

REHABILITATING BIRDS

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Abstract

Birds represent the largest group of wild animals seen at Healesville Sanctuary annually. Of the approximately 1,300 animals admitted to the Sanctuary by community members, government employees and carers, 56.5% are birds. Despite the need for experienced bird handlers and carers, there are very few who have the experience, the knowledge or the facilities to adequately rehabilitate birds. This paper outlines the main housing facilities, feeding regimes and handling required by a variety of bird species. First aid and the commonly seen injuries and diseases in Australian birds are also covered.

The role of the wildlife carer is one of profound importance. They are the first point of contact and often offer advice to the public. It is a rare bird that is able to be caught and does not need veterinary attention. Any delay in rescue and treatment by a veterinarian can influence the fate of the bird. Quick, accurate diagnosis is essential to ensure injuries can be treated correctly with the most favourable outcome. After veterinary attention, wildlife carers are often the people that look after the birds until they are fit enough for release.

With all birds it is important to seek veterinary care quickly. Find a vet that is knowledgeable or at least keen to learn more. Open wounds have a small window of opportunity to be fixed and often need to be attended to within 24 hours of the injury occurring. All fractures into joints will lead to arthritis and birds should be euthanised for humane reasons. Feeding can be complex and should be altered for different species. As a general rule, if a patient is eating one thing all the time (not including whole prey items which consist of multiple dietary requirements), the diet will not be balanced. Rehabilitation facilities can be modified to suit different birds, but should include staging enclosures to increase the room for exercise as necessary. Adequate fitness for the lifestyle of the bird is essential before re-release should go ahead.

Birds make interesting, challenging and rewarding patients. They do not require the same intensity of care as hand-raising marsupials and the average time they spend in rehabilitation is around 6 weeks. There are many different species to become familiar with, so the case load is never boring. Best of all, watching a bird fly again, makes all the effort worthwhile.

Introduction

The majority of wild birds rescued are injured. They are usually hit by cars, or they collide with windows, are attacked by cats or dogs or are shot. The number of birds that are actually ill is under 10% (9). Like all wild animals injured birds are stressed. In some birds this manifests as extreme panic and can result in further injury to the bird and handlers; in others aggression is elicited, usually putting the handler at risk; and in still others the defense mechanism employed is to “play dead”, which can incorrectly lead to a more guarded prognosis than necessary. Knowing about the individual bird species can greatly enhance the information obtained at the initial contact and lessen the stress. The aim of all wildlife rescues is release and birds are no different. The initial assessment of the animal not only needs to take into account the nature of the injury, but how long the bird will need to be in captivity, whether adequate facilities exist for rehabilitation (given the species and the injury), whether release is possible, whether the birds are territorial or migratory, and whether the personnel are available for the job.

At Healesville Sanctuary, 600-900 birds are seen by the Vet department each year. Over 100 species are represented and each year the proportions vary. With the diverse range of species being seen, housing and feeding requirements can be demanding. Of the birds seen, the majority have broken wings or concussions. Many of these birds have injuries that are inconsistent with successful rehabilitation and are humanely euthanised or die before treatment can be instigated. Of the birds where treatment is attempted, more than half are eventually released back to the wild.

Rescue

When a bird is rescued an accurate **history** should be obtained and passed on to anyone who will attend to the bird.

What is it?

When treating birds, one of the most important references you can have is a bird identification book. **The Graham Pizzey and Frank Knight Field Guide to the Birds of Australia** is a good first reference. To make it easier to find a bird in any guide it helps to have a basic knowledge of the kind of bird you are dealing with. Beaks can be used to narrow the bird down and to assess the kind of diet it is used to. For instance nectarivores usually have long, narrow, curved beaks. Omnivores, like butcherbirds, often have hooks on the end of the beak. Insectivores often have fine feathers (whiskers) around the mouth and nose. Raptors always have a significant hook on their beaks for tearing and powerful talons.

Accurate weighing scales (that measure down to a gram) are very helpful. **Weight** can be used to differentiate between species, distinguish between the sexes (in raptors - see appendix one) and to judge how long a bird may have been injured if a normal weight is known for the species.

Two other key identification features to note are the **age and sex** (if sexually dimorphic species) of the bird to help assess what rehabilitation will be necessary and to help understand the social dynamics of the bird and how this might effect its likelihood of successful release. Again, a good bird identification book is invaluable here. Young birds can be assessed by feather development, colouration and behaviour (willingness to eat from humans) in some cases.

