Rehabilitating Australian Diurnal Raptors

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1. Some general remarks

Wild birds are markedly different from domestic birds and mammals in their post-veterinary care. By being aware of this, veterinarians will be better able to advise their local wildlife carers, and will be able to intelligently assess the needs of their wild patients. It is neither professional nor humane to release birds that are unable to survive on their own in the wild. As avian veterinarians, we should lead the way to better standards.

Raptors are not alike. Consider the wild behaviour of your patient before, during and after treatment so that you can make your decisions rationally. For example ospreys and white-bellied sea eagles use their first digit (equivalent to the thumb) to capture fish. Amputation of this digit renders them unreleasable. An osprey is incapable of walking due to the structure of its toes. Wing amputation is especially cruel in this species. A male eagle needs both feet to hunt and copulate but a female might survive without a few toes as the male will feed her. A harrier (with low wing loading and slow hunting techniques) might survive with slightly asymmetrical wings. A peregrine falcon will not (high wing loading, very rapid hunting). A slightly deformed cere will probably not kill a kestrel after release but it very well might kill a falcon stooping at over 100 km/h in pursuit of a pigeon.

The aim of raptor rehabilitation is to return a functional member of a species to the wild, where it can perform all the functions of a member of that species. The alternative to this ideal is euthanasia. Keeping unfit birds in captivity is unprofessional, and decreases the resources available to birds with a chance of release. There are no breeding programs currently operating for any species of raptor in Australia. This means that amputees, geriatrics and birds requiring a guide dog or a hearing aid are better euthanised. Please bear in mind that a breeding program worthy of that name should fit the following criteria. It should be producing birds that are fit in every way for release. They should not be imprinted or humanised. They should recognise wild prey and be capable of catching it. There should be a need for the species to be bred, i.e. it should be endangered, vulnerable or rare. Breeding tawny frogmouths, kestrels, grey goshawks, ospreys or boobook owls is pointless unless it produces useful information. The birds should be released into suitable habitat where they won't compete with birds that are being produced in the wild already. Finally, scientifically valid information that will benefit the species now or in the future should be generated from such a program.

"Why are you here?"

This question should be asked of every patient, including wild birds of prey. Look beyond the initial presenting complaint to see if there is an underlying reason for the bird's injury or debilitation. Is your patient blind, calcium deficient, brain damaged or intoxicated? Has some well-meaning person been feeding it beef instead of mice? Are its joints normal? Is it sick or injured at all? Is it one of the 80% of juveniles that would normally die during their first year? Does it possess a full complement of feathers? Is the area from which it came being developed, contaminated, harvested, mined, irradiated? Was it shot or poisoned out of simple stupidity or out of malice or self interest?

2. Aiding recuperation. How not to ruin a good Perm.

Proper feather structure and alignment is vital to life for raptors and many other birds. Return to the wild can be impeded by many months if primary, secondary or tail feathers are damaged. Cages with bars, enclosures with wire netting and improperly placed furniture such as perches and water dishes can destroy tail and wing feathers. Cage bars and chicken wire resemble twigs and foliage, which some raptors (notably goshawks) will attempt to fly through. Such attempts will also destroy a cere very quickly and may cause severe head trauma. Other birds will grasp wire netting and flap continually, ruining both tail and wing feathers.

Cardboard boxes and cages or aviaries constructed from vertical wooden slats are appropriate in most circumstances. Cardboard boxes are easily modified to suit current needs and are discarded periodically. Vertical wooden slats represent a psychological barrier to birds and cannot be grasped by a frightened bird. Wooden slats reduce visibility of approaching humans, which is important in avoiding humanisation.

Faeces do feathers no good at all. Provide your patient with a perch to raise itself from the mire, especially if you are not able to clean out the enclosure regularly (such as if a bandage has just been removed but the callus is not yet ossified). Especially in soft-feathered raptors, (Owls, *Elanus* kites) apply a tail bandage to protect the tail from mechanical and faecal damage.

Duck a l'Orange or Paté de Foi Gras

Choosing a diet that is suitable for patients is often a matter of convenience and expense. As a general rule, whole animal prey is far superior to processed or butchered food. Laboratory mice and rats make an adequate diet for most birds of prey most of the time. Exceptions are juvenile birds, which need to be taught to recognise their wild prey, and crested hawks (which are insectivorous), weak or debilitated birds which may not be strong enough to open an adult mouse. Juvenile and new-born rodents are deficient in calcium and fibre and are not acceptable for more than a few days, especially in orthopaedic and juvenile patients. Larger patients (eagles, large falcons) will appreciate pigeons and small mammals. Adult chickens, whilst nutritionally sound, should not be offered to raptors as predation of domestic chickens markedly reduces life expectancy. As a precaution against parasite infestation, food items should be frozen and thawed prior to being offered to patients. Be aware that some infections are transmitted from prey to raptors.

