

CONTENTS

<i>List of Illustrations</i>	<i>ii</i>
<i>List of Plates</i>	<i>iv</i>
<i>List of Colour Plates</i>	<i>v</i>
<i>List of Tables</i>	<i>vii</i>
<i>Dedication</i>	<i>viii</i>
<i>Foreword</i>	<i>x</i>
<i>Preface, including acknowledgements</i>	<i>xi</i>

Chapters

1	Introduction: Captive birds, their biology and its relevance to their care	1
2	Health versus disease	16
3	Maintenance of health: The importance of management	22
4	Signs of health and disease	31
5	Types of disease: Infectious, non-infectious and multifactorial	38
6	Investigation and diagnosis of disease: Why the bird-keeper and the veterinarian should work together	45
7	Diseases affecting the skin and plumage	53
8	Diseases of the digestive tract	58
9	Respiratory diseases	62
10	Diseases of the liver and other internal organs	65
11	Diseases affecting fertility, hatchability and the survival of young	67
12	The use of medicines and disinfectants	72
13	Accidents, emergencies and supportive care	77
14	A veterinary <i>vade mecum</i>	81
15	Legislation for bird-keepers (by Margaret E Cooper)	96

Appendices

I	Glossary of scientific names	106
II	Useful addresses and sources of information	108
III	Daily record sheet	117
IV	Live bird submission form	118
V	Dead bird submission form	119
VI	Laboratory sample submission form	120
VII	Egg submission form	122
VIII	Health hazards from birds	124
IX	Checklist of equipment for the bird-keeper and avian veterinarian	126

References and Further Reading	127
--------------------------------	-----

Index	131
-------	-----

LIST OF ILLUSTRATIONS

Figure	Page
1.1. A domestic fowl.	1
1.2. External features of a bird - a domestic pigeon.	4
1.3. The basic features of the skeleton of a bird, showing the vertebrate structure, with the forelimbs modified as wings and modifications to the pelvis and sternum.	6
1.4. The shape of the beak (bill) of a bird reflects its use in feeding. The reader with a knowledge of natural history will recognise those above.	10
1.5. A thrush (a small passerine) is examined in the hand; careful restraint permits investigation of the wing and flight feathers.	12
1.6. A dove is restrained with two hands, thus controlling its wings and preventing unnecessary distress.	12
1.7. Large, long-legged birds, such as this heron, need particularly careful handling as they are easily damaged and some can stab.	14
1.8. Small birds are often best held securely cupped in the hand, with fingers on each side of the neck.	14
3.1. The majority of birds favour a high vantage point in order to display, to sing, to attract a mate or to roost. The status of a bird in the 'peck order' may be indicated by whether it occupies a high or low perching position on a tree, a cliff or a building.	29
4.1. A bird that is showing early signs of disease may have an oval, rather than a round, eye and its feathers may be raised or ruffled (lower picture). Careful observation will help in the detection of such signs.	32
4.2. An apparently healthy peacock-pheasant. The bird is erect, with a good stance and well-maintained plumage.	33
5.1. Bacteria that may cause disease in birds are microscopical in size and differ in appearance. These examples are highly magnified representatives.	38
5.2. Male and female roundworms (nematodes) usually differ in shape and size: the female is larger, with a pointed tail (left), while the male has a characteristic terminal bursa, used in copulation.	39
5.3. A cross-section of a roundworm (nematode), showing the intricate structure of these parasites. The worm has an external cuticle, a muscular bodywall and its own internal organs, including an intestine (centre).	39
5.4. Three types of roundworm (nematode) eggs that may be found in the droppings of birds and which can be associated with ill-health. The <i>Capillaria</i> eggs (top) are thin-walled and have a cap (operculum) at each end, while the 'ascarid' type (middle) have a thicker, tougher cuticle. The eggs at the bottom of the picture, 'strongyle' - type, contain cells which are developing into embryos.	39
5.5. A mute swan with lead poisoning shows a characteristic 'S-shape' neck, associated with muscle weakness. Once stimulated, however, the bird could hold its head up, straight, for a few minutes.	40
5.6. A free-living blood parasite, a trypanosome. These are not uncommon in birds but only rarely are, <i>per se</i> , a cause of clinical disease.	40
5.7. An intracellular parasite (protozoan) in tissue. The parasite (lower part of picture) occupies	41