Where was it found?

With few exceptions, wild birds should be released as close to the point of rescue as possible. It is essential that the place where the bird came from be identified and recorded with as much detail as possible.

Why was it rescued?

Was the bird found on the side of a road, beneath a tree, in a cat's mouth, in a backyard, caught by the children, found in a swimming pool, unable to fly, unable to walk - all these are important to note.

When was it rescued?

Birds that are held onto without medical attention have been shown to have a reduced chance of successful rehabilitation.

The **length of time** that an injury has existed will often determine a bird's "treatability". The fresher the injury, the better the chances of successful rehabilitation. We have treated fresh, open fractures successfully, but grossly contaminated wounds and/or dry exposed fracture fragments are very reliable indicators that rehabilitation is unlikely.

Handling

Handling birds can be stressful to both the bird and the handler. Wherever possible be confident, quick and quiet. A towel or blanket will be more useful than anything else. Thrown over the bird it almost always quietens the bird and puts it more at ease. It can then still be used when examining the bird as a cover for the head. It is important to restrain the bird confidently, but gently as a bird held too tightly cannot breathe.

Different birds present different restraining problems. Below is a list of birds and their “weapons” (in descending order of “dangerousness”) which necessitates holding them certain ways. Some birds are extremely unlikely to harm the handler, but are at risk of being harmed by the handler.

Psittacines - beak, feet, voice - small birds can be handled in one hand with the head restrained between 2 fingers, but larger ones require the use of both hands - one securely holding the head and the other holding the legs and wings. Ear plugs are not a stupid idea!

Raptors/owls - talons, beak - most require both hands and a towel because of their size, with the towel around the body and one hand holding the talons away from people and objects and the other hand holding the wings against the body. Few raptors resort to using the beak, but the head may have to be held. Raptors feel most secure wrapped in towels and can be transported wrapped firmly (but loose enough to breathe) for short trips (under 30 minutes).

Seabirds - beaks, wings, faeces - heads should be restrained at all times, in larger birds the beak can be held, but be careful of pelicans, gannets, frigate birds, cormorants and darters as these birds have reduced or absent external nostrils and rely on breathing through their mouths - a loose hold on the beak should be employed. The wings, if unrestrained, can also bruise the handler, so a blanket over the larger birds can be used to restrain the wings. Birds can then be held under the handler’s arm with the other hand holding the beak. It is a normal response to threatening situations for sea birds to eject faeces at high velocities so aim the cloaca away from people.

Waterbirds - wings, beak, faeces - the wings, in larger birds like swans, can bruise the handler, so a blanket over the larger birds can be used to restrain the wings. Some water birds will try to bite and as such the heads may need to be held, but the beaks seldom cause more damage than a few scratches. Like the sea birds it is a normal response to threatening situations for most water birds to eject faeces at high velocities so aim the cloaca away from people.

Magpies/bowerbirds/some honeyeaters - feet, beak - like the raptors the feet of these birds can have a vice-like grip and hurt the handler, but they are unlikely to cause the same amount of damage. The legs should be restrained along with the beak in most cases.

Emu - legs, size - as adults these birds should almost always be sedated or anaesthetised before handling as they can tear large wounds into the handler with their feet. Their size makes them very strong and difficult to handle awake in most cases.

Cassowaries - head, legs, size - similar to the emu except they can fatally wound handlers with their hard crowns.



Figure One - Holding large birds

Birds under 50g - should be handled very carefully as they are fragile and rough handling could further their injuries. They are also difficult to hang onto if they try to escape and can be injured while doing so. A finger on either side of the neck and the body cupped in the palm of the hand allows a good position to examine without restraining the chest too tightly.

Once captured, a rescued bird will travel most calmly in a box with breathing holes, a pet pack or even a pillow case.

Basic First Aid

The success of bird rescue is all in the timing. The sooner veterinary attention is received, the more chance the bird has of eventual release. If a bird cannot fly the reason may be apparent, but it may require diagnostic tests that the normal person cannot perform, such as radiographs and anaesthetics. Veterinary attention is almost always necessary with rescued birds, but there are things rescuers can do if a vet is not available immediately.

Initial Treatment

Basic treatment should always involve **warmth, dark, and quiet**. Cardboard boxes (with air holes), pet packs or pillowcases are the carry cases of choice. If a bird is housed overnight place the box in a warm and quiet place.

