in transit necessitated the destruction of a second turtle from the same group of animals. These turtles are listed as endangered species but were apparently destined for a restaurant.

**Amphibia** (Table X)

Only nine Amphibia were examined post-mortem during the year, eight of them from the Collection. More representatives of the Class will have died, but post-mortem autolysis is so rapid in a hot and humid exhibit that the remains found are seldom suitable for examination.

As usual Aeromoniasis appeared to be the most important cause of death, a Mud puppy, a Yellow-bellied toad, a Carolina tree frog and an African bullfrog succumbing to the disease. An *Aeromonas* sp., probably *A. hydrophila*, was also isolated from two other toads but was not considered to have been significant.

*Rhabdias* spp. nematodes were found in the lungs of an American toad and of an Oriental fire-bellied toad. Large numbers of a *Strongyloides* sp. nematode were also found in the large intestine of the American toad but the cause of death in this animal was a systemic mycosis. The fungus involved was not identified.

**WHIPSNADE PARK**

*D. G. Ashton*

The standard of diagnosis in the Collection has been improved by the examination of twice as many samples as in the previous three years.

Virological examinations have been carried out on faecal samples from cases with diarrhoea by the Central Veterinary Laboratory at Weybridge, the London School of Hygiene and Tropical Medicine, and the Regional Virus Laboratory, East Birmingham Hospital. Entero-viruses have been seen in European bison, Yak, Cape buffalo, and Sika deer, rotaviruses in Scimitar horned oryx, and suspected corona and arenaviruses in Oryx and Yak respectively. The significance of these viruses is unknown. Routine bacteriology is now carried out on a much greater number of post-mortem cases by the pathology unit at Regent's Park and, in selected instances, samples for virological examinations from carcasses are also collected. The possibility that the chronic diarrhoea seen in some of the ruminant species may be caused by mycobacteria is being investigated with the help of the Institute for Research on Animal Disease, Compton. The routine parasitological examination of gastro-intestinal tracts at Regent's Park continues and has revealed species not reported in the last 10 years from the collection, including the abomasal nematodes *Haemonchus contortus*, *Skrjabinagia kolchida* and *S. lyrata*. *H. contortus* may be partly responsible for diarrhoea, poor growth rate and loss of condition in some of the European bison.

Plasma creatine kinase levels in some cases of injury have been surprisingly high (34,400 iu/litre in an American bison, compared to a normal level of about 100). This enzyme is released from damaged muscle cells. Reports of selenium deficiency are becoming more frequent in domestic ruminants in this country and in order to monitor the selenium status of animals at Whipsnade, estimations of Glutathione peroxidase have been carried out at the Central Veterinary Laboratory, Weybridge. Most results indicate an adequate to high level by the standards of domestic ruminants.
| *Major groups of diseases, etc. encountered at post-mortem examination | Acclimatized (4) Number | Acclimatized (4) % | Unacclimatized (4) Number | Unacclimatized (4) % | New-born (0) Number | New-born (0) % | Total (8) | % of total deaths | Research Institute (0) Number | Research Institute (0) % | External sources (1) Number | External sources (1) % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bacterial infections | 2 | 50.0 | 3 | 75.0 | — | — | 5 | 62.5 | — | — | 1 | 100.0 |
| Viral/Rickettsial infections | — | — | — | — | — | — | — | — | — | — | — | — |
| Fungal infections | 1 | 25.0 | 1 | 25.0 | — | — | 1 | 12.5 | — | — | — | — |
| Parasitic infections | 2 | 50.0 | 1 | 25.0 | — | — | 3 | 37.5 | — | — | — | — |
| (a) Arthropods | — | — | — | — | — | — | — | — | — | — | — | — |
| (b) Helminths | 2 | 50.0 | 1 | 25.0 | — | — | 3 | 37.5 | — | — | — | — |
| (c) Protozoa | — | — | — | — | — | — | — | — | — | — | — | — |
| Nutritional/Metabolic | — | — | — | — | — | — | — | — | — | — | — | — |
| Debility (including senility) | — | — | — | — | — | — | — | — | — | — | — | — |
| Injuries and accidents | — | — | — | — | — | — | — | — | — | — | — | — |
| Neoplasia | — | — | — | — | — | — | — | — | — | — | — | — |
| Euthanasia | 1 | 25.0 | 1 | 25.0 | — | — | 1 | 12.5 | — | — | — | — |
| No diagnosis | 3 | 75.0 | 1 | 25.0 | — | — | 4 | 50.0 | — | — | 1 | 100.0 |
| Others | 1 | 25.0 | 1 | 25.0 | — | — | 2 | 25.0 | — | — | — | — |

*Not necessarily the cause of death in all cases.
The results of estimations of copper levels in blood and liver samples taken over the past eight years show that both potentially toxic, and marginal or deficient levels can occur in different ruminant species on the same pasture, receiving the same diets (Ashton, Jones & Lewis, 1979). The highest liver levels were seen in neonatal deer, with concentrations of up to 5000 ppm in the liver of Moose, Hog, Axis, Sika, Fallow and Swamp deer. The adult copper levels of these species were invariably lower, and in the few instances where both foetal and maternal levels were obtained, the ratio of foetal to maternal concentration was between 10 and 30. The lowest liver levels (less than 15 ppm) were seen in the large bovids and Red deer, with some values considered to be marginal or deficient by domestic ruminant standards. The monogastric ungulates (Equidae, Rhinocerotidae, and Suidea) showed much less variation and clinically normal animals usually had liver copper levels in the range of 20–50 ppm.

Blood copper levels showed less variation, but gave some indication of copper status by generally reflecting the liver copper concentration. Further work will now be carried out to ascertain whether or not the very high levels found in some neonates are toxic. The diets of Blesbok, European bison, Yak and Wildebeeste have been supplemented with copper sulphate.

In collaboration with the Pathology Department of the Nuffield Laboratories the effects of immobilising drugs on haematocrit and other haematological values are being studied.

In order to learn more of the genetic background and degree of heterozygosity in the herd of Przewalski horses, blood samples have been taken from all of the animals. This study has been extended to other species and the results are discussed below (p. 553).

The reliable recognition of individual animals is essential for good management. Ear tags are frequently unsatisfactory, especially in a long haired species such as European bison, and a successful method now employed in the group is to brand small (2 cm) Roman numerals onto the horn on the rostral part of its inner curvature. These brands are made with a hot iron when the animal is immobilised for other procedures, and are easily visible with binoculars at a distance of 50 metres.

**CLINICAL WORK**

Four anthelmintics, fenbendazole, mebendazole, thiophenate and pyrantel embonate have been used extensively. Fenbendazole is a relatively new benzimidazole derivative with activity against larval and immature worms and is being tested, with the help of the manufacturers, in ruminants and carnivores. Better results are obtained with doses given over a five day period, than with a single dose at the standard rate. Mebendazole has been used for some time in the routine treatment of the Equidae, but its palatability has made it useful for the treatment of other species. It is very effective at a dose of 10 mg/kg for 10 days for the elimination of *Trichuris* sp. from Moose. This is the first in-feed drug used at Whipsnade that has been efficient against this parasite, and on two occasions has resulted in the elimination of *Trichuris* eggs from the Moose faeces for periods of up to three months. Thiophenate medicated pellets fed to several ruminant species was effective in a single dose, but some animals found the preparation unpalatable. Pyrantel embonate was introduced as an anthelmintic for the Equidae because, despite routine treatment with mebendazole, the faecal egg counts, particularly of the Przewalski horses, Common zebra
and Cream ponies were beginning to rise. The use of a chemically unrelated drug appears to have solved this problem.

