its funds in capitalising or financing (by loans, guarantees or otherwise) such company or companies and the Society, its Fellows and the members of Council shall be under no liability for any loss which may result from any exercise of this power.

FINANCIAL STATEMENTS

Consolidated Income and Expenditure Account for the year ended 31st March 1989

	Notes	£'000s	Year ended 31 March 1989 £'000s	Year ended 31 March 1988 £'000s
Income from activities	2		8,725.1	6,149.3
Cost of activities	2		9,442.0	7,912.5
Net deficit on activities			(716.9)	(1,763.2)
Administrative expenses			(147.3)	(110.5)
			(864.2)	(1,873.7)
Other operating income	3		21.8	12.2
Operating deficit for the year			(842.4)	(1,861.5)
Income from investments	4	69.7		63.5
Interest receivable	5	837.1		233.9
			906.8	297.4
Surplus/(deficit) for the year	6		64.4	(1,564.1)
Grant – Department of Environment	8		—	2,095.9
			64.4	531.8
Exceptional item				
Profit on sale of assets			32.9	61.5
Excess of income over expenditure			97.3	593.3
Appropriation				
Transfer to Building and Equipment Fund			(271.4)	(394.6)
			(174.1)	198.7
Balance brought forward			540.9	342.2
Balance carried forward			366.8	540.9

The notes on pages 68 to 75 form part of these accounts

Consolidated Balance Sheet at 31st March 1989

	Notes	£'000s	1989 £'000s	1988 £'000s
Fixed assets				
Tangible assets	9		2,249.7	1,752.7
Investments	10		906.9	516.7
			3,156.6	2,269.4
Current assets				
Stocks	11	184.8		149.5
Debtors	12	1,645.1		1,386.3
Cash at bank and in hand		13,109.0		2,438.5
		14,938.9		3,974.3
Creditors: amounts falling due within one year	13	(2,103.8)		(1,287.9)
Net current assets			12,835.1	2,686.4
Total assets less current liabilities			15,991.7	4,955.8
Creditors: amounts falling due after more than one year	14		(23.5)	(29.1)
			15,968.2	4,926.7
Funds and reserves				
Deferred government grant			11,945.2	1,195.2
Funds	15		1,071.3	824.2
Building and Equipment Fund	16		2,584.9	2,366.4
Income and Expenditure Account			366.8	540.9
			15,968.2	4,926.7

Approved by Council 12th July 1989
PEYTON
Treasurer
SIR WILLIAM HENDERSON
President

Consolidated Statement of source and application of funds for the year ended 31st March 1989

	£'000s	Year ended 31 March 1989 £'000s	Year ended 31 March 1988 £'000s
Source of Funds			
Grant from Department of the Environment		—	2,095.9
Surplus/(deficit) for the year		64.4	(1,564.1)
		64.4	531.8
Items not involving the movement of Funds			
Composition Fund-transfer	—		(2.2)
Depreciation	269.0		189.4
Transfer from Building and Equipment Fund	(99.1)		(88.5)
		169.9	98.7
Total generated by operations		234.3	630.5
Funds from other sources			
Sale proceeds of assets	34.2		62.2
Net decrease in investments	—		32.1
Surplus on sale of Scientific Fund investments (note 15)	253.5		177.7
Funds income	—		6.2
Grants for purchase of fixed assets			
Department of the Environment	750.0		160.9
Other	46.2		357.6
Capital Grant from Department of Environment	10,000.0		—
		11,083.9	796.7
		11,318.2	1,427.2
Application of Funds			
Net increase in investments	390.2		—
Purchase of tangible fixed assets	767.4		427.9
Funds expenditure	6.4	1,164.0	427.9
		10,154.2	999.3
Movement in working capital			
Increase in stocks	35.3		12.5
Increase in debtors	258.8		33.1
(Increase) in creditors	(810.3)		(128.3)
		(516.2)	(82.7)
Movement in net liquid funds			
Increase/(decrease) in bank balances and deposit		10,670.4	1,082.0
		10,154.2	999.3

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

We have audited the financial statements on pages 65 to 75 in accordance with approved auditing standards.

In our opinion the financial statements, which have been prepared under the historical cost convention, give a true and fair view of the state of affairs at 31st March 1989 and of the excess of income over expenditure and source and application of funds for the year ended on that date.

ARTHUR YOUNG *Chartered Accountants*
12th July 1989

Notes to the Financial Statements

1. ACCOUNTING POLICIES

(a) *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.