Bandaging of wings is usually unnecessary if the bird is contained in a small enough box to discourage movement. However, to avoid further damage to open or unstable fractures good immobilisation may be required.

Strapping the wing to itself or to the body provides good immobilisation. The best tapes for the job are vetwrap or micropore. Elastoplast should never be used as it sticks to the feathers permanently.

Possible diagnoses for flightless birds

If a bird cannot fly and/or is holding a wing incorrectly then there is a very good chance that it has:

- A fracture of the long bones i.e. humerus, radius, ulna, metacarpals, and/or the phalanges AND/OR
- A fracture of the pectoral girdle i.e. clavicle, coracoid, scapula AND/OR
- A subluxation/dislocation of the shoulder or elbow or carpus AND/OR
- Radial nerve damage or a brachial plexus avulsion (may/may not be permanent) AND/OR
- Significant muscular damage AND/OR
- Significant feather damage AND/OR
- A concussion AND/OR
- An eye injury or both eyes injured AND/OR
- A back injury AND/OR
- A concurrent/chronic disease or is a juvenile that is too weak to fly AND/OR
- A leg injury (if a bird cannot spring off the ground, flight cannot be initiated in many cases)

Early, accurate diagnoses are critical to a patient's chances of rehabilitation.

Disease

A diseased bird is often recognizable by its poor condition. If the bird is thin (measured over the keel bone) and no other signs of injury are apparent, then weakness from disease could be concluded to be the cause of flightlessness. If the bird has fresh injuries, but is in poor condition, an old injury or a concurrent illness should be suspected. The most frequently encountered avian diseases in Victoria include:

- *Chlamydophila* (rosellas and lyrebirds)
- spironucleosis (king parrots) (11)
- beak and feather disease (parrots)
- gape worm and throat worm (magpies)
- aspergillosis

In Queensland and N.S.W. other diseases to be aware of include:

- angiostrongylus (causes neurological signs in tawny frogmouths)
- haemoproteus (currawongs)
- necrotic enteritis (rainbow lorikeets)
- encephalomyelitis (rainbow lorikeets)

Some diseases are treatable, but all require prescription medications which can only be supplied by a veterinarian.

Juvenile birds

Nestlings demand much time. The younger the bird, the more chance it has of becoming imprinted and the less likely it will be suitable for release into the wild. It is important that if these birds are to be rehabilitated, they remain unattached to human beings and that they are fed a balanced diet.

Traps to avoid

A common mistake made by inexperienced people is to assume that the bird will get better if an obvious fracture of the wing cannot be found. If a bird cannot fly, all the other injuries need to be ruled out before time and rest can be concluded to be the treatment of choice. Some diagnoses can be very difficult and require time and the ruling out of other injuries before they are made. Appendix three outlines the prognosis for various injuries.

The other mistake commonly made is strapping wings for the treatment of injuries. Unfortunately, few injuries will benefit from strapping for extended periods. Most injuries are either mild enough not to need strapping, or too severe for strapping to work alone. The structure of the wing's patagium and its associated ligaments means that immobilisation for anything longer than 2 weeks will often cause contraction of the elbow or carpal joint leading to a wing that is unable to straighten properly. Very few fractures heal in 2 weeks.

Rehabilitation after treatment

Treatment for birds can range from orthopaedic surgery to cage rest for a concussion. Where the veterinarian leaves off and the rehabilitator takes over will depend on the individual arrangements between the vet and the carer and the facilities available to both parties.

Not everyone will have the facilities necessary for bird rehabilitation, but for most injuries this should be a critical factor in deciding if treatment should be attempted. If the facilities and the experienced people do not exist for rehabilitation, treatment should not be attempted and referral should be considered. Different birds have different **housing and dietary** needs during rehabilitation. Most bird's needs change through the rehabilitation phase. Nearly all birds require small, restricted spaces (enough room to stretch wings, but not enough to fly) to start with, graduating to large exercise areas, to increase fitness closer to release. The general recommendations are that the width of the exercise enclosure be three

times the wing span of the bird to be rehabilitated and at least 10 wing beats long. All birds require at least a week of the rehabilitation time to be outdoors in conditions similar to those that will be experienced once they are released. Most birds need perches set up off the ground to avoid feather damage and faecal soiling.

All birds enjoy a degree of browse in their enclosure, either to hide behind or to eat and destroy!

The dietary requirements of birds vary.