The use of potent, palatable anthelmintic drugs has markedly reduced the losses in some groups. In the winter of 1976–7, eight Moufflon died with suspected parasitic gastroenteritis. Since the use of fenbendazole, no deaths from this cause have occurred. In other groups such as the Scimitar horned oryx, frequent anthelmintic treatment failed to eliminate clinical signs of parasitism. The younger subordinate animals were particularly badly affected and in two which died, abomasal nematode counts of 15,900 and 17,400 were recorded, with similar numbers in the small intestines. The Oryx were kept with a large group of Llamas which grazed the paddock heavily to prevent possible digestive disturbances in the Oryx. Although the Llamas were treated individually with anthelmintics before introduction to this paddock, the high stocking rate, coupled with the high susceptibility of the Oryx to gastro-intestinal nematodes, appears to have been responsible for their loss of condition. Routine blood samples for haematology, biochemistry (including glutathione peroxidase) and copper estimations have shown no consistent abnormalities. Removal of the Llamas from the paddock, and frequent anthelmintic treatment of the Oryx, should prevent a recurrence of this problem.

A high incidence of chronic inflammatory lesions of the plantar surface of the feet is seen regularly in the three Flamingo species at Whipsnade (see p. 529). These bear a strong resemblance to the lesions seen in domestic poultry suffering from biotin deficiency.

Selected cases

The female Black rhinoceros developed a rapidly enlarging swelling and sinus under the lower mandible. She was immobilised and the lesion, a large fibrous granuloma apparently arising from the peristium of the jaw, was excised. Histological examination suggested an actinomycotic lesion, although attempts to culture the organism were unsuccessful. The animal was reimmobilised 10 days after the operation for removal of the dressing and sutures and two weeks later a near full term foetus was aborted, and the placenta had to be removed manually 48 hours later. The use of the combination of etorphine and acetyl promazine to immobilise the animal on two occasions was considered an unlikely cause of the abortion in view of the safe use of this mixture in other pregnant animals. Histopathological examination of the placenta showed a placentitis, probably of bacterial origin.

One of the two Bottle-nosed dolphins failed to eat and an initial blood test showed a degree of renal malfunction with no evidence of infection (blood urea 33·3 mmol/litre). In spite of supportive treatment (anabolic steroids, vitamin B complex and force feeding) she deteriorated, and further tests showed a neutrophilia. Over the next seven weeks a series of antibiotics were administered including a course of Gentamycin. Because of the potential toxicity, blood levels were monitored using the nitro-blue tetrazolium (NBT) test 4½–6 litres of water were given daily by stomach tube in an effort to promote diuresis and to lower the high urea levels. Blood urea levels remained high in spite of an improved NBT test, and the animal died 12 months later.

Two Moose calves were reared successfully in 1978 for the first time in five years. Since 1973, 11 calves have died before the age of three weeks. One animal was fed a ewe milk replacer but left with the mother, the other was naturally reared. A change in management
which may explain the success was the feeding of more browse before and after the birth of the calves.

An outbreak of cowpox affected three Cheetahs; two died from pneumonia and the third recovered after an illness lasting approximately three weeks. The animal that recovered, and one of those that died, had skin lesions. Pox virus was isolated from pharyngeal swabs and most affected tissues. The skin lesions were characterised by the presence of large eosinophilic inclusion bodies.

Human antivaccinia immunoglobulin was given but failed to save the acute case, even though administration began before clinical signs developed. Spread to the remaining Cheetahs was prevented by strict isolation. The source of the infection in a similar outbreak reported in Moscow Zoo (Marrenikova, S. S. et al., 1977) was thought to be a rodent breeding establishment which had supplied infected rats to the zoo for food. The extreme rarity of cowpox infections in cattle in Britain and the absence of new introductions into the Cheetah or neighbouring groups, suggested that small wild mammals living in the area might carry the disease. Ninety small mammals and 12 birds were trapped and examined for the presence of mammalian pox virus but none was found.

Equine herpes virus type 1 was isolated from one of three stillborn Przewalski foals born in 1978. Tests for this virus in the other foals were negative, although the mother of one of these had an antibody titre of 1 : 64. Sera collected in 1976 and 1977 from 15 animals (nine adults, two yearlings, and four foals) in the group were examined for antibodies to Equine herpes virus. Three adults had titres ranging from 1 : 96 to 1 : 256, and one of the foals had a titre of 1 : 256. The remaining animals had titres of less than 1 : 16. No new animals have been introduced into the herd since 1974, and the source of the infection is unknown.

**Sedation and anaesthesia**

The relatively high volume of Ketamine needed to immobilise Red-necked wallabies makes darting with this drug impracticable. Preliminary work has shown that this species may be safely immobilised with an Etorphine/Xylazine or Etorphine/Ketamine mixture. Dose rates of Etorphine have been in the range 42–96 µg/kg, together with Xylazine 2–4 mg/kg, or Ketamine 2–2.5 mg/kg. No significant clinical difference in effect between the two mixtures was noticed, and there did not appear to be any advantage in the higher dose rates. With both mixtures induction took between 4 and 15 minutes, and recovery was rapid after administration of Diprenorphine.

Azaperone and Xylazine have been used on several occasions in African elephants, to produce sedation with the animal remaining on its feet. Azaperone at a dose rate of 0.11–0.15 mg/kg was significantly better than Xylazine at 0.3–0.4 mg/kg, the animals being roused less easily by minor surgical procedures and showing less residual sedation.

Trials with combinations of Etorphine, Xylazine and/or Ketamine in one Ostrich and five Emus have shown that reversible immobilisation can be achieved, but the relatively high dose rates found necessary in the Emus (60–130 µg/kg Etorphine, 5–12 mg/kg Xylazine, 5–12 mg/kg Ketamine), preclude the use of a single dart injection. Excitation during the induction and recovery periods was a serious problem and necessitated physical restraint.

Trials with Etorphine and Azaperone or Etorphine and Xylazine in Wild boar and Peccaries showed that a relaxed state of anaesthesia could be achieved with the Azaperone
combination. However, further use of Etorphine in these species is not recommended because recycling occurred in three out of four cases in the Wild boar and one Peccary died after being immobilised for one hour.

**PATHOLOGY 1977**

During the period 1 January to 31 December 1977 inclusive, 470 post-mortem examinations were carried out at Whipsnade Park (Table XI) and included 90 wild mammals and 12 wild birds caught or found in the park, and examined for pox virus.

Tables XII and XIII summarise the main findings at post-mortem examination. The criteria for the subdivisions and inclusion in the groups designated are the ones previously used (see Scientific Report 1973–75 (*J. Zool., Lond.* (1976) **178**: 457) and Scientific Report 1975–77 (*J. Zool., Lond.* (1978) **184**: 338)).

Table XI

*Post mortem examinations at Whipsnade 1977*

|                  | Acclimatised | Unacclimatised | Neonate/Stillborn | Total |
|------------------|--------------|----------------|-------------------|-------|
| Mammalia         | 270 (111)    | 0              | 61 (11)           | 331   |
| Aves             | 129 (13)     | 0              | 9 (1)             | 138   |
| Reptilia         | 1            | 0              | 0                 | 1     |
| Totals           | 400          | 0              | 70                | 470   |

**Mammalia (Table XII)**

**Bacterial infections**

*Mycobacterium kansasii* was isolated from a granuloma causing obstruction of the large intestine in the pelvic region of a male Cheetah. Acid fast organisms were also seen in the lungs and pelvic lymph nodes. A mycobactin dependant *Mycobacterium* of the *avium–intracellulare* complex was cultured from the ileocaeco-colic lymph node of an adult male Formosan sika deer, which had been destroyed. Acid fast bacilli (probably *Mycobacterium avium*) were found in lesions in the liver, spleen and mesenteric lymph nodes of two Red-necked wallabies.

