

RAPTOR CARE AND REHABILITATION: PRECEDENTS, PROGRESS AND POTENTIAL

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ABSTRACT.—Over the past two decades much has been learned about the care and treatment of raptors. Nursing, therapy, rehabilitation and release all necessitate specialized skills, coupled with an understanding of the biology and needs of the patient. Clinical work must be augmented by necropsy of carcasses, eggs and embryos.

Future developments will include diagnostic and therapeutic aids, advances in captive breeding, better collation of information, a more analytical approach to data, closer collaboration between different disciplines and the extension of existing knowledge to conservation projects. Public attitudes to animals are also changing and raptor biologists must be prepared to respond appropriately.

Birds of prey have been used for falconry for many centuries, and as a result, there is a long history of recognition and treatment of raptor diseases. An early Arabic treatise (A.D. 775-785) discussed this topic and the reader was advised: "Do not change the disease through medicines before its recognition and diagnosis. But ascertain and investigate until you understand the disease. As soon as you are firmly convinced of your diagnosis quickly start the treatment . . ." (Cooper 1979).

The first written account of raptor diseases in English is to be found in the "Boke of St. Albans" (Berners 1486). Subsequently many authors discussed the various ailments to which hawks were prone and treatment (both medical and surgical) was advocated. Examples are given in Cooper (1979). Very few significant advances appear to have been made and many mediaeval cures were still being recommended in the late 19th and early 20th century. The first major breakthrough was probably in 1948 when Dr. R. M. Stabler elucidated the aetiology of "frounce" (Stabler 1954). From 1960 onwards there was an upsurge of interest, prompted mainly by concern over pesticides and the decline of a number of species. There was a gradual increase in awareness by veterinarians of the significance of raptors. Scientific publications on disease began to appear and authors started to advocate the use of modern drugs.

My own involvement in birds of prey can be traced to my boyhood interest in the natural history of raptors and falconry. When I entered veterinary school in 1962 I started to study raptor anatomy and

in 1965 included *post-mortem* examinations and attempts at diagnosis. Following graduation I extended my research to include clinical investigations both in Britain and East Africa, where I worked from 1969-73. In 1978 I published some of my data in "Veterinary Aspects of Captive Birds of Prey" (Cooper 1978). This was followed by other publications—for example, the excellent section on birds of prey in "Zoo and Wild Animal Medicine" (Fowler 1978) and a number of scientific papers from both sides of the Atlantic. In 1980 an International Symposium on the Diseases of Birds of Prey was held in London. This was a chance to bring together those interested in pathology and disease and to exchange views and information. The Proceedings, consisting of papers by specialists, were published (Cooper and Greenwood 1981).

Over the past five years the subject has expanded. The establishment in many parts of the world of raptor centres has involved an increasing number of veterinarians and biologists in the treatment and rehabilitation of sick and injured raptors. Much information gained is still unpublished, but there are opportunities to disseminate and share it at conferences and meetings.

There is a clear need for veterinary attention for captive birds, for example, in zoos and for falconry, but there are those who argue against care and attempted rehabilitation of free-living raptors. I do not share this view and believe that treatment can be justified on four grounds: 1) legal, 2) humanitarian, 3) scientific, and 4) conservation. These four views will be discussed briefly.

Insofar as the legal situation is concerned, in Britain the tending of casualty birds is permitted by law (the Wildlife and Countryside Act of 1981) (Cooper 1986), and the killing of a casualty which might have recovered may constitute a legal offence. Sim-

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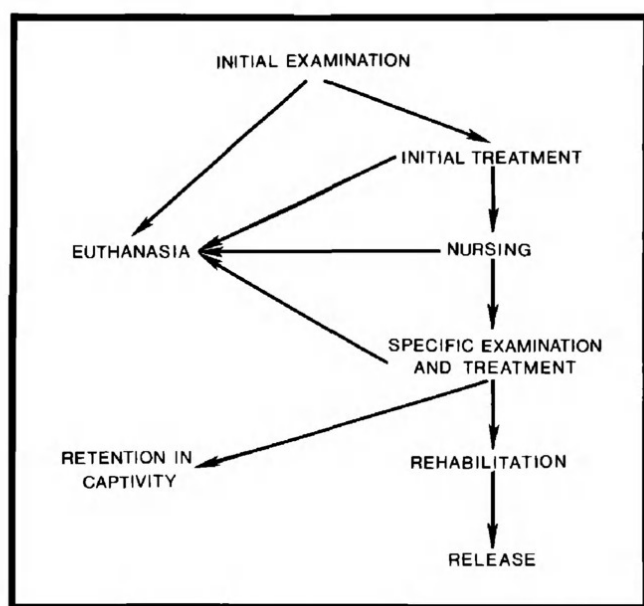


Figure 1. An outline for the treatment of raptor diseases.

ilar protection is afforded to raptors in many other parts of the world. The taking and care of sick or injured birds is strictly regulated in some countries and states/provinces (particularly in North America), but elsewhere there is little specific control.