Day old chicks (DOC's) are less acceptable, especially for birds that are growing, moulting or recuperating from orthopaedic procedures. Long term reliance on DOC's should be mitigated by intermittent feeding of adult mice, rats, pigeons or the like.

Beef, strips of heart with or without calcium seasoning, dog food and mince are without exception unacceptable foods for raptors.

Some birds, especially juveniles, need to be provided food that they would find in the wild. White mice are rare in the forests and skies of Australia, so a psychologically acceptable diet for a bird with an uninformed palate will include whole birds, wild-colour mice and rats, possums, cats, etc. Road-kills are a good source of these, as are unreleasable wild patients. Provide fish-eaters with whole, ungutted fish. Carrion-eaters (whistling kites, wedge-tailed eagles, etc) can receive possums, wallabies, etc.

Entrée? Desert?

If you are feeding *ad libitum*, you can expect many birds of prey to refuse food for one or more days after they initially ate well. This is normal. The bird is not tired of its unvarying fare, nor is it suddenly sick (unless other clinical signs support this supposition). It is simply watching its weight. If you are not feeding you patient *ad libitum* (and even if you are), it is incumbent on you to watch its weight. Weight loss is a sign of illness or inadequate food intake in all species. In small species (kestrels, letter-winged kites) a small weight loss in an already debilitated bird can be fatal. Weight gain is desirable in most patients as some degree of debility at presentation is common.

In order to assess changes in weight or food intake, always refer to your patient. If your patient is growing, healing or underweight, then weight gain is required. If your patient is plump and mature, then periodic inappetence is normal. If your patient is inappetent but emaciated, underweight or showing signs of illness, then pain, illness or stress is a possibility. Stop staring when you feed it, remove cats from sight, noisy dogs from earshot and larger, hungrier raptors from the cage across the passage; move the bird higher from the ground. Offer pain relief if pain is likely to be present. Reconsider your diagnostic approach if systemic illness is a possibility.

Bandages, splints and internal fixation

Always be aware that fracture and joint fixation represents a compromise between stability of the fracture site and retention of musculoskeletal function. Contraction of muscles, tendons and ligaments can permanently inhibit return to full power of flight. Improperly applied internal fixation can damage joints and interfere with tendons and muscles.

Two regimens of post-orthopaedic care are used with success by these authors.

In the first, external coaptation (bandages, etc) is removed after ten to fourteen days and the bird placed in a small enclosure that permits turning and movement but does not allow flight. Feeding is accomplished without startling the bird. One week or more later (depending on the case) internal pins are removed. Birds without orthopaedic prostheses may be released to a larger enclosure which permit limited flight and full wing extension at this stage. Birds with orthopaedic prostheses should be allowed full wing extension, and limited flight a few days later. In these cases, a climbing perch should be provided between the ground and the horizontal perches. Once the bird starts to fly to the horizontal perch, remove the climbing perch.

In the second method, external coaptation is maintained for three weeks and orthopaedic prostheses are removed after five or six weeks. Beginning three to five days after fixation, the bird is anaesthetised every three days with isoflurane and physiotherapy is performed on the wing. The aim of the physiotherapy is to gradually extend the limb to full extension at each session. Failure to achieve full extension at one session will increase tendon contraction in the period between sessions, thereby increasing the chance of failure to return to function.

Granny Flat, Edwardian Mansion, Buckingham Palace?

Consider the size and usual habitat of your patient when assessing enclosure requirements. Only a handful of cages on earth permit proper exercise to an eagle or large falcon. If an enclosure with sufficient size is unavailable, then one of the graded release techniques will provide sufficient exercise whilst supplying food until hunting has resumed. Small falcons

(hobbies, kestrels) and forest hawks (collared sparrowhawks) will obtain moderate exercise in a 3m x 3m x 3m room, but a harrier will not. Regardless of the size of the enclosure, two (and only two) swinging perches should be supplied, one at each end of the enclosure. The minimum size for a convalescent enclosure is 3x3x3 metres; a flight enclosure should measure no less than 6x4x4 metres.