part of the cytoplasm of a liver cell and is therefore well protected from drugs that may be administered in order to kill it. Such a parasite is <i>Atoxoplasma</i> , a cause of ‘going light’ in finches.	
5.8. Many parasites of birds have a simple life-cycle, which can be interrupted relatively easily in captivity if management is good. Here the parasites voided by one bird are ingested by another: hygienic precautions will effectively reduce the risk of such spread.	41
5.9. Some parasites of birds have a complicated life-cycle, involving intermediate hosts. This blood parasite of thrushes multiplies in a blood-sucking fly which, if circumstances are right, can transmit it to another bird.	41
5.10. A blood parasite (protozoon) within a bird’s red blood cell. The nucleus of the red cell is black; the other object in the cell is the parasite, with its own nucleus and cellular contents. This is a <i>Haemoproteus</i> .	41
6.1. A warbler, showing some of the measurements that are used by most ornithologists, some aviculturists and a few veterinary surgeons. Morphometrics is an important part of health assessment (see text).	48
7.1. Wing feathers and tail (flight) feathers.	53
7.2. Feather tracts (pterylae) on a young bird. These are often characteristic of certain species or orders. The open areas, apterylae, are where feathers do not grow.	54
7.3. Types of feather.	54
7.4. A Harris’ hawk with a drooping wing as a result of the disease ‘wing-tip oedema’, probably associated with low temperature.	55
7.5. A parrot preens its plumage. A normal preening pattern is associated with good health.	55
7.6. A biting louse. These parasites are common on birds, both in captivity and in the wild, but often secondary to ill-health rather than the cause of it.	56
7.7. A soft tick (<i>Argas</i> sp). These parasites suck blood and can also transmit bacteria and protozoa.	56
8.1. The digestive tract of a bird (pigeon).	58
8.2. The head of a tapeworm (cestode), showing the row of hooks and the suckers that help this parasite to attach to the wall of the bird’s intestine.	60
8.3. A fluke (trematode), showing the intricate internal structure and the two suckers that help this parasite to attach to the bird’s intestine, kidney or other internal organs.	60
8.4. A thorny-headed (acanthocephalan) worm: as the English and scientific names suggest, this parasite has a characteristically barbed head which can damage the bird’s interior.	60
9.1. A pair of <i>Syngamus</i> (gape) worms. The male is the tiny structure near the top, attached to the female. Gapeworms are prevalent in wild birds and both there, and in captivity, they can cause clinical or subclinical disease.	62
9.2. The respiratory system of a bird, showing trachea, lungs and certain air sacs.	62
11.1. The urogenital (urinary and reproductive) system of a male bird.	67
11.2. The urogenital (urinary and reproductive) system of a female bird.	67
11.3. The endocrine organs of a bird, that produce hormones (chemical ‘messengers’).	68
11.4. A mute swan on the nest.	69
11.5. A hatching egg: this is a critical period in the life of an embryo and disturbance, or adverse humidity/temperature, during ‘pipping’, can cause problems.	70
12.1. Force-feeding a sick gull. This technique looks easy but requires experience. Gulls and certain other seabirds are adept at regurgitation!	74
13.1. A free-living barn owl that died as a result of electrocution and burning. Feathers are charred and there are skin lesions.	77
13.2. A hospital cage, complete with heater and thermostat - ideal for nursing a sick bird.	78

13.3.	An area of a bird's skin is lifted in order to give a subcutaneous injection of fluids. The 'tenting' and how long the raised skin takes to return to its original position can be used to a certain extent in the assessment of hydration.	79
15.1.	Various types of trap can be used to catch birds but most need to be operated under licence. Some, such as the one shown, are illegal in many parts of the world.	99
15.2.	A hooded hawk (falcon). In some countries birds of prey may be taken from the wild, under licence, for falconry. Falconry techniques may also be used for the rehabilitation of wild birds and for the release of captive-bred stock.	99
15.3.	Different attachments to a bird's leg may signify its provenance, ownership or use. From left to right: a leather jess suggests that the bird is captive, possibly used for falconry. A closed ring is usually considered to be suggestive of a captive-bred bird, ringed at an early age. A 'split' plastic ring is likely to have been applied as a simple marking device, usually on a captive bird.	101
15.4.	Veterinary students assessing an owl.	101
Appendix VIII	Figure 1. The droppings of birds, such as those of pigeons in London, are a potential source of infectious agents, some of which can cause disease in human beings.	124