Humanitarian considerations dictate that a sick or injured raptor should either be killed or treated. It is important that the welfare of the bird is the prime consideration but this can sometimes pose a moral dilemma (Cooper and Eley 1979). There is little doubt that considerable scientific benefit may be obtained from the treatment and rehabilitation of raptors. Much progress in veterinary care over the past 10–15 yr is due to work on such birds (Cooper and Greenwood 1981; Duke et al. 1981).

The contribution of raptor rehabilitation to conservation is debatable. Many argue that releasing relatively small numbers of birds to the wild contributes nothing to the species' status and in some cases could even be counterproductive. However, the indications are that, in the case of the Bald Eagle (*Haliaeetus leucocephalus*) in the United States and the Northern Goshawk (*Accipiter gentilis*) in Britain, rehabilitation programmes may have played a part in bolstering wild populations. In addition there are the indirect benefits of such work—for instance, the availability of casualties for captive breeding programmes and the enormous educational impact of birds which cannot be returned to the wild but which can be viewed and handled by the public.

Practical Aspects. The care of casualty raptors can be broken down as nursing, therapy, rehabilitation, and release. Each is an integral part of the process and yet each requires special skills and facilities. Expertise varies and the same person may not be involved in all aspects. A team approach is desirable. The four headings will be discussed in turn.

Nursing. As seen in Figure 1, nursing occupies a central position. Successful nursing requires knowledge of the biology and needs of the patient. In Britain and North America there are many wildlife rehabilitators who are extremely skilled and who appreciate the need for a "holistic" approach to the bird and its problems. Nursing can be defined as "tending (a sick person or animal), trying to cure" and the emphasis is on supportive care, such as provision of warmth and hand-feeding, rather than specific diagnosis and treatment.

Therapy. Strictly this is the domain of the veterinary profession. In the past there has been a shortage of veterinarians with interest in and experience of non-domesticated birds, but the situation has greatly improved in recent years. It is important that the rehabilitator and veterinarian work together, each contributing his/her own expertise. There have been enormous advances in the diagnosis and treatment of raptors and many of these are described in standard texts (e.g., Cooper and Greenwood 1981; Fowler 1978, 1985). The role of laboratory investigations and necropsy cannot be overemphasised as they supplement clinical work and help provide a more accurate diagnosis.

Treatment can be divided into surgery, chemotherapy and attention to management. Major advances have been made in surgical techniques and orthopaedic, ophthalmological and abdominal operations are now regularly performed (Harrison 1984; Coles 1985). Such work has been facilitated by the development and use of new anaesthetic techniques (Harrison and Harrison 1986; Samour et al. 1984). Likewise, many modern chemotherapeutic agents are used. However, more study is needed on the efficacy and safety of drugs in birds. A few have been investigated employing birds of prey such as gentamicin in the Great Horned Owl (*Bubo virginianus*) (Bauck and Haigh 1984; Bird et al. 1983) and amphotericin B in a range of species (Redig and Duke 1985). Others have been tested in pigeons prior to clinical use in raptors (Cooper 1985), but many remain unproven. Managerial changes can

play an important part in the prevention and treatment of disease, such as the correction of poor perching and improvements to ventilation following the use of settle plates or smoke tests to detect deficiencies (Cooper 1978).

Rehabilitation. Rehabilitation is different from release. The Concise Oxford Dictionary defines rehabilitation as "restore to privileges, reputation or proper condition; restore to effectiveness by training (especially after imprisonment or illness)." In many ways rehabilitation is an extension of nursing—the "holistic" approach whereby one is endeavouring to improve both the physical and psychological well-being of the patient. Although there are some published works on this subject (e.g., Cooper and Eley 1979; Redig 1978; Llewellyn and Brain 1983) there remains a need for an authoritative volume compiled by those who are most experienced.