*Yersinia pseudotuberculosis* was cultured from three Maras and a Thick-tailed bushbaby. A fourth Mara died with ulcerative enteritis and lymphadenitis from which an aerogenic *Pasteurella* was isolated. *Listeria monocytogenes* was isolated from the liver of a seven week old Sitatunga calf, the first time the organism has been isolated from this species at Whipsnade. *Staphylococcus aureus* was isolated from the lungs of an adult Thomson’s gazelle with pneumonia. This animal also had 1000 adult nematodes in its abomasum.

A haemolytic *Escherichia coli* was the only organism isolated from a fibrosed and calcified lung lesion in a Fallow deer, and *E. coli* septicaemia was responsible for the death of an adult Patas monkey. A mixed culture of a *Klebsiella* sp. and *Proteus* sp. was grown from liver abscesses found in a sub-adult Guanaco.

Four Red-necked wallabies died with purulent and necrotic lesions involving the soft tissues of the head. In one the base of the tongue, pharynx and proximal oesophagus were
Table XII

Mammalia (1977)

| Main group of conditions encountered at post-mortem examination* | Acclimatised (165) | Unacclimatised (0) | New-born (79) | Totals (331) |
|---------------------------------------------------------------|-------------------|--------------------|---------------|-------------|
|                                                               | Number            | %                  | Number        | %           | Number      | %       | Number | % total deaths |
| Bacterial infections                                          | 55                | 20·3               | 0             | —           | 3           | 4·9     | 58     | 17·5        |
| Viral infections                                              | 3                 | 1·1                | 0             | —           | 0           | —       | 3      | 0·9         |
| Mycotic infections                                            | 0                 | —                  | 0             | —           | 0           | —       | 0      | —           |
| Parasitic infections                                         |                   |                    |               |             |             |         |        |             |
| (a) Arthropods                                               | 0                 | —                  | 0             | —           | 0           | —       | 0      | —           |
| (b) Helminths                                                | 9                 | 3·3                | 0             | —           | 0           | —       | 9      | 2·7         |
| (c) Protozoa                                                 | 1                 | 0·4                | 0             | —           | 0           | —       | 1      | 0·3         |
| Nutritional/metabolic                                        | 5                 | 1·8                | 0             | —           | 8           | 13·1    | 13     | 3·9         |
| Debility                                                     | 8                 | 3·0                | 0             | —           | 0           | —       | 8      | 2·4         |
| Injuries and accidents                                       | 43                | 15·9               | 0             | —           | 6           | 9·8     | 49     | 14·8        |
| Neoplasia                                                    | 2                 | 0·7                | 0             | —           | 0           | —       | 2      | 0·6         |
| Euthanasia**                                                 | 111               | 41·1               | 0             | —           | 12          | 19·7    | 123    | 37·2        |

* Not necessarily the cause of death.

** Including 77 of the small wild mammals caught in the pox virus survey.
affected. There was minimal pus formation, and a profuse growth of \textit{Pseudomonas aeruginosa} was grown on aerobic culture. In another, an extensive purulent abscess associated with marked necrosis of the muscular and connective tissues of the left side of the face and erosion of the lower jaw and zygomatic arch also yielded a \textit{Pseudomonas sp.} Four Wallabies died with pulmonary infections (three with abscesses), apparently originating from purulent and necrotic abscesses affecting the lower limbs. Anaerobic cultures were not carried out on these animals, but it is suspected that all nine were cases of necrobacillosis, caused by Fusobacteria and \textit{Bacteroides sp.}

\textbf{Viral infections}

An infection with a cowpox virus killed two adult Cheetahs and a viral agent was thought to be responsible for the intranuclear inclusion bodies seen in the liver of a Central American agouti.

\textbf{Parasitic infections}

Heavy infestations of \textit{Camelostongylus mentulatus} were responsible for the deaths of two Thomson’s gazelles. This parasite was also found in a Llama, and a Windsor white goat. \textit{Ostertagia circumcincta}, a \textit{Bunostomum sp.} and a \textit{Nematodirus sp.} were recovered from a Mouflon, and a \textit{Trichostrongylus sp.} from a Thomson’s gazelle. \textit{Nematodirus helvetianus} was identified from a Thomson’s gazelle, and an unidentified species of this genus from two other Thomson’s gazelles (one already mentioned with staphylococcal pneumonia). This animal also had large numbers of a \textit{Strongyloides sp.} in the abomasum. \textit{Nematodirus rosidus} was found in a Fallow deer. \textit{Oesophagostomum venulosum} was identified from two Formosan sika deer. \textit{Trichuris cervicaprae} was present in a Thomson’s gazelle, \textit{T. ovis} in a Windsor white goat. \textit{T. globosa} in another Thomson’s gazelle, and an unidentified member of this genus from another Thomson’s gazelle, a Llama, and two Musk ox calves. \textit{Dictyocaulus eckerti} was found in the lungs of three Formosan sika deer, and a Red deer.

A debilitated Red-necked wallaby was found to have a very heavy burden of gastric nematodes (probably \textit{Rugopharynx sp.}) associated with a faecal egg count of 6500 eggs per gram. \textit{Rugopharynx zeta} and \textit{Macropostrongylus sp.} in large numbers were found in the stomach of another Wallaby with head injuries, and a \textit{Papovastrongylus sp.} from a Wallaby with arthritis. A Mara had an infestation of \textit{Graphidioides affinis}. The hookworm \textit{Uncinaria stenocephala} was recovered from a Canadian timber wolf. The Cheetah which died with an infection of \textit{Mycobacterium kansasi} had a heavy burden of \textit{Toxascaris leonina}. The nematodes found in a faecal sample from a Brown bear proved to be \textit{Baylisascaris transfuga}.

Coccidiosis was considered responsible for the chronic enteritis and debility in a six week old Windsor white goat.

\textbf{Accidents and injuries}

Fourteen Red-necked wallabies died with injuries ranging from severe contusions and lacerations to fractured limb bones. A two-month-old male Swamp deer was found with bilateral separation of the epiphyses of the os calcis and had to be destroyed. Aggression within their groups resulted in the deaths of a Thomson’s gazelle, a Moose and a Mouflon,
all adult males. Three young North American bison ranging from 3–9 months were killed by older animals in the group. A Lion cub only a few hours old was badly mauled by older cubs and had to be destroyed. Two neonate Mouflon lambs, and a two month old Nilgai, drowned. An adult female Nilgai died from haemorrhage and shock after prolapse of the uterus, and post partum haemorrhage was the cause of death in a Mara.

_Miscellaneous_

Two Llamas, a female and her male calf, were destroyed after showing ataxia. Spinal lesions were found and were characterised by a Wallerian-type degeneration of the white matter involving all the tracts. There was also degeneration of the ventral nerve roots. The degeneration could be traced in the brain stem to the inferior cerebellar peduncles. The cause of the lesions is not known.

A two-year-old male Hartmann’s mountain zebra was destroyed on humane grounds after recurrent lameness due to severe necrosis of the hoof-horn. There was also extensive pedal osteitis of all feet. The pathology was probably due to repeated attacks of laminitis of unknown cause. This animal’s mother and grandmother were similarly affected and also had to be destroyed.

Three Yaks died; a six-year-old male of a metabolic disorder of unknown aetiology and a seven-year-old male of cardiac arrest following immobilisation with an Etorphine/Xylazine mixture. The third, an old female, was destroyed after a period of recumbency, thought to be due to a disease of the nervous system. Histological examination showed moderate Wallerian degeneration in the white matter of the ventral funiculus of the thoracic and lumbar spinal cord.