LIST OF PLATES

Plate	Page	
1.1.	Examination of a bird's skull helps the aviculturist and the veterinarian to understand diseases affecting the beak.	15
1.2.	A Mauritius pink pigeon is placed in a cloth bag for weighing.	15
1.3.	A blood smear is prepared. Examination of the stained sample may assist in the detection of subclinical changes in the bird.	15
1.4.	Radiography of the wing of a wild bird casualty which has been treated surgically. Excess bone deposition (callus) is seen, which hampers proper movement.	15
1.5.	A radiograph (x-ray examination) of a snipe illustrates the anatomy of the bird's long, specially adapted, beak.	15
6.1.	Swabs of different types are used to take samples for laboratory investigation. Those above are but a small selection.	51
6.2.	The preparation of histological slides - thin sections of tissue from live birds (biopsies) or dead birds - requires sectioning by skilled technicians.	51
6.3.	Part of the process for the production of histological slides involves embedding tissues in paraffin wax, as above. Thin sections can then be cut and stained.	51
6.4.	Microscope work is an essential part of diagnosing disease and monitoring the health of birds.	51
6.5.	Blood-sampling equipment for birds is likely to include a syringe, needle, microscope slides (for smears) and bottles for storage of the blood.	51
6.6.	Samples from live or dead birds can be examined initially using fairly basic equipment. Here bacteria have been cultured on agar plates and are about to be examined using special stains (the bottles in the background).	51
6.7.	<i>Post-mortem</i> dissection of a Mauritius pink pigeon - part of health monitoring of this rare species.	52

6.8.	A microscopical view of a histological section from a bird that died of aspergillosis. This is the air sac - markedly thickened, inflamed and containing thread-like fungal hyphae.	52
6.9.	Careful examination of a bird's wing is necessary in order to detect fractures, dislocations or other abnormalities.	52
6.10.	The cloaca of a pigeon is examined using an auroscope. Such standard equipment, available in any veterinary practice, is invaluable in clinical investigation.	52
6.11.	An experienced veterinary clinician examines a radiograph (x-ray plate) of a bird as part of diagnostic work.	52
6.12.	The use of barium sulphate, which is radio-opaque and therefore shows up as white material on this x-ray plate of a pigeon, permits the demonstration of various organs, including the oesophagus and crop.	52
10.1.	A <i>post-mortem</i> radiograph of a parrot that died unexpectedly after many years in captivity. The bird had cardiovascular disease: calcium salts (the white streaks at the top of the picture) have been deposited in the blood vessels.	66
11.1.	Eggs of a sparrow-hawk that failed to hatch. Prior to <i>post-mortem</i> examination they will be weighed, measured, described and candled.	71
11.2.	An unhatched egg of a cockatiel is measured prior to examination. The wearing of gloves is a hygienic precaution.	71
11.3.	A dead-in-shell bird removed from its egg for pathological investigation. In this case there was an incubator fault and a concurrent bacterial infection.	71
11.4.	<i>Post-mortem</i> radiograph of an owl that died following egg-binding. The egg is clearly visible in the body cavity.	71

LIST OF COLOUR PLATES

Plate		Page
1.	A mixed collection presents challenges to the avian veterinarian. Birds from different countries can spread infectious organisms and inter-specific aggression may occur.	92
2.	This African grey parrot is free in the house where it is able to perform much of its normal repertoire. However, it is also in close proximity to potentially dangerous objects, such as electrical wires and lead fittings (see text).	92
3.	Careful observation will help to detect both subtle and distinct clinical signs. Here, a young ostrich that has a nutritional deficiency appears unable to stand. However, once approached, it would get to its feet and try to behave normally.	92
4.	Close observation of birds in cages will help in the detection and diagnosis of disease. This parrot, which has marked feather loss, is in poor quality accommodation - a possible cause of its problem.	92
5.	Proper handling precedes detailed examination. Even at this stage important clinical features may be detected - for instance, the deformity (rotation) of the right foot of this pink pigeon.	92
6.	Some apparently minor clinical signs may, nevertheless, be a sign of possible internal disorders. This free-living (casualty) guillemot has only traces of oil on its plumage, but it has ingested large quantities of the chemical.	92
7.	This budgerigar has 'French moult', which is essentially a viral infection but a	92