(b) *Basis of Financial Statements*
The Society has received from the Department of the Environment an endowment of £10 million. It also receives on going revenue grants to support the Institute of Zoology. The financial statements have accordingly been prepared on a going concern basis and under the historic cost convention.

(c) *Consolidation*
The financial statements consolidate the results and the assets and liabilities of Zoo Operations Limited, a wholly owned subsidiary which commenced to trade on 3rd October 1988, taking over the activities of the Zoological Gardens at London Zoo and Whipsnade Wild Animal Park and of the Education Department; activities formally carried out by the Society itself.
The results and the assets and liabilities of Zoo Restaurants Limited and Zoo Enterprises Limited, also wholly owned subsidiaries are not consolidated. Concession fees, covenanted profits and losses of these companies are included in catering and retail services income. Note 2(f).

(d) *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.

(e) *Building and Equipment Fund*
The fund comprises grants received and appropriations from income and expenditure account, which are released back to revenue over the expected useful life of the relevant asset by equal annual amounts.

(f) *Grants*
Government grants received of a revenue nature are credited to the income and expenditure account for the year in which they are received. Grants for capital expenditure are credited to a deferred government grant account and are released to revenue over the expected useful life of the relevant asset by equal annual amounts.

(g) *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.

(h) *Special Funds*
Special 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 18.

(i) *Pension Scheme Arrangements*
The pension scheme of the Society is maintained as a separate trust fund. Payments made to the fund and charged in these financial statements are based on actuarial advice. The fund is actuarially valued every three years.

(j) *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	1989 Surplus/ (Deficit) £'000s	1988 Surplus/ (Deficit) £'000s
Specific activities					
Zoological Gardens					
London Zoo	2(a)	4,715.1	5,070.5	(355.4)	(262.1)
Whipsnade Park	2(a)	1,438.1	1,916.4	(478.3)	(517.2)
Education	2(b)	124.9	180.6	(55.7)	(66.5)
Library	2(c)	0.8	89.8	(89.0)	(90.2)
Publications	2(d)	295.0	275.7	19.3	(8.9)
Institute of Zoology	2(e)	2,068.4	1,876.5	191.9	(909.7)
		8,642.3	9,409.5	(767.2)	(1,854.6)
General activities					
Members subscriptions and fees		110.3	32.5	77.8	98.8
Transfer: Composition fees	15	—	—	—	2.2
Donations		23.8	—	23.8	37.0
Less: Transfer to income from investments	2(e)	(51.3)	—	(51.3)	(46.6)
		8,725.1	9,442.0		
Net deficit on activities				(716.9)	(1,763.2)

2 (a) Zoological Gardens

	Notes	London Zoo 1989 £'000s	London Zoo 1988 £'000s	Whipsnade Park 1989 £'000s	Whipsnade Park 1988 £'000s
Income					
Admission of visitors		3,782.1	3,254.1	1,005.5	789.5
Admission of cars		—	—	114.9	100.9
Catering and retail services	2(f)	705.7	494.4	178.7	101.8
Miscellaneous income		122.1	73.2	99.4	74.4
Friends of the Zoos		105.2	87.5	39.6	30.2
		4,715.1	3,909.2	1,438.1	1,096.8
Expenditure					
Staff costs		2,316.7	2,004.3	939.5	832.1
Administration costs		503.1	381.5	209.9	196.9
Provisions		293.5	268.2	161.4	157.8
Less: Income from animal adoption scheme		(145.9)	(107.5)	(16.7)	(14.3)
Backlog maintenance		288.8	319.8	95.1	72.6
Minor works		47.2	79.1	23.2	13.3
Works materials		207.8	103.0	65.6	54.5
Equipment and supplies		159.2	101.5	83.2	42.0
Miscellaneous direct expenses		133.6	54.6	31.6	39.9
Rates and insurances		96.3	79.4	10.9	11.8
Fuel, light, water and transport		490.4	446.3	96.6	95.8
Advertising and promotion		365.6	282.3	169.7	74.6
Graphics and information		60.9	95.2	9.0	21.1
Professional consultancy		156.1	—	5.0	—
Friends of the Zoos		11.2	10.5	2.1	2.8
Depreciation		156.4	115.0	56.6	37.4
Transfer from Building and Equipment Fund		(70.4)	(61.9)	(26.3)	(24.3)
		5,070.5	4,171.3	1,916.4	1,614.0
Deficit		(355.4)	(262.1)	(478.3)	(517.2)