A nearly full-term Black rhino foetus was aborted, probably due to placentitis. Two Swamp deer calves were stillborn; both were assisted births, one a posterior presentation, the other had died several days before birth. A Nilgai foetus was found to have cerebral hypoplasia.

A four-day-old Brindled gnu calf had bilateral congenital cataracts. Congenital defects were also found in an Axis deer fawn and a Sitatunga calf which had shortened carpal flexor tendons. A Guanaco had a lateral deviation of the forelegs below the carpal joint, and apparent hypoplasia of the phalangeal bones of both digits. No microscopic abnormalities were detected in the bones of this animal. Two Fallow deer fawns were affected with chondrodystrophy. These and two other animals affected have been more fully described in a paper by Baker, Ashton, Jones & Noddle (1979). Four Moose calves died in the first two weeks of life; these deaths were associated with low birth weights and general weakness.

Skeletal disease was found in an 8-year-old female Cape hunting dog whose progressive paresis was found to be due to a severe spondylosis and ankylosis affecting the thoracic vertebrae. An adult stallion Common zebra was destroyed with poor hind leg conformation, including over-extension of the metatarso-phalangeal joints. A Collared peccary had severe arthritis, particularly of the lower joints of the limbs. No organisms were cultured from joint fluid, and serological examinations for Mycoplasmas, Chlamydia, and Erysipelothrix were negative.

An aged Formosan sika deer female died with extensive bony metaplasia in the dorsal abdominal and pelvic cavities associated with fat necrosis.

A five-year-old female Serval was found to have a nephrosis with dilated cortical and
medullary tubules lined by flattened epithelium. Acute and chronic inflammatory cells were present. Calculi of calcium oxalate monohydrate were an unusual finding in the cortical tubules, calices and in the bladder. A 10-day-old Sitatunga calf died with focal liver necrosis thought to have been due to septicaemia, but no organisms were isolated.

An adult female Cape buffalo died suddenly with evidence of acute pneumonia. Chronic pleurisy, suppurative pneumonia and enterotoxaemia, were found in a Southern sealion. The animal also showed a low liver level of vitamin A (12 iu/gram).

An unusually large number of Formosan deer (15) died in the year—seven adults or sub-adults in a debilitated state, two youngsters with a parasitic gastro-enteritis, three neonatal deaths, and three stillborn. The herd has been closed for nearly 30 years and in-breeding, together with too high a stocking rate, may have been partly responsible.

Gastro-intestinal disturbances resulted in the deaths of a Brindled gnu with duodenal torsion, a Grey timber wolf with a perforated gastric ulcer, and a Red-necked wallaby, with suspected enterotoxaemia, an unusual condition in this species.

**Neoplasia**

A luteal cell tumour affecting one ovary was found in a wild European hare shot in the park.

**Aves (Table XIII)**

**Bacterial infections**

Acid fast organisms were seen in a Snowy owl, three Demoiselle cranes, a Whooper swan, a Barnacle goose, a Hawaiian goose, a Carolina duck, an Impeyan and a Cheer pheasant, a Common and an Orange-checked waxbill, two Common peafowl, a Guinea

| Main group of conditions encountered at post-mortem examination* | Acclimatized | Unacclimatized | Neonate  | Totals |
|---------------------------------------------------------------|--------------|----------------|----------|--------|
|                                                               | Number       | Number         | Number   | Total  |
|                                                               | %            | %              | %        | %      |
| Bacterial infections                                           | 28           | 0              | 0        | 28     |
| Viral infections                                               | 0            | 0              | 0        | 0      |
| Mycotic infections                                             | 1            | 0              | 0        | 1      |
| Parasitic infections                                           |              |                |          |        |
| (a) Arthropoda                                                | 2            | 0              | 0        | 2      |
| (b) Helminths                                                 | 6            | 0              | 0        | 6      |
| (c) Protozoa                                                  | 1            | 0              | 0        | 1      |
| Nutritional/metabolic                                          | 12           | 0              | 4        | 16     |
| Debility                                                      | 2            | 0              | 0        | 2      |
| Injuries and accidents                                         | 27           | 0              | 0        | 27     |
| Neoplasia                                                     | 1            | 0              | 0        | 1      |
| Euthanasia                                                    | 13           | 0              | 1        | 14     |

*Not necessarily the cause of death.
fowl and two North American turkeys. This represents 10% of the avian deaths; the average for the three years 1974–1976 was 6.2%. The elimination of this resistant organism from the collection is extremely difficult in the absence of a reliable in vivo diagnostic test, and is complicated by the large numbers of free-living Peafowl and indigenous wild birds in the Park.

Mycotic infections

Aspergillosis was diagnosed in an adult Barnacle goose with lung and air-sac lesions.

Parasitic infections

*Syngamus trachea* nematodes were found in a young Emu, and obstructed the trachea in a White stork. *Gnathostoma* sp. and *Cyathostoma brentae* were found in the tracheas of a Barnacle goose and a Hawaiian goose respectively. *Heterakis* sp. infections were associated with typhlitis in a Lady Amherst’s pheasant, two Cheer pheasants and a North American turkey. The caeca had ruptured in the two Cheer pheasants, and contained extensive caseous necrotic material in the Turkey. It is suspected that this bird had concurrent histomoniasis. *H. dispar* was found in the caeca of a Hawaiian goose. Heavy infestations of the mite *Cytodites nidus* were associated with pulmonary oedema and pneumonia in two Elliot’s pheasants.

Accidents and injuries

Deaths in this category included a Black stork and a Demoiselle crane with fractured humeri and a Rosy flamingo with a dislocated tarsal joint. A South African crowned crane suffered multiple injuries after being run over by the train, and a Hooded crane suffered fatal head injuries, probably as a result of an attack by a companion. A Cheer pheasant and a Greater snow goose had extensive internal haemorrhage. A Tawny owl was found with the lower part of a chicken’s leg lodged in the oesophagus, proventriculus and gizzard, with associated haemorrhage from rupture of the liver. An emaciated Lesser snow goose had a pull-ring from a tin can wedged onto its beak. An old Humboldt’s penguin died of shock after being attacked by companions. A Sacred ibis, an Upland goose and a Chiloe wigeon were killed by predators, probably stoats.

Miscellaneous

An adult female Rosy flamingo had extensive necrosis, oedema, haemorrhage and haematoma formation in one leg and foot; a few small arterosclerotic plaques were found in the proximal aorta. Extensive lesions of arterio-sclerosis were seen in two old Common peafowl, and a Sacred ibis. Haemorrhage from the liver, which showed extensive fibrosis, was the cause of death in a South African shelduck and hepatic fibrosis was also found in a Greater snow goose. Marked fatty change was seen in the livers of an adult Guinea fowl, two adult Red-rumped parakeets and a four-day-old Lesser snow goose. Renal interstitial fibrosis was the cause of death in an adult Hooded crane, and nephrosis was diagnosed in a Lesser snow goose, a King penguin, and a Blue and yellow macaw. Visceral gout was present in the goose and the penguin, and the macaw had marked subcutaneous oedema and enteritis. A Victoria crowned pigeon with a corneal perforation died after induction of anaesthesia with an alphaxalone/alphadolone mixture given intravenously at 9 mg/kg (Saffan, Glaxo).
Impaction of the gizzard with fibrous material was the main finding in three recently hatched North American turkeys. An old Grey lag goose had an impacted proventriculus, and an adult Elliot’s pheasant had a prolapsed intussusception of the large intestine.