Release. The Concise Oxford Dictionary defines release as "set free, liberate, deliver, unfasten (from)." Release is the final stage of care, the point at which the raptor is liberated. Contact may be maintained (see later) but essentially the bird is independent and having to cope with what is often a relatively unfamiliar and hostile environment. Rehabilitation and release may overlap, especially if a bird is being hacked back. The successful return of a bird to the wild is not an easy matter and may pose more problems than nursing and therapy. In particular it often proves difficult to assess whether or not a casualty bird is fit for release. A number of authors have addressed themselves to this and although there are some differences of opinion, many points are generally accepted. Cooper et al. (1980) listed four considerations when assessing whether a bird should be liberated. These were 1) the physical and psychological health of the bird, 2) its relationship with man, 3) the locality for release, and 4) time of year, climate, etc. Prior to release, birds should not only be examined clinically but also screened for evidence of pathogens or underlying health problems. A routine screening programme, which is adapted from Cooper and Greenwood (1981), is depicted in Figure 2.

Despite a few studies and publications on the subject (e.g., Duke et al. 1981) the assessment of the fate of released birds remains a hurdle. All raptors which are returned to the wild should be banded, and colour marking may assist subsequent identification. Telemetry permits a bird's progress to be monitored but is an expensive and time-consuming

- A) PHYSICAL EXAMINATION

 - a) CLINICALLY HEALTHY
 - b) FREE OF SIGNIFICANT INJURIES, LESIONS AND ECTOPARASITES

B) LABORATORY TESTS

 - a) MUTES
 - i) FREE OF PARASITES
 - ii) NO EVIDENCE OF *Salmonella* OR OTHER SIGNIFICANT ENTERIC PATHOGENS
 - iii) NO ACID-FAST ORGANISMS (*Mycobacterium* spp.) IN SMEARS
 - b) BLOOD
 - i) NO PARASITES OR SIGNIFICANT ABNORMALITIES IN SMEARS
 - ii) PCV (haematocrit) WITHIN NORMAL LIMITS
 - iii) PLASMA PROTEIN WITHIN NORMAL LIMITS

Figure 2. A screening programme for raptors prior to release.

procedure. Re-trapping of released raptors will enable them to be weighed, examined clinically and screened. A small study on re-trapped Black Kites (*Milvus migrans parasitus*) in Kenya showed considerable variation in condition even though all birds were receiving a food supplement (Cooper 1977). Duke et al. (1981) reported recoveries and resightings of a number of species which had been released following treatment. More extensive studies are urgently needed.

The Future. Despite many advances, much remains to be learned. It seems likely that future developments will be primarily in the following and as discussed beyond; 1) increased specialisation, 2) more sophisticated technology, 3) extension of existing knowledge and techniques, 4) greater manipulation of birds, and 5) closer association with conservation.

Increased Specialisation. In 1978 it was possible for one person to write a book on diseases of raptors. Currently, it would be more prudent and satisfactory if individuals were to contribute chapters on their own speciality. While most veterinarians involved with raptors retain general interests, some have made a particular study of clinical problems such as orthopaedics or parasitic diseases, while others have

tended to concentrate on microbiology or pathology. Such specialisation, however, brings with it the danger of less collaboration and, ultimately, the fragmentation of the discipline.

More Sophisticated Technology. It can be safely assumed that developments in veterinary medicine will be mirrored in work with raptors. Insofar as diagnostic procedures are concerned, the following techniques are amongst those that are likely to develop and be utilised more fully: a) radiography—especially contrast studies; b) endoscopy—rigid and flexible; c) ultrasound; d) computerised axial tomography (CT scan); and e) nuclear magnetic resonance (NMR). Some have already been employed. For example, Furley and Greenwood (1982) reported the use of wholebody (CT) scanning in the diagnosis of aspergillosis in falcons in the Middle East. Other techniques have still to be investigated and, if possible, adapted to work with raptors. Therapeutic procedures are likely to develop on similar lines and amongst those that will undoubtedly prove of increasing value in raptor work are endoscopic procedures, cryotherapy, laser surgery and radiotherapy. Homeopathic remedies and acupuncture have been advocated but have attracted little attention to date.

Extension of Existing Knowledge and Techniques. Despite advances of the past few years, many opportunities have been overlooked. For instance, there appear to be only two studies on the normal embryonic development of raptor species; the American Kestrel (*Falco sparverius*) by Bird et al. (1984) and on the Pariah Kite (*Milvus migrans govinda*) by Desai and Malhotra (1980). Likewise, with a few notable exceptions (e.g., Burnham et al. 1984) very little has been published on "normal" eggshell size and thickness and yet many thousands of falcon eggs have been produced and some are presumably available for study.

Other pathological data are urgently needed. For instance, organ weights and organ/body weight ratios are important in toxicological studies in other species and have been investigated in seabirds (Osborn and Harris 1984). They should be a routine part of raptor *post-mortem* examinations to help ensure a more analytical approach. Clinicopathological case reports still have a part to play but detailed analyses of larger numbers of birds, preferably in controlled studies, are required.