(b) Education

Income				
Education visits	99.5	90.1	25.4	20.4
Expenditure				
Staff costs	128.6	117.9	18.7	15.4
Administration costs	25.4	24.6	2.7	3.2
Printing	—	—	—	0.6
Equipment and supplies	1.5	1.3	0.8	1.6
Sundry	2.9	8.9	—	3.5
	158.4	152.7	22.2	24.3
Surplus/(deficit)	(58.9)	(62.6)	3.2	(3.9)

(c) Library	1989 £'000s	1988 £'000s
Income	0.8	1.0
Expenditure		
Staff costs	60.1	56.2
Administration costs	10.7	11.5
Equipment and supplies	19.0	23.5
	89.8	91.2
Deficit	(89.0)	(90.2)

(d) Publications

	Journal of Zoology Symposia	International Zoo Year Book	Zoological Record and Nomenclator	1989 Total	1988 Total
	£'000s	£'000s	£'000s	£'000s	£'000s
Income					
Sales	222.9	68.6	3.5	295.0	268.8
Expenditure					
Staff costs	67.8	40.4	17.8	126.0	119.8
Administration costs	13.2	10.6	4.0	27.8	24.5
Paper and printing	102.3	18.0	—	120.3	122.2
Sundry	0.6	0.1	—	0.7	10.7
Depreciation	—	0.9	—	0.9	0.5
	183.9	70.0	21.8	275.7	277.7
Surplus/(deficit)	39.0	(1.4)	(18.3)	19.3	(8.9)

(e) Institute of Zoology

	Veterinary Science £'000s	Wellcome Laboratories £'000s	Nuffield Laboratories £'000s	1989 Total £'000s	1988 Total £'000s
Income					
Fees	8.9	—	—	8.9	5.2
Scientific Fund – investment income	—	51.3	—	51.3	46.6
Grants					
Department of Environment	460.3	194.3	645.4	1,300.0	—
Specific project	—	411.6	296.6	708.2	600.2
	469.2	657.2	942.0	2,068.4	652.0
Expenditure					
Staff costs	279.6	430.6	570.7	1,280.9	1,099.4
Administration costs	49.1	75.9	101.1	226.1	133.6
Equipment and supplies	52.7	145.7	127.4	325.8	273.1
Miscellaneous direct expenses	3.2	6.3	8.1	17.6	25.2
Sundry	—	—	1.8	1.8	19.7
Depreciation	—	13.3	13.3	26.6	13.0
Transfer from Building and Equipment Fund	—	(1.1)	(1.2)	(2.3)	(2.3)
	384.6	670.7	821.2	1,876.5	1,561.7
Surplus/(deficit)	84.6	(13.5)	120.8	191.9	(909.7)

(f) Catering and Retail Services

Included under this heading are concession fees and covenanted profits from Zoo Restaurants Ltd and its subsidiary company Zoo Enterprises Ltd as follows:

	1989			1988		
	London Zoo	Whipsnade Park	Total	London Zoo	Whipsnade Park	Total
	£'000s	£'000s	£'000s	£'000s	£'000s	£'000s
Zoo Restaurants Ltd	283.3	33.0	316.3	167.5	—	167.5
Zoo Enterprises Ltd	422.4	145.7	568.1	293.1	101.8	394.9
	705.7	178.7	884.4	460.6	101.8	562.4
Add: release of provision on Zoo Restaurants Ltd	—	—	—	33.8	—	33.8
	705.7	178.7	884.4	494.4	101.8	596.2

Sales for the period amounted to		
Zoo Restaurants Ltd		
– Concession operations	2,681.4	1,832.3
Zoo Enterprises Ltd	1,846.2	1,534.0

3. OTHER OPERATING INCOME

	1989	1988
	£'000s	£'000s
Income from consultancies	21.8	12.2

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.

4. INCOME FROM INVESTMENTS

Listed investments	69.7	63.5

5. INTEREST RECEIVABLE

Bank deposits	820.2	211.6
Zoo Restaurants Ltd and Zoo Enterprises Ltd	16.9	22.3
	837.1	233.9

6. OPERATING DEFICIT

After charging		
Auditors' remuneration	24.0	14.9
Depreciation	269.0	189.4
Consultancy fees	161.1	95.9