Skeletal abnormalities were the reason for destruction of five birds. A four-day-old Humboldt’s penguin chick had lateral deviation of the distal femurs, a one-year-old Rosy flamingo had a deformity of the right femoro-tibial joint and an adult Ostrich had a medial rotation of the distal tibia of one leg. A young Japanese quail had bursitis and arthritis, of unknown cause, involving the tarsus and foot of opposite legs, and an adult Bar headed goose had arthritis of a tarsal joint.

**Neoplasia**

A White naped crane died with occlusion of the trachea at its bifurcation by a ganglio-neurofibroma.

**PATHOLOGY 1978**

During the period 1 January to 31 December 1978 inclusive, 367 post-mortem examinations were carried out. These are sub-divided as shown in Table XIV, and include eight British wild animals found in the park. Tables XV and XVII summarise the main post-mortem findings.

**Table XIV**

*Post mortem examinations at Whipsnade 1978*

|                | Acclimatised | Unacclimatised | Neonate/stillborn | Total |
|----------------|--------------|-----------------|-------------------|------|
| Mammalia       | 193 (60)     | 0               | 56 (4)            | 249  |
| Aves           | 103 (10)     | 1               | 9 (1)             | 113  |
| Reptilia       | 3            | 0               | 0                 | 3    |
| Pisces         | 2            | 0               | 0                 | 2    |
| Totals         | 301          | 1               | 65                | 367  |

**Mammalia (Table XV)**

*Bacterial infections*

*Yersinia pseudotuberculosis* serotype 1A was recovered from lesions in a five-month-old Hog deer, an adult Mara, and an Orange rumped agouti. *Mycobacterium avium* MAIS type 12, mycobactin dependant, was cultured from the ileocaecocolic junction of a North American bison and the faeces of a four-month-old Formosan sika deer. In neither case was the organism considered to be the cause of death, although it may have been a contributory factor to the weak and debilitated condition of both animals. The bison had a heavy burden of gastric nematodes and the Sika deer a septicaemia with a coagulase positive *Staphylococcus aureus*. *M. avium* type 2 was cultured from the mesenteric and mediastinal lymph nodes of a Yak with enteritis and of a Red-necked wallaby, both in a debilitated condition. The significance of this organism in the Yak is uncertain; no acid fast organisms were seen in the small intestines but a coronavirus was seen in the faeces.
The wallaby had bronchitis from which *Bordetella bronchiseptica* was cultured. *Salmonella indiana* was isolated from the faeces of a Common zebra with grass sickness, but the organism was not thought to be significant. A pure growth of *Klebsiella aerogenaes* was cultured from a Thomson's gazelle with pneumonia. Haemolytic *E. coli* were isolated from an aborted Common zebra foal, and from a Musk ox calf which died of heat stroke. *E. coli* was also thought to be responsible for septicaemia in neonatal Swamp deer and Reindeer calves with umbilical infections. Haemolytic streptococci were the most likely cause of pulmonary abscesses and pneumonia in a Red-necked wallaby; they were also isolated from a case of periostitis of the lower jaw in another Wallaby, and from micro-abscesses in the caecal wall of a Mara.

### Table XV

*Mammalia (1978)*

| Main group of conditions | Acclimatized (193) | Unacclimatized (0) | Neonate (56) | Totals (249) |
|--------------------------|--------------------|--------------------|--------------|--------------|
|                         | Number (%)         | Number (%)         | Number (%)   | Total (%)    |
| Bacterial infections     |                    |                    |              |              |
| Viral infections         |                    |                    |              |              |
| Myotic infections        |                    |                    |              |              |
| Parasitic infections     |                    |                    |              |              |
| (a) Arthropoda           |                    |                    |              |              |
| (b) Helminths            |                    |                    |              |              |
| (c) Protozoa             |                    |                    |              |              |
| Nutritional/metabolic    |                    |                    |              |              |
| Debility                 |                    |                    |              |              |
| Injuries and accidents   |                    |                    |              |              |
| Neoplasia                |                    |                    |              |              |
| Euthanasia               |                    |                    |              |              |

*Not necessarily the cause of death.*

A Windsor white goat with hind leg ataxia was found to have a spinal abscess from which *Staphylococcus aureus* was isolated. This organism was also responsible for a shoulder abscess in a Red-necked wallaby. *Corynebacterium pyogenes* caused secondary infection of wounds caused by fighting, in a Blackbuck and a Thomson's gazelle. *Corynebacterium* sp. was the main organism isolated from a severe pneumonia with pulmonary abscesses in a Scimitar horned oryx.

*Clostridium perfringens* enterotoxaemia was considered the likely cause of death of hand-reared Père David’s deer fawns. All had similar symptoms initially of mild diarrhoea and partial anorexia. Three died within 8–10 hours of onset of these signs, two others recovered after being given specific antiserum (Lamb dysentery antiserum, Wellcome) and supportive treatment. *C. perfringens* was present in large numbers in faecal smears of the two animals that recovered.

A heavy growth of *Acinetobacter lwoffii* was cultured from the spinal fluid of a Brindled gnu which died within 12 hours of being found in a collapsed state.
Sixteen albino Red-necked wallabies (two thirds of the group) died in the early part of the year. Seven had necrosis, abscessation, and oedema of the soft tissues of the face and throat, particularly the submandibular, lingual and pharyngeal regions. Aerobic cultures revealed mixed growths of *E. coli*, Staphylococci, and Streptococci, but no anaerobic cultures were made. Two other animals had large necrotic, oedematous and thickened ulcerated lesions of the gastric wall. These deaths occurred in prolonged cold, wet conditions with much of the paddock frequently water logged, at a time when the population density of the group was high. Stress was probably a factor leading to the high mortality and retrospectively, necrobacillosis caused by anaerobic Fusobacteria, (Finnie, 1976), was diagnosed. Necrobacillosis was also thought to have caused the lesions in 10 Red-necked wallabies from elsewhere in the park and a Red kangaroo. Four animals had gastric abscesses, five had facial abscesses, mostly affecting the lower jaw, and one had a chronic foot abscess; the Red kangaroo had severe infective osteomyelitis of the mandible.

**Viral infections**

Equine herpes virus type 1 caused the abortion of a Przewalski horse foetus. Large numbers of Rotaviruses were seen in the faeces of a two-week-old Sitatunga calf which died with enteritis; bacteriological examination yielded *E. coli* from the intestines only. A substantial number of faecal samples from animals with diarrhoea have now been examined under the electron microscope and this was the first time the virus was seen; its presence in such large numbers was considered significant. Of more doubtful significance was the presence of Enteroviruses in the fluid faeces of a Formosan sika deer, two Yaks and a North American bison, all of which died in a debilitated condition.

**Parasitic infections**

Animals with significant gastro-enteric parasite burdens and the species identified are given in Table XVI. Eight Black Japanese sika deer died with parasitic bronchitis and pneumonia due to *Dictyocaulus eckerti*. This parasite appears to have been introduced to the group by some Red deer which were kept for a time in the paddock. A lungworm suspected to be of this species was also found in large numbers in a young Red deer from the main herd.

Two wild European hares were found with parasitic enteritis due to *Graphidium strigosum*.

*Ostertagia leptospicularis* was collected from a Bactrian camel and a Hog deer. Nematodes of the family Ostertagiinae were found in the small intestine of a Chinese water deer. *Skrjabinagia kolchida* was present in Red deer and Brindled gnu. *Bunostomum* sp. was found in a Thomson’s gazelle. *Cyelostrongylus* sp. was found in Red-necked wallabies. *Cyclocycalus adese* (a small strongyle found in the Equidae) was identified from a faecal sample of a Common zebra.