Seed eaters - should be fed a mixed seed of appropriate size with careful observation to ensure that more than one type of seed is actually being eaten. In addition, many native plants, seeding grasses, vegetables and sprouted grain can be offered. Some large cockatoos even enjoy grubs.

Insectivores - should be fed moths, earth worms, fly pupae, maggots, meal worms and crickets which are often available from specialist animal food stores. The last two should be fed on dog food or dipped in calcium powder before being fed to birds as they will lead to calcium deficiencies. Minced meat should never be used alone, but mixed in a 50% ratio with "Insectivore mix" by Wombaroo it may be sufficient for shorter rehabilitation periods.

Piscivores - see below for fish eaters.

Carnivores - eat whole prey in the wild and the same needs to be fed in captivity. Mice and rats make excellent food sources for many birds and chicks and rabbits are useful for larger birds. Sometimes fresh road kill can be useful as a food source to encourage birds to start eating in captivity. Meat alone is not balanced and should be mixed with insectivore mix if no other food source is available.

Nectavores - should be fed a combination of nectar (for recipe, see appendix two), dry lorikeet mix (see recipe below or available in most pet stores) and finely chopped fruit.

The following outlines **recommended housing and feeding** arrangements for various birds. Also mentioned are any peculiarities frequently encountered.

Psittacines - need sturdy, indestructible, weathered wire cages to avoid bored, destructive behaviour and heavy metal poisoning. These birds become humanized quite easily so extensive contact should be avoided.

Feeding - usually seed eaters or nectavores. Seed eaters should be watched to ensure that sunflower seeds are not the only seeds to be eaten. A variety of vegetables, corn, fruit, sprouts, almonds, and native plants should be offered. The nectavores can be offered a variety of fruit and native flowers with a nectar mix. Sprouted seed, mealworms and a lorikeet dry mix can also be offered. If a seed eating parrot is in good condition, but not eating the food offered, it may be too young to have learnt how to fend for itself. Seed may need to be dehulled or the bird crop fed initially. Gang Gang parrots are notorious for taking around 4 days to begin eating in captivity. Hawthorn berries can be used to tempt fussy eaters. Milk thistle is another favourite of galahs and cockatoos.

Raptors & Owls - majority are highly strung and injure themselves when they are disturbed, so the enclosures should have solid sides or blankets over the sides to minimize the disturbance caused by the traffic of people. Goshawks are amongst the most nervous. Birds of prey need thick branches (thicker in circumference than grip) to perch on and to avoid bumble foot. Perches should be placed so that tail feathers are not being damaged. Normal light cycles (especially for owls) should exist. Once exercise is started, a large enclosure should be available. Minimum requirements are 3 metres high x 25 metres long x 5 metres wide. Ideal measurements are 7-8 metres high x 100 metres long x 15 metres wide. Nylon meshing and cables are sufficient, however steel mesh laid into the ground and extending above the ground should be used to stop mice entering the enclosure. These birds often need to be housed for extensive periods, either to regain fitness after an injury or in the case of young birds, to "teach" them how to survive. Young wedge-tailed eagles can take over 12 months to rehabilitate.

Feeding - live food can be problematic, so we only feed dead prey items. These consist of part or whole carcasses of rabbits, chicks, quails, mice, rats etc. Food may need to be alternated till a preferred food source is found. Most raptors will refuse to eat initially, but start eating by day three - seven. If extensive weight loss is seen (10% of bodyweight) crop feeding should be considered, but most raptors are likely to regurgitate in inexperienced hands. Food can consist of egg yolks and /or Hill's a/d diet. This is best avoided, if possible, due to the stress caused to the animal in repeated handling, the expertise required and the risk of aspiration.

Seabirds & Waterbirds - all need some water source to swim in (and often feed in), especially those birds that are not designed for efficient walking like the blue billed duck and grebes. Concrete should never be used alone as it erodes feet and causes bumble foot readily. Instead, either sand or rubber matting should be used. Some ducks, like the freckled ducks, are extremely highly strung and will frequently die without any previous signs of illness. Contact and stress should be minimized. Penguins and some other birds require shelter or a burrow. Larger water birds like pelicans and albatrosses are unlikely to be able to fly unless the area available to take off is extensive (like an open lake) so assessing flying ability can be difficult.