Jogging and aerobics, sprinting and marathon running

Regardless of the size of the bird or the enclosure, exercise in captivity rarely compares to that required in the wild. You can increase the demands placed on your birds by encouraging vertical flight. Place perches as close to the roof as good posture will allow. Feed from a platform on the ground rather than higher up. Remove low perches or ramps once healing is sufficient to allow flight. Provide prey in small pieces at odd times during the day to increase the number of flights required of the bird. Maximise the distance between perches. Once fracture healing is complete, encourage flight by reducing the amount of food supplied. This encourages "foraging" by the bird. Swinging rather than fixed perches increase exercise. Wild behaviour dictates the type of exercise you should be encouraging and looking for in all cases.

How big is my parachute?

Wing loading is the amount of weight carried by an area of wing (or tail) surface. Wing loading is very low in gliding and soaring species (harriers, soaring kites, condors) and very high in rapid hunters (Peregrine falcons, hobbies). Changes in wing loading due to asymmetric wings (rotation of fractured bones, shortening due to overriding or missing fragments) is very poorly tolerated by birds with high wing loading.

3. Assessing fitness. Fly, little bird, fly....

Birds differ with regard to their requirements for power of flight. Emus and kiwis represent one end of the spectrum which is occupied on the other end by goshawks, sparrowhawks and falcons. Assessing whether a bird of prey is capable of pursuing the full range of its natural behaviour is challenging. Being able to flap from one perch to another is not an indication that a bird of prey will be able to swoop, evade predators, engage in courtship or rapidly pursue an escaping duck. These latter activities require power of flight.

The ability to gain height in an enclosed space is a minimum requirement for release for all raptors. The ability to fly vertically (upwards) is an excellent sign of fitness. Voluntary flight in the enclosure is likewise a good prognostic sign. Forest dwelling raptors should demonstrate rapid flight with rapid changes of direction. For example, a healthy sparrowhawk can fly at speed along the wall of an enclosure and turn sharply through 90^{o} within centimetres of the oncoming wall.

Assessment of large falcons and eagles after wing trauma might require falconry techniques which are mostly illegal and should be performed by experienced, licensed professionals. A properly qualified rehabilitator should be able to train and assess a raptor's suitability for release in 6-8 weeks. Please be aware that the main problem with falconry techniques is their overuse. Such techniques are not intended to train a bird to hunt and are unsuitable for many species.

Packed cell volume decreases with illness and with lack of exercise. Regardless of other indications of fitness, subnormal PCV is a sign that a bird is not ready for release (David Graham, Pers. Comm.)

Can your bird shop, plan a budget, design a menu, build a pergola....?

Hunting, nest building, mating and eating are largely instinctive behaviours. Some that are learned from the parents will be developed, but more slowly, with experience in the absence of parents. Birds that are presented to you as adults may usually be assumed to be capable of everything except traffic avoidance. In some circumstances other wild birds of the same species will assist with training. For example, juveniles that fall out of a nest can be returned to the nest or a nearby substitute nest in many cases. Crested hawks (Pacific bazas) have accepted captive-reared juveniles during their periodic mass migrations. Again, knowing wild behaviour is paramount in judging whether behaviour displayed by your patients is normal, dysfunctional or an indicator of stress.

4. Release techniques and their applications

Pre-release preparation

Juvenile birds must be dehabituated to human presence. This is best done by not habituating them in the first place. Avoid visual contact at feeding times, minimise contact with humans, do not permit inspection by curious visitors (“This is a veterinary surgery, not a zoo”). If a bird is to be released quickly, without a graded technique, it is polite to offer it a full meal before discharge. Large raptors such as sea eagles and wedge-tailed eagles are dangerous to the public if they associate humans with food. Do not release human-habituated eagles.

It is important to distinguish imprinting from human habituation. Imprinting occurs in all species at the time of proper visual development, at around 10 to 14 days of age. This period is marked by a change in behaviour from staring at people/parents to waving the head to improve 3-D vision. If humans allow themselves to be seen by the bird, especially at feeding time, during this period, then imprinting will occur. This process is irreversible, renders the bird unfit for release and is an indication for euthanasia. Human habituation occurs after this period, and is used by some carers as a reason not to release a raptor. This behaviour is irresponsible and should be discouraged. Affected birds should be fed out of sight of humans at irregular times.

Seaside resort, country cottage or woodland retreat?