**Accidents and injuries**

Traumatic injuries were the main findings in nine Red-necked wallabies. Fractures of limb bones necessitated euthanasia of an old Hog deer, a Reindeer, and a Mara. An unsuccessful attempt was made to repair the ruptured femoro-tibial joint of an adult female Thomson’s gazelle, and an old female Arabian camel fractured the last lumbar vertebra after collapsing suddenly whilst being immobilised. An adult Llama died of shock.
after fracturing its pelvis. Ten animals (six males and four females) died as a result of aggression from members of their own groups, or other animals in the paddock. These included two Thomson’s gazelles, a Black Japanese sika, a Chinese water deer, a Red deer, a Windsor white goat, a Collared peccary, a Central American agouti, a five-week-old Sitatunga calf, and a neonatal Lion cub.

**Table XVI**

*Animals with significant gastro enteric parasite burdens and the species found*

| Host species and age | Abomasum Counts and identifications in: | Small intestine | Large intestine |
|----------------------|-----------------------------------------|-----------------|-----------------|
| European bison 1 year| 30,000 *Haemonchus contortus*, *Ostertagia* sp., *Skrjabinagia* lyrata. | 6750 *Nematodirus helvetianus*, *Cooperia oncophora*. | *Nematodirus helvetianus*. |
| North American bison 20 months | > 10,000 *Trichostrongylus axei*, *S. kohchida* | 20,000 *Ostertagia* ostertagi | 1100 *O. ostertagi*. 4000 *O. ostertagi*. |
| Yak 2 years | 15,900 *Trichostrongylus axei*. | 13,700 *T. colubriformis*. 300 *Trichus* sp. |
| Scimitar horned oryx 4 years | 17,400 *Trichostrongylus axei*. *S. kolchida*, *Camelostongylus mentulatus*. | 25,000 *C. mentulatus*. |
| Scimitar horned oryx 3 years | 1000 (> 30,000 larvae) | 2000 *Nematodirus roeselius*. |
| Thomson’s gazelle 4 years | 17,400 *Trichostrongylus* sp., *Camelostongylus mentulatus*. | 3000 *Trichostrongylus* sp. |
| Thomson’s gazelle Adult | 25,000 *C. mentulatus*. | 2000 *Nematodirus roeselius*. |
| Formosan deer 7 months | 1000 (> 30,000 larvae) | 2000 *Nematodirus roeselius*. |
| Arabian camel 8 months | 32,000 *Rugopharynx zeta*, *Gonioaimus* sp. | 100 *Globocephalus triphidospicularis*. |
| Soay sheep | 1500 *O. circuncincta*. | |

**Miscellaneous**

Stillbirths from 13 species included a mid-term Brindled gnu foetus with hepatic rupture and haemorrhage, a full-term Blesbok foetus with extensive haemorrhage (presumably a result of a prolonged parturition), two Swamp deer, both assisted births, and an oversized Przewalski horse weighing 33.5 kg. Another Przewalski horse died soon after birth, before full expansion of lung tissue had occurred. It was the mare’s first foal; this and the cold, wet conditions prevailing at the time were considered responsible for the death.

A pregnant Common zebra with grass sickness was destroyed. This is the second case to occur in the group, the first was reported in the previous Scientific Report (*J. Zool., Lond.* (1978) **184**: 349). The foal, which was probably 3–4 weeks premature, was delivered
by Caesarian section, but died after approximately seven hours. It is possible that this too was affected with grass sickness, but the changes seen in the central nervous system could have been due to anoxia.

Two neonatal Musk ox calves died of heat stroke in hot weather because of inadequate shade. A Central American agouti, and an Orange rumped agouti, died with severe frost bite.

A Spectacled bear cub, which had been removed from the mother soon after birth because of her history of neglecting her cubs, was hand reared in an incubator but died six days later.

The Mountain zebra mare referred to in the Scientific Report 1973–75 (J. Zool., Lond. (1976) 178: 496) in connection with treatment for under-running infections of her feet was destroyed on humane grounds. She had been immobilised on more than 60 occasions for treatment of this problem caused by recurrent laminitis. This animal’s foal was also destroyed with the same condition.

Euthanasia was carried out on six animals with congenital defects. A Cream pony foal had overextension of both metatarso-phalangeal joints, a Formosan deer fawn, a Llama and two Windsor white goats showed pronounced weakness and had not stood by the time they were 24 hours old.

Enteric problems occurred in several animals. An adult Axis deer died with diarrhoea and dehydration and although on post-mortem examination a localised, very intense enteritis was found, bacteriological and virological examinations revealed no significant organisms. A Mara, a Soay sheep, and a Chinese water deer, died as a result of over-eating grain, and two more Chinese water deer had suspected enterotoxaemia, thought to be the result of over-feeding on concentrates. A Reeve’s muntjac, and a Grey wolf died with ruptured intestines. The cause was not clear in either, although the hookworm Uncinaria stenocephala may have been responsible in the wolf.

The cause of the lesions found in seven animals has not yet been ascertained. A Cape buffalo died suddenly with spectacular ulceration of the pharynx, oesophagus and colon. Two Nilgai had meningeal oedema and markedly injected meningeal blood vessels. One had enlarged and oedematous lymph nodes, and longitudinal striping of the small intestine, the other a markedly oedematous and thickened abomasal wall. A Père David’s deer had a partially sloughed hoof, a lymphadenopathy, perilimbal corneal oedema and haemorrhage and a haemorrhagic ileo-caecal valve. A Brindled gnu died suddenly with marked congestion of meningeal vessels, bloodtinged, cloudy cerebrospinal fluid, and a congested thymus with ecchymotic haemorrhages. A young Red deer had a marked generalised lymph node enlargement. These seven cases all had markedly congested lower respiratory tracts, but no significant organisms were isolated. The results of histopathological examinations are not yet complete.

Skeletal abnormalities were found in several animals. A Formosan sika deer had a markedly narrow pelvic canal and was destroyed after prolonged dystokia. A Fallow deer fawn had a chondrodystrophy similar to the two mentioned in the 1977 report. A Collared peccary was destroyed with a chronic proliferative polyarthritis. Cultures for Mycoplasmas, Brucella, and Erysipelothrix were negative. An old Hog deer was destroyed with generalised arthritis and ankylosis of the spine. Chronic arthritis with suspected nephritis were found in an old Grey wolf.

An adult Nilgai developed bilateral cataracts over a period of several weeks, and was
destroyed. Three Red-necked wallabies with cataracts were also destroyed. Central nervous signs suggesting eighth cranial nerve damage were seen in two, the third had glaucoma of the affected eye.

An adult female giraffe was immobilised for surgical treatment of a bleeding wound, and stood up after the antidote was administered. She became recumbent again several minutes later, was unable to rise, and eventually had to be destroyed. An adult White rhinoceros was immobilised for investigations of a lameness which proved to be due to a fractured metatarsal bone. She died shortly after the administration of the standard dose of 3-37 mg etorphine and 15 mg acetyl promazine intravenously. The intravenous route is recommended in domestic horses and cattle, but it will not be used again in the rhinoceroses at Whipsnade.

Toxaemia from a retained placenta was thought to be responsible for the death of an adult Brindled gnu which aborted its foetus. An 11-year-old Guanaco died with ascites and evidence of renal and hepatic failure.

An old female Reeves muntjac developed severe dyspnoea, which was found to be due to a collapse of the mid-cervical trachea.

**Neoplasia**

A Siberian chipmunk died with a hepatoma. An eight-year-old Northern lynx was destroyed with multiple abdominal tumours diagnosed as a leiomyosarcoma.