	1989 £'000s	1988 £'000s
7. STAFF COSTS		
Wages and salaries	4,241.4	3,907.7
Employers National Insurance contributions	404.6	369.9
Other pension costs	366.8	342.7
	5,012.8	4,620.3
The average weekly number of employees during this period was made up as follows:		
Zoological Gardens – London Zoo	197	189
Whipsnade Park	102	99
Education	10	10
Library	4	4
Publications	10	10
Institute of Zoology	78	72
Administration	27	29
	428	413
8. DEPARTMENT OF THE ENVIRONMENT		
Revenue grants were received as follows:		
General	—	2,095.9
For Institute of Zoology (shown under income)	1,300.0	—
Capital grants were received as follows:		
Matching £ for £ sums raised by the Society	750.0	160.9
Endowment	10,000.0	—

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 1988	612.4	913.2	568.3	205.0	54.3	2,353.2
Additions during the year	139.0	406.4	132.7	85.6	3.7	767.4
Disposals	—	—	—	(1.4)	—	(1.4)
At 31st March 1989	751.4	1,319.6	701.0	289.2	58.0	3,119.2
Depreciation						
At 31st March 1988	118.3	168.7	168.8	137.2	7.5	600.5
Charge for the year	35.7	80.9	107.0	42.8	3.9	270.3
Disposals	—	—	—	(1.3)	—	(1.3)
At 31st March 1989	154.0	249.6	275.8	178.7	11.4	869.5
Net book value						
At 31st March 1989	597.4	1,070.0	425.2	110.5	46.6	2,249.7
At 31st March 1988	494.1	744.5	399.5	67.8	46.8	1,752.7

	1989 £'000s	1988 £'000s
10. INVESTMENTS		
Investments at cost		
Quoted investments	906.9	516.7
Market valuation at 31st March	1,318.7	955.8
These investments are attributed to:		
Scientific Fund	1,299.3	942.1
Fantham Bequest	19.4	13.7
	1,318.7	955.8
11. STOCKS		
Raw materials and consumables	168.0	148.5
Finished goods and goods for resale	16.8	1.0
	184.8	149.5
12. DEBTORS		
Trade	103.4	—
Amounts due from Zoo Restaurants Ltd and Zoo Enterprises Ltd	622.2	353.0
Other debtors	714.0	663.2
Prepayments and accrued income	205.5	370.1
	1,645.1	1,386.3
13. CREDITORS: amounts falling due within one year		
Trade	560.1	—
VAT, PAYE and National Insurance contributions	140.1	147.8
Other creditors	264.5	599.5
Accruals and deferred income	995.3	540.5
Amounts due to Zoo Restaurants Ltd and Zoo Enterprises Ltd	143.8	—
	2,103.8	1,287.9
14. CREDITORS: amounts due after more than one year		
Finance lease obligations	23.5	29.1

15. FUNDS

	Heer Bequest £'000s	Fantham Bequest £'000s	Scientific Fund £'000s	Composition Fund £'000s	Staff Benevolent Fund £'000s	Lord Zuckerman Prize Fund £'000s	Total £'000s
Balance at 31st March 1988	0.1	9.1	780.7	30.8	3.5	—	824.2
Investment income	—	0.2	38.5	—	0.2	—	38.9
Additional capital	—	—	0.2	2.2	—	3.6	6.0
Surplus on sale of investments	—	—	253.5	—	—	—	253.5
Transfer to Income and Expenditure Account	—	—	—	—	—	—	—
Transfer to Institute of Zoology	—	—	(51.3)	—	—	—	(51.3)
Balance at 31st March 1989	0.1	9.3	1,021.6	33.0	3.7	3.6	1,071.3

16. BUILDING AND EQUIPMENT FUND

	£'000s
Balance at 31st March 1988	2,366.4
Grants received during the year for the purchase of fixed assets	46.2
Transfer from Income and Expenditure Account	271.4
	2,684.0
Less: Transfer to Income and Expenditure Account	99.1
Balance at 31st March 1989	2,584.9

17. PENSION FUND

At the last triennial valuation at 30th June 1987, the Pension Fund showed a small surplus of assets over liabilities and was solvent in terms of benefits to be provided on winding up. The Society made a contribution of £240,996 to the Pension Fund during the year.

18. SPECIAL FUNDS

(a) De Arroyave Fund

The capital of the fund is held by the Official Custodian for Charities. The net income was £18,271.

(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 £89.

19. CAPITAL COMMITMENTS

	1989 £'000s	1988 £'000s
Expenditure contracted	542.9	32.0
Authorised but not yet contracted	30.0	39.5

20. FINANCE LEASE OBLIGATIONS

Net amount payable		
Next year	7.8	7.8
In the second to fifth years	23.5	29.1
Thereafter	1.0	—
	32.3	36.9

21. 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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THE ZOOLOGICAL SOCIETY OF LONDON

ANNUAL REPORT 1988 - 1989