Release birds in habitat that is suitable for their survival. Fish-eating species prefer watercourses and dams. Falcons are best not released in areas with a high density of pigeon fanciers. Resident raptors, even of different species, will attack introduced raptors, as will crows, butcherbirds, noisy miners, magpies, masked lapwings and other mobbing species. Release raptors discreetly, in areas not frequented by these. Refer to a book about raptor biology or a botanist to increase your habitat-spotting skills. Choosing an unsuitable habitat, such as a closed woodland for a kestrel or a forest for a harrier will result in your patient injuring itself or being unable to find or capture prey. Liaise and consult with farmers if you are aware of nests or plan to release birds on or near their property; they might know a more suitable area for release or might advise about the state of the mouse population. Circular harvesting techniques kill juvenile harriers and parents who defend them.

Timing of release is equally important. Diurnal raptors should be released early in the morning, nocturnals late in the afternoon. Calendar time should also be considered. Males released in the breeding season are likely to be attacked by resident pairs. Choose a release area which will provide sufficient food without supporting a resident pair. Females released during mating

season are likely readily to find a male who will feed them. As a result, females can be released slightly unfit at this time. Males who vacate a breeding territory during breeding efforts will quickly be replaced.

Solo? Duo? En Masse?

This depends totally on the facilities available and the species involved. For both hacking techniques, two or more birds of the same species and around the same age are preferred to solo efforts.

Out of Pentridge and into a halfway house

The big blue sky is an excellent place for birds to perform the last few phases of their recovery, but how do they practice and improve without starving to death? The answer is a graded release method. Traditional hacking and cage hacking are founded on the lazy habit of most birds to hang around if they're being fed. The hack box performs the functions of the parental nest, the cage represents the wider area around the nest that juveniles frequent after fledging whilst they are still being fed by the parent birds.

"Leave the bandages on for two weeks then let it go" is unprofessional advice in almost all circumstances involving raptors. Gradual return to function begins with your medical and surgical intervention and continues for weeks to months afterwards. For this reason, it is necessary to provide your patient with nutritional support for some time after release into the wild. This part of the rehabilitation process will also tell you whether or not you have done a good job in your assessment and management of the patient.

Traditional hacking

Choose a box large enough for the bird to stand, turn and stretch its wings. Ballroom dancing is uncommonly practised in Falconiformes, so be sensible about size. Unfledged juveniles are kept in the box and fed by means of a chute in the roof. Slats in one side enable the bird to see out and fresh air to get in. Birds get hot too, so avoid the baking sun. Once the birds are old and feathered enough to fly, quietly open the door one moonless night. Be discreet about feeding, don't let them see you. A ledge on the front of the box facilitates landing by the bird and will encourage use of the box after successful flight. A box measuring 2.4 by 1.2 metres and 1 metre high will accommodate kestrels through to wedge-tailed eagles.

Knowledge of wild behaviour is crucial to success. For example, some species vacate the nest well before flight is possible. These are unsuitable to traditional hacking.

Cage hacking

Developed by Peter Frater, Greg Czechura and others in response to the problems presented by recently fledged birds and birds that routinely leave the nest before they are capable of flight. Such birds routinely leave box hack sites with alacrity and do not return. Proceed as above except that an enclosure of small room size replaces the box, and an older bird inhabits it. Don't hack more than two diurnals or three nocturnals at the same time. If you are well aware of the wild behaviour of the species involved, you will be in a better position to tailor your methods to the birds involved.

The simple toss

Suitable for adult birds that have returned to full flight, evidenced by their ability to fly vertically or to gain height in a small room, especially after a minor fracture or procedure (eg fracture of either (but not both) the radius or ulna, minor foot problems, flew into a house by accident, stunned but recovered). Release the bird into the area where it was found as soon as possible after presentation. Prolonged absence of a bird from its territory invites interlopers who might object to eviction. If that area is unsuitable (new roads, toxins, residential development), find the nearest similar habitat. Know the requirements and behavioural habits of the birds to prevent mistakes, like releasing harriers in a forest, owls in the daytime or inexperienced hunters into areas with scarce prey.

Into the madding crowd

This is an experimental technique in which juvenile birds of a species that flocks periodically are released into the passing flock. This procedure was successfully performed with two crested hawks in Queensland. Careful consideration of the process in light of knowledge about wild behaviour of that species is crucial to success.

When do you need The Boke of St Alban?