**Aves (Table XVII)**

**Bacterial infections**

*Mycobacterium avium* was cultured from lesions in a West African crowned crane, and this organism was thought to be responsible for lesions in a two-year-old Rosy flamingo,

**Table XVII**

| Main group of conditions encountered at post-mortem examination* | Unacclimatized (1) | Acclimatized (103) | Neonate (9) | Totals (113) | % total deaths |
|---------------------------------------------------------------|--------------------|-------------------|------------|--------------|---------------|
| **Bacterial infections**                                      | 0                  | 19                | 11         | 20           | 17.6          |
| **Viral infections**                                          | 0                  | 0                 | 0          | 0            | 0             |
| **Mycotic infections**                                        | 3                  | 2.9               | 0          | 3            | 2.6           |
| **Parasitic infections**                                      |                    |                   |            |              |               |
| (a) *Arthropoda*                                              | 0                  | 0                 | 0          | 0            | 0             |
| (b) *Helminths*                                               | 3                  | 2.9               | 0          | 3            | 2.6           |
| (c) *Protozoa*                                                | 0                  | 0                 | 0          | 0            | 0             |
| **Nutritional/metabolic**                                    | 11                 | 10.6              | 1          | 12           | 10.6          |
| **Debility**                                                  | 0                  | 0                 | 0          | 0            | 0             |
| **Injuries/accidents**                                        | 17                 | 16.5              | 100        | 18           | 15.9          |
| **Neoplasia**                                                 | 2                  | 1.9               | 0          | 2            | 1.8           |
| **Euthanasia**                                                | 10                 | 9.7               | 0          | 11           | 9.7           |

*Not necessarily the cause of death.*
a Demoiselle crane, a South African and a New Zealand shelduck, a Garganey teal, a Pekin duck, a Carolina duck, and a North American turkey. This is an incidence of 8% of the total mortality for the year. *Erysipelothrix insidiosa* septicaemia killed a Humboldt’s penguin and a Carolina duck. *E. coli* was considered responsible for the localised chronic enteritis in a Canary winged parakeet, and suspected septicaemia in a Blossom headed parakeet, a Red-breasted goose, and a Humboldt’s penguin chick. Pneumonia and air sacculitis in a one-month-old Humboldt’s penguin chick was thought to be due to a streptococcal infection; streptococci were also isolated from a Rosy flamingo with endocarditis and a Pekin duck with suspected hepatic neoplasia. A Rosy flamingo had septicaemia caused by a haemolytic *Staphylococcus* and a coagulase positive *Staphylococcus* caused a similar condition in a Greater flamingo.

*Mycotic infections*

*Aspergillus fumigatus* was cultured from the lower respiratory tract lesions in a Canada goose, and *A. flavus* from the lungs and spleen of a Humboldt’s penguin. A secondary infection of oral candidiasis occurred in a Blue crowned pigeon with renal failure.

*Parasitic infections*

*Heterakis* sp. infections caused typhlitis in a Brown eared pheasant and a Common peafowl. Two Red-breasted geese had light to moderate infections of a species of the gizzard worm *Amidostomum*. *Trichostrongylus tenuis* was identified from an Impeyan pheasant. A *Drepanidotaenia* sp. cestode was found in a Canada goose.

*Accidents and injuries*

Two Greater flamingos died with fractured bones, and a Rosy flamingo with haemorrhage and bruising of one leg. A Lesser sandhill crane had extensive damage to the soft tissues of the cloaca, inflicted by a Cape Barren goose. Two adult Humboldt’s penguins were found drowned after icing of their pond made it difficult to get out.

A Cape Barren goose, a Black necked swan, two Common peafowl, and a North American turkey were killed by a fox. Two Eyton’s whistling ducks were killed by a smaller predator (probably a stoat).

*Miscellaneous*

A Chilean flamingo was destroyed with a severe bilateral ophthalmitis and cataracts. No significant organisms were isolated. This bird, two Rosy and two Greater flamingos mentioned above had the hyperkeratosis and fissuring of the plantar surfaces of their feet referred to in the clinical section of this report.

Foreign bodies in the proximal alimentary tract were responsible for the deaths of a Humboldt’s penguin, and a Mountain witch dove. The penguin had three sticks, one of them 230 mm long, which had perforated the stomach, the dove a piece of wire which had perforated the gizzard. Three young Common rhea chicks had gizzards impacted with dense fibrous material. In the oldest bird the gizzard and contents weighed 21% of the total body weight. Other alimentary tract diseases were found in two Golden mantled rosella parakeets, one with necrotic typhlitis, possibly associated with an *E. coli* infection, the other with enteritis. Enteritis also occurred in a Cockatiel, two Purple guans, and a Greater...
snow goose. The goose had free blood in the gut lumen. The causes of these cases were
undetermined.

Chronic arthritis necessitated the euthanasia of a Canada and a Barnacle goose, and an
Australian cassowary chick with twisting and lateral bending of one tibia, probably
nutritional in origin, was also destroyed.

Suspected myopathies were seen in two Red-breasted geese; in one the pectoral muscles
were affected, in the other the muscles of the lower leg. Myocardiosis was seen in a Fulvous
whistling duck. Two West African crowned cranes had hydropericarditis, in one of them,
associated with calcification of the endocardium. An adult Common rhea had a thickened
eodematosous epicardium and ascites. Extensive lesions of arteriosclerosis were seen in two
Common peafowl and a West African crowned crane. A Sacred ibis was destroyed with
ischaemic necrosis of the tibiotarsus and foot but no arteriosclerotic lesions were detected.

Nephrosis was diagnosed in a Red-breasted goose, a Carolina duck, a Rosy flamingo
and a Reeve’s pheasant. These birds were all adults.

Neoplasia

An Impeyan pheasant died from haemorrhage associated with suspected neoplasia of
the kidney. An old female Thomson’s gazelle which died in 1976 had three tumours, an
undifferentiated carcinoma of the thyroid gland, a haemangiomata of the spleen and a phaeo-
chromocytoma of the adrenal medulla.

Wallaby cataracts

Between 1969 and 1977 approximately 5% of the Red-necked wallabies examined at
post-mortem have shown ocular lesions, including cataracts. Histopathological examination
carried out by Professor N. H. Ashton of the Institute of Ophthalmology, has
suggested three main causes: congenital defects such as persistent hyperplastic vitreous
with ectopic proliferation of lens material; uveitis with cataract formation, associated
with Toxoplasma like pseudocysts in the retina; or idiopathic, with no inflammatory
changes.

Occasional cases of blindness occur with no obvious lens changes, and one of these
was shown to have a retinochoroiditis with Toxoplasma like pseudocysts in the brain. Sera
from the affected animals was not available, but a small survey has shown high
antibody titres to Toxoplasma (1: 4000) in two Wallabies. Sera collected from members
of the staff showed no significant levels of Toxoplasma antibodies. This investigation will be
continued.

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ACKNOWLEDGEMENTS

Although the veterinary department is well endowed with both staff and facilities, the technical
detail which is apparent in all aspects of the veterinary work of the Society would not be possible
without the considerable help given by many scientific friends and colleagues from all over the
country and even from a few who work abroad. Some are asked to assist on a single occasion for a
particular problem, many receive material on a more regular basis and a few act as mainstays for
the day to day routine diagnostic work involving the examination of both living and dead
animals.

Almost all the histopathology is carried out by Dr P. F. Wadsworth (Huntingdon Research
Centre) (HRC) and Mr J. E. Cooper (Royal College of Surgeons). Additional help is also given
in this respect by other professional members of staff of Mr D. E. Prentice's department at HRC,
and Dr E. C. Appleby (Royal Veterinary College).