Feeding - Whole fish, preferably fresh, should be fed to the piscivores. If live fish are fed it may help to have them in a shallow dish rather than a deep one. If force feeding, always give fish head first to go in the direction of the scales. Piscivores should also be fed Vitamin E and a Vitamin B complex to compensate for insufficiencies in captive diets. We use "Sea Bird Tablets" by Vetafarm Pty Ltd. For Sea birds a source of 3% salt water is useful to avoid atrophy of the salt gland (the regulatory gland that allows sea water to be drunk and the excessive salt in the sea water to be voided). Alternatively salt can be added to the diet (3g/kg of fish) or a 1% salt water gavage building up to a 3% salt water gavage, can be given in the week before release (2).

Most ducks, geese, swans, etc will eat a mixture of pasture replacement pellets, bread or chick crumble, leafy greens, sprouts and other finely chopped fruit and vegetables. Some of the omnivorous ducks, like the freckled ducks and shelducks also require a protein source like fly pupae.

As a precaution against aspergillosis, sea and water birds should be medicated with itraconazole at 10mg/kg daily while in captivity.

Kookaburras - some are quite calm around humans, but others are extremely nervous and often injure themselves trying to get away. They should be disturbed as little as possible and placing towels/blankets over their cages reduces the stress of visual stimuli. The flightier they are, the longer it takes them to eat in captivity and the more likely they are to damage their feathers. They routinely do not eat for the first 4 days and sometimes require force feeding (small mice are useful). They are also a kingfisher and often appreciate a shallow dish to bathe in. When outdoors, they spend a lot of time watching out their enclosures and perches should be offered to facilitate this as tail feathers are often damaged if they are hanging off wire frequently. Tail guards may be necessary. We do not use tail guards regularly, but if necessary, small zip lock plastic bags stapled to the feather shafts work well. The feathers should be dry when this is done as mould can grow on wet feathers.

Feeding - usually offered a mix of meal worms, fly pupae, crickets, Eco Pet dog food, and mice, the mice being a preferred food. Mice are useful to administer medications. The medications are injected into the dead mouse and fed to the kookaburra.

Tawny Frogmouths - these are very stoic birds that prefer to remain immobile rather than expend energy eating and flying in captivity, even when faced with immediate threat. They can be aggressive so should be treated with respect. No special housing requirements are necessary for these birds. However, it is very important that thick branches and foliage are offered as these birds are designed to blend in with their surroundings and will naturally try to.

Feeding - similar to kookaburras, Eco Pet, mice and mealworms. More often than not these birds need to be hand fed (they would normally eat insects). Rarely will they search it out. Most take the food readily from the hand, even adults, so do not think the bird is a juvenile if it behaves this way. Provided they are actually being hand fed regularly these birds will tend to get overweight in captivity, so keep the quantity to around 2-3 mice a day or an equivalent. Despite an apparent dependence on carers in captivity radio-tracking studies have shown that they feed themselves again once released.

Swifts and Swallows - can be very difficult to house because they like to sit high up in corners and if left in this position in captivity, extensive feather damage often occurs. Placing sheets around for these birds to cling to often reduces the damage. Feather guards can also be used. Some of the swifts are also migratory so rehabilitation has to be considered in terms of whether the bird will be releasable by migration time. If not, they will have to be kept in captivity for another year till the next migration.

Feeding - mostly insectivorous so they require a source of fly pupae, meal worms, earthworms, crickets and they will also eat nectar mixes, canary starter and "meat mix" (see appendix two). Like the frogmouths, they prefer to catch food while flying so they do not feed in captivity voluntarily. This means that they need to be force fed. Unlike the frogmouths which can be fed once a day, the swifts require frequent meals. A decision to try and rehabilitate these birds should not be undertaken lightly.

Magpies, Ravens, Currawongs - relatively easy to house, but they make a lot of mess. They are very intelligent and lose their fear of humans quite rapidly. It is best to make them find their food rather than offering it to them easily.

Feeding - "meat mix" (see appendix two), earthworms in soil, mealworms, small mice and crickets will all be eaten.

The above list is not exhaustive, but many of the other birds have relatively easy requirements. The Veterinary department at Healesville Sanctuary has an extensive list of captive diets for birds, so if advice is needed for an unusual species a veterinarian can be contacted on (03) 5957 2830.

Exercise

Due to the time spent in inactivity during recovery most birds will be less fit after treatment than when they presented. The degree of necessity for exercise depends on the species of bird and how long it is in captivity. Studies both here at Healesville Sanctuary and in America (3, 4, 5, and 7) have shown that in raptors fitness can determine the likelihood of success of a bird once released. Birds that were less fit when released were more likely to lose weight than their fit counterparts. Weight loss is a good indicator of whether the bird is eating and since these birds have to be fit to catch their food it has been shown that fitness is essential to survival. This makes sense, considering the athleticism required by many raptors when capturing food.