Falconry techniques are rarely required. Be suspicious of rehabilitators who use it on everything that comes into their care. Falconry techniques should only be practised by licensed, trained professionals. Falconry techniques are sometimes required to gauge whether a falcon or eagle is capable of rapid or sustained flight and prey capture, especially after wing trauma. They are not required to teach juveniles how to hunt. In most states these techniques are illegal except under license. Falconry techniques are dangerous to the bird, especially in the case of small or easily stressed raptors (kestrels, sparrowhawks, goshawks) due to the practice of food restriction.

Be wary of the use of falconry hoods. These devices are designed to prevent a falconry trained bird from prematurely pursuing prey. They are not required for the training of the bird. The short-term sedative effects of the hood can be duplicated with a soft clean cloth. Ill-fitting hoods can damage eyes.

Grading your performance

If a hacking technique was chosen, then return of the bird and capture of prey signify your success. In other cases, ringing the birds might tell you if they live or die, especially if you use a staged release method. Banding of released native fauna should be mandatory - it might reduce the incidence of irresponsible and cruel rehabilitation practices. (Do not use RED coloured bands on raptors, or the band will get eaten or ripped off.) Radiotagging will enable you to follow your patients, judge their performance and add valuable data to the literature. Visit the release site frequently and invest in a pair of binoculars. Take a picnic.

Become familiar with the literature, or befriend someone who is. This will save you making the mistakes that others have already made for you. If you find yourself involved with birds of prey regularly, invest in membership of the Australasian Raptor Association or like interest group. Someone with regular field experience of raptors can save you a lot of time and work. Beware of instant experts and dubious consultants. Be informed enough to ask intelligent questions to gauge the expertise of your informant.

Experimental releases

Field reports of one-eyed owls and one-footed eagles inspire confidence in the ability of some birds to adapt to (or at least to live in spite of) handicaps. If you feel moved to release a one-eyed raptor, do so with a radiotracking device attached so that you can share your success with confidence. Other experimental techniques such as releasing birds in groups, should be documented and followed up so that others can emulate your triumphs and avoid your unavoidable mistakes. It should go without saying that such releases should be well thought out in consultation with an authority on raptor behaviour (one who goes out in the field and looks at them, not one who only goes to his books and reads about them).

5. Important considerations

a. Correct identification of species

This is especially difficult for juvenile birds. Correct identification will save you from the embarrassment of mistaking a male peregrine falcon for a female hobby, or a male brown goshawk for a female collared sparrowhawk. Knowledge of the species involved will allow you to correctly find out about fledging ages, breeding times, normal weights and sizes, sex discrimination, mating age, habitat requirements, prey species, mode of flight and behavioural peculiarities. This information might differ within a species in different parts of its range. For example, birds in the southern parts of a range are likely to be larger than northern ones, habitat preferences anf prey species might be different according to time of year or location within the range.

b. Wild behaviour of the species

Releasing or training owls in daylight, expecting kestrels to stoop, hoping that letter-winged kites will attack birds, or that crested hawks will devour large rats are the sorts of things that can be avoided with a sound knowledge and a few good texts on wild behaviour. More subtle information like conditions required for breeding in the wild, times of prey abundance and territorial requirements will be gleaned, and will inform your rehabilitation practices.

c. Age of patient

As a general rule, juveniles fledge at around the same time that prey species juveniles emerge. Thus the inexperienced are hunted by the inexperienced. Releasing an inexperienced bird into a territory scarcely stocked with experienced prey is at best discouraging and at worst lethal. Mature birds may be assumed to be adept at most required behaviours, but be aware that head trauma or toxicities might negate this assumption. Know wild behaviour so as to spot idiot birds.

d. Injury

An injury which renders a bird of one species and sex unfit for release does not necessarily condemn another. Know the requirements for hunting, mating and flight and compare them to your patient’s capabilities.

e. Time of year

Is it the breeding season? Is suitable prey abundant? Is your bird seasonally migratory and are you releasing it into a hostile environment?

f. Facilities available

If you or your rehabilitator are incapable - due to lack of food, enclosures, experience or funds - of rehabilitating a bird properly, consider referral or euthanasia.

g. Experience (relative and absolute) of the veterinarian and rehabilitator

Don't be afraid to be guided by highly experienced and well read rehabilitators, but be informed enough to know the difference between one of these and an instant expert. Do not be party to practices that will prevent release of a bird into the wild.

h. Location and time of finding of the bird, name and contact details of finder.

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