Professor A. Zuckerman and his staff (London School of Hygiene and Tropical Medicine) carry
out many of the specialised microbiological studies needed and in particular most of the virology
and mycology. These particularly involve Professor D. W. Mackenzie, Dr R. J. Hay, Dr J. Grant
and Dr K. N. Tsiquaye.

Dr D. A. Gardner and his staff (University College Hospital, Department of Chemical
Pathology) carry out all the routine clinical biochemistry. Examination of blood and tissue levels
of trace elements and vitamins A and E is carried out by Miss G. Lewis and her staff (Central
Veterinary Laboratory, Weybridge).

Dr L. F. Khalil of the Commonwealth Institute of Helminthology identified helminths. Dr G. B. White (British Museum (Natural History)), identified arthropod parasites. Dr J. Riley (University of Dundee), identified pentastomes. Dr W. P. Beresford-Jones (Royal Veterinary College) and Dr B. R. Laurence (London School of Hygiene and Tropical Medicine), identified mites. Dr H. Hoogstraal (U.S. Naval Research Unit No. 3, Cairo), identified ticks. Mr K. G. V. Smith (British Museum (Natural History)), identified Diptera larvae. Prof. W. H. R. Lumsden and Mr P. G. Sargeant (London School of Hygiene and Tropical Medicine), identified protozoa. Dr D. G. Fleck (Public Health Laboratory, St. George's Hospital, Tooting), examined blood and tissues for the presence of toxoplasma antibodies. Mr G. H. Lowe (Public Health Laboratory, Cardiff), identified intestinal flagellates.

Dr E. S. Anderson and Dr B. Rowe (Central Public Health Laboratory, Colindale), carried
out identification and typing of Salmonella and Escherichia coli and Dr S. P. Lapage and Dr L. R.
Hill identified unusual Gram negative bacilli. Dr N. S. Mair (Public Health Laboratory, Leicester),
identified Pasteurella spp. and typed Yersinia cultures. Dr A. T. Willis (Public Health Laboratory, Luton), identified Clostridium spp. Dr E. P. J. Glencross (Public Health Laboratory, Newport
(Gwent), confirmed the presence of Erysipelothrix and Listeria in cultures where it was suspected.
Dr L. H. Turner (Leptospirosis Reference Laboratory), carried out serological examinations for
leptospira. Dr A. L. Furniss and his staff (Public Health Laboratory, Maidstone), examined many
samples of faeces for pathogenic bacteria. Mr P. R. J. Matthews and Mr P. Collins (A.R.C.
Institute for Research on Animal Diseases, Compton), examined a number of cultures for the
presence of Mycobacterium spp. Dr W. H. Allan and Dr G. A. Cullen (Central Veterinary
Laboratory, Weybridge), assisted in the diagnosis of ornithosis and Newcastle disease, and Mr
R. E. Gough examined tissues for the presence of duck virus enteritis. Dr T. H. Flewett (Regional
Virus Laboratory, Birmingham), examined samples of faeces for the presence of viruses.

Mr K. E. Elgar and Dr J. Robinson (Shell Toxicology Laboratory, Sittingbourne), investigated
dieldrin levels in birds of prey. Professor N. Ashton (Institute of Ophthalmology), examined eyes
from animals with defective sight. Dr R. Finlayson (Wellcome Museum of Medical Science),
examined the cardiovascular systems of animals with suspected arteriosclerosis. Dr A. C. Palmer
(University of Cambridge), also undertook histopathological examination of tissues. Dr M. Preece
(Hospital for Sick Children), carried out blood thyroxine estimations on giraffes.
Technical advice on nutrition was given by Dr Alan Walker, Dr Marie Coates, Mr John Eva and Mr Donald Coomber. Technical assistance with capture weapons was given by Mr H. V. Ilsley and Mr P. Ott. Clinical advice and assistance was also given by Mr L. R. Thomsett and Mr D. Clayton-Jones (Royal Veterinary College). Advice on anaesthesia was given by Dr Barbara Weaver (Bristol Veterinary School), Dr P. Lees (Royal Veterinary College), Dr J. P. Blackburn (Westminster Hospital) and Professor M. de Burgh Daly (St. Bartholomew’s Hospital Medical College), Glaxo Laboratories Ltd., I.C.I. Ltd., May and Baker Ltd., Merck, Sharp and Dohme Ltd., Parke, Davis & Co., Reckitt and Colman Ltd., Roche Products Ltd. and Smith Kline & French Laboratories Ltd. all donated drugs. Mr C. A. Browne (Department of Clinical Measurement, Middlesex Hospital), kindly lent a portable ECG for use in the hospital over a period of a year. Richard Wolf Ltd. of West Germany kindly lent a number of fibre optic laparoscopes and accessory equipment which was used on many occasions under the guidance of Mr T. Northwood.

We are grateful to Mr W. L. Whitehouse, (Queen Mary’s Hospital, Roehampton) for financial donations to purchase equipment.

In addition the following individuals and organisations gave help specifically to Whipsnade Park, Mr P. A. Kingsbury and his staff (Wellcome Research Laboratories, Berkhamsted), continued to give valuable assistance with regular parasitological examination of faecal samples. Virological investigations were carried out by Miss M. Lucas and her staff (Virology Department, Central Veterinary Laboratories, Weybridge), Dr P. Gibbs (Animal Virus Research Institute, Pirbright) and Dr D. Baxby (Department of Medical Microbiology, Royal Liverpool Hospital). Histological examinations were carried out by Miss K. Whitwell (Animal Health Trust, Equine Research Station, Newmarket) and Mr J. S. Gilmour (Moredun Research Institute, Edinburgh). Assistance with investigations into the arthritis seen in the Peccaries was given by Dr I. F. Keymer (Norwich V. I. Centre), and Professor R. H. C. Penny (Royal Veterinary College). Dr P. Anderson and Dr N. F. Cunningham (Biochemistry Department, Central Veterinary Laboratories), respectively carried out glutathione peroxidase estimations and plasma hormone assays. Dr W. M. F. Leat, and Dr M. Peaker (Institute of Animal Physiology, Babraham), carried out analysis of milk and blood samples. Miss P. Waterhouse (Department of Microbiology, University College Hospital), carried out Gentamycin assays on blood samples from the Dolphin. Mr A. M. Scott (Equine Research Station, Newmarket) and Dr R. Fisher (M. R. C. Department of Human Genetics, University College), carried out blood typing and isoenzyme work on Przewalski horses; karyotyping on these animals was performed by Mr J. G. Matthews (Equine Research Station) and Dr J. Delhanty (University College, London). The Equine Research Station carried out certain biochemical examinations from a number of species and Dr C. M. Colles gave clinical assistance with the laminitis cases. Miss B. A. Noddle (University College, Cardiff), examined bones for evidence of disease or abnormality.

Mr J. Best and Dr D. McBeath (Hoechst UK Limited), supplied the “Panacur” and carried out faecal parasitic egg counts for the anthelmintic trial. Glaxo Medical Limited donated supplies of Carbenicillin and Mrs D. Edwards (Information Pharmacist, Luton and Dunstable Hospital), arranged for the supply of these and other antibiotics used in the treatment of the dolphin. Glaxo Veterinary Limited donated supplies of “Saffan”, Mr G. Holbrook (Hoechst UK Limited), supplied “Cimicat” for hand rearing young carnivores. Mr H. V. Ilsley of Liverpool supplied capture equipment for trials with the “Conservator” system. Mr N. Comben (Roche Products Limited), provided advice on nutritional matters relating to the flamingos. Miss B. Horder and her staff (Royal College of Veterinary Surgeons Library), continue to supply the department with many references and Journals.