- condition that has attracted much debate and controversy amongst aviculturists over the years.
8. Close examination of this budgerigar in the hand reveals ‘scaly face’, due to the mite *Knemidocoptes*, affecting both the periorbital region and the cere. 92
 9. The abnormal appearance of the beak of this budgerigar is due partly to poor beak care, including over-enthusiastic clipping, earlier in life. 93
 10. This free-ranging domestic fowl has erythema of the face, comb and wattles due to an infectious disease and large numbers of sticktight fleas *Echidnophaga gallinacea* on the exposed skin. 93
 11. Parting of the feathers, particularly over areas of the body that appear distended or are not bilaterally symmetrical, may reveal lesions. This is a ‘feather cyst’ in a canary. 93
 12. Even normal structures need careful examination and checking. This preen (uropygial) gland of an owl does not show any abnormalities and oil could be expressed from it. 93
 13. The feet must always be carefully examined. This heron has pressure sores, as a result of its being kept on too rough a substrate. 93
 14. Observation and clinical examination may need to be backed up by laboratory tests. This blood smear shows a microfilaria (in the centre) and the blood parasite *Leucocytozoon*. 93
 15. Radiography (x-ray examination) is an important adjunct to clinical assessment. This radiograph of an Amazon parrot confirms that the distention noted in the neck is due to an overdilated cervicocephalic air-sac. 93
 16. A radiograph of a kestrel that was presented unable to fly; the bird has unusual bilateral lesions of the head of the humeri. 93
 17. Simple endoscopy can yield a great deal of clinically useful information. A pigeon is examined, using a rigid endoscope, in order to search for lesions in the oesophagus or crop. 94
 18. Emergencies and accidents often need prompt action - and the veterinary surgeon may not be fully equipped or prepared! This young crane with a leg injury is an example. 94
 19. Pending a definitive diagnosis, emergency treatment may be necessary. A tawny owl with a damaged cornea has its eyelids sutured under anaesthesia in order to protect the lesion. 94
 20. Wild birds that present as emergencies are frequently the victims of road accidents. This spotted eagle owl has been wrapped in a towel, both to restrain its wings and to help keep it warm. 94
 21. A key part of emergency treatment is the provision of fluids and electrolytes. These can be given by a variety of routes - in this case, by crop tube. 94
 22. Pathological examination plays a key part in diagnosis and preventive medicine. A double-headed microscope enables slides to be examined by two people and can permit the clinician to learn from the pathologist - and vice-versa! 94
 23. The feet of a parakeet, in an outside aviary, that contracted severe frost-bite. The dry, gangrenous, lesions are clearly visible. 94
 24. Dropped feathers yield important information about the health of a bird. This feather shows two changes - ‘pinching-off’ at the base and layers of retained keratin around the shaft. 94
 25. This scanning electronmicrograph (SEM) of a damaged feather shows changes to the barbs and barbules that are characteristic of burning. Such information can be of particular value in legal cases. 95

26.	Three nestling finches that died following a history of ‘going light’. The cause of this disease was confirmed as a result of laboratory investigation (see next picture).	95
27.	An electronmicrograph (TEM) of the liver of one of the nestlings above. Mononuclear cells predominate and in some of them there is an intracytoplasmic parasite - <i>Atoxoplasma</i> (see text).	95
28.	Histological sections of tissues may reveal significant lesions or parasites and assist in diagnosis. This section of the trachea of a Gouldian finch shows a mite, <i>Sternostoma</i> sp.	95
29.	A histological section from the foot of a finch with ‘scaly leg’ that shows 95 proliferations of keratin in which <i>Knemidocoptes</i> mites are embedded.	
30.	Tick infestations are increasingly recognised as being of veterinary importance. This section shows a tick (right) and, in the dermis (left), there is a marked inflammatory reaction.	95
31.	The production of abnormal eggs may be a feature of reproductive disease in birds. Such eggs must be properly examined and the necessary laboratory tests performed.	95
32.	It has long been known that fractured bird bones heal rapidly. This eagle bone is one of a number studied by John Hunter (1728-93), who was an observant naturalist as well as a surgeon and comparative pathologist.	95

LIST OF TABLES

Table	Page
1.1. Some examples of birds that have been domesticated.	2
1.2. Examples of orders of birds.	4
1.3. Some examples of psittacine and passerine birds that are often kept in captivity.	5
1.4. Some biological characteristics of five different orders of birds.	7
1.5. Some examples of incubation periods.	9
1.6. Recommended methods of handling and restraint of birds.	11
1.7. Equipment for handling and restraining birds.	13
3.1. Accommodation for birds.	23
4.1. Some clinical signs (‘symptoms’) of disease seen in birds.	34
5.1. Some examples of infectious diseases of birds.	42
5.2. Some examples of non-infectious diseases of birds	43
9.1. Possible sequences of events leading to a fatal respiratory infection.	63
11.1. Some examples of why eggs fail to hatch.	68
14.1. Investigation of a sick bird.	82
14.2. Some medicines that can be used for birds.	84
15.1. Legislation affecting birds.	104