An important way of promoting extension of existing knowledge is by organising multidisciplinary

conferences and encouraging the publication of papers. In addition, however, there is a need for information to be shared more freely and for the establishment of a data base, preferably on computer, so that raptor biologists can have quick and easy access to both published and unpublished material.

Greater Manipulation of Birds. Already raptors are being manipulated in order to obtain more information or benefit from them. Examples include artificial insemination, double clutching, hand-rearing and cross fostering (Olney 1984). More invasive procedures, such as the experimental production of disease, toxicological investigations and the implantation of cannulae are becoming more frequent (Cooper 1978). While such studies have already yielded some useful information we must be aware that, unless carefully controlled, manipulations can become mutilations and birds may suffer. The extent to which the latter are acceptable will depend upon the purpose of the study and this may necessitate a careful and sensitive assessment of the cost benefits. In a rehabilitation centre invasive procedures have no place and such investigations should be reserved for the research laboratory. Those working with raptors should be aware of the increasing numbers of people, notably members of animal rights movements, but also including a growing proportion of the general public, who view the exploitation of animals with concern. There is no clear-cut solution to this conflict of interests but one important way to help ensure a humane approach is to have a code of practice at each centre and to follow it when raptors are treated, rehabilitated, bred or used. Various guidelines are available; for example, those produced in Britain by the Biological Council (Anon. 1984) and in Canada by the Canadian Council for Animal Care (Anon. 1980–84). A humane approach to animals is not new. As long ago as the fourth century, St. Chrysostom (A.D. 347–407) wrote: "Surely we ought to show them (animals) great kindness and gentleness for many reasons, but, above all, because they are of the same origin as ourselves" (Hume 1957).

Closer Association with Conservation. Much knowledge gained from the care of sick and injured raptors and from investigation of morbidity and mortality can be applied to conservation. Collaboration between veterinarians and biologists in Britain has greatly enhanced investigations into native birds of prey. For instance, sickness and deaths in free-living Northern Goshawks were recently traced to out-

breaks of trichomoniasis (Cooper and Petty 1987). Studies on the Merlin (*Falco columbarius*) and Common Barn-Owl (*Tyto alba*), both declining in Britain, are in progress and those involved include veterinarians and wildlife rehabilitators as well as field biologists. In some areas the submission of dead owls and hawks for necropsy prior to toxicological investigation has permitted the diagnosis of a number of conditions which might well otherwise have been missed. At the same time the possible interaction between toxic compounds and infectious agents (Kende et al. 1984) can be better evaluated.

It is probably in Third World countries, in areas where raptors (and other species) are facing grave threats, that application of knowledge is most needed. I am fortunate enough to be involved in several projects where raptors are being tended in captivity and, in a number of cases, used for captive breeding. Thus, tissues for pathologic examination have been received from Philippine Eagles (*Pithecophaga jefferyi*) which have died at the captive breeding project at Manao. Eggs of this species which have failed to hatch have been sent, under permit, to my laboratory for necropsy and following our investigations we have forwarded them to Ian Newton for toxicological analyses. This combined approach has not only provided valuable data on the morphology of these eggs but also revealed the presence of significant levels of chlorinated hydrocarbon insecticides.

The longest and most intensive veterinary input has been on the Mauritius Kestrel (*Falco punctatus*). I have been an advisor to the Mauritius Conservation Project since its inception in 1973 and over the 12 yr period have been able to advise on clinical problems, examine pathological material and introduce a screening programme (Cooper et al. 1981). A visit to the island in December 1984 permitted the extension of this work to encompass the pathologic examination of infertile unhatched eggs and the monitoring of the captive breeding facilities for environmental contamination. There is strong evidence that bacterial infection may have caused the death of some embryos and a rigid programme of hygiene has been drawn up for the project. Veterinary advice of this kind, based as it is on experience with raptor centres and captive breeding units in Europe and North America, could provide a valuable input to other programmes.

Conclusions. The study of raptor diseases and rehabilitation is now a recognised and *bona fide* discipline. Much has been achieved, but a great deal

more remains to be learned and put into effect. In the past there have been too many barriers between those who work with captive raptors and those who are concerned with the conservation of these birds in the wild (Cooper 1983). There has also been a lamentable absence of dialogue and collaboration between biologists, veterinarians, rehabilitators and others. A clear need exists for closer cooperation. We must be willing to pool resources and to share with others both our achievements and our failures. The need for greater interchange between the Western and Eastern Hemispheres and between developed and developing countries has never been greater. If we work together, those of us concerned with raptor care can make a substantial contribution to the conservation and management of some of the world's most magnificent and inspiring birds.

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