A study done by Holz and Naisbitt showed that forcing brown goshawks to fly around a large enclosure repeatedly (as recommended by some authors to promote fitness) did not help build up fitness as appreciably as falconry training, a highly controversial and illegal practice in Australia. Some institutions, such as Healesville Sanctuary, have special licenses allowing them to use falconry techniques to regain the fitness of raptors, but the skills required takes years of practice to become proficient and involve hours of time with each individual bird. The details are far too complex for inclusion here, but briefly the training is based on food rewards and the bird is encouraged to fly away from and then come back to the handler. Initially this is done on a large rope known as a creance and eventually the bird is free flown, then left out in the wild for longer and longer periods, while still being fed by the handler. After a while the supplementary food is stopped.

Not all birds require the degree of fitness that some raptors require, but all need to be able to **feed, compete, escape threats and fear humans**. Any bird that is in captivity for longer than 2 weeks can be assumed to have lost significant fitness and should be encouraged to exercise before release. They should be able to get good lift off the ground and rise two metres straight up. They should also be able to complete at least 10 flights of their exercise aviary with a return of the normal breathing rate within 30 seconds.

For some this may involve being “chased” around an enclosure. Birds can be encouraged to fly by placing their food away from their perches, or pacing it on the ground while the perches remain high. Kookaburras gain a reasonable amount of fitness this way.

Migratory birds require an extensive level of fitness and this should be considered before undertaking rehabilitation. If there is insufficient time to treat a bird and get it fit before its intended migration then arrangements to house it till the following migration need to be considered. Often this is not practical or humane for the bird.

Water birds not only need to be fit for flight and swimming, but their feathers have to be waterproof. After being covered with oil and cleaned, penguins in rehabilitation take many days to become waterproof again. During this time they have to have regular swimming sessions to preen. They should be watched closely because if they become water logged they can drown. Before release, penguins should be able to swim for three hours without becoming wet beyond the outer layer of feathers.

If a bird is only in captivity for a short period (1 -2 weeks), then the levels of fitness should not have altered dramatically.

Post mortems of birds

If a bird dies in care and the reason is not obvious a post mortem is always recommended. These should be performed by a veterinarian. Birds should be refrigerated, not frozen and a post mortem should be performed within 48 hours of death. As with treatment, it is helpful to have a veterinarian that is knowledgeable in bird anatomy or at least interested. The most likely findings will be a traumatic injury to the body, head or back, a septicaemia (indicated by an enlarged spleen or liver) and aspergillosis.

In Summation

Treating wild birds can be very rewarding, but should be undertaken with a few things in mind.

- Quick, accurate diagnosis is essential to ensure injuries can be treated correctly.
- New techniques are being developed for treating injuries all the time so communicate with other carers and veterinarians.
- Open wounds need medical attention immediately.
- Fractures into joints nearly always lead to arthritis and these birds should be euthanised.
- Strapping should be employed only as a temporary measure until veterinary attention can be sought.
- Appropriate housing and feeding is essential during the rehabilitation phase, and if it is not available it is best to refer the patient or euthanase the bird
- Adequate fitness for the lifestyle of the bird is essential to encourage a successful transition between captive rehabilitation and release to the wild.

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Appendix One

Table one - Morphometric data (weight only) of Australian diurnal raptors. Species are listed in order of descending dimorphism indices.

Species	Sex	Mean (g)	Range (g)	Number
Grey Goshawk	M	359	283 – 450	8
<i>Accipiter novaehollandiae</i>	F	674	530 – 785	13
Collared Sparrowhawk	M	125	110 – 150	10
<i>Accipiter cirrhocephalus</i>	F	242	180 – 280	14
Brown Goshawk	M	311	230 – 375	19
<i>Accipiter fasciatus</i>	F	569	480 – 700	27
Little Eagle	M	600	530 – 680	6
<i>Hieraaetus morphnoides</i>	F	1100	880 – 1250	18
Peregrine Falcon	M	588	505 – 675	10
<i>Falco peregrinus</i>	F	875	703 – 950	18
Spotted Harrier	M	507	477 – 537	2
<i>Circus assimilis</i>	F	717	700 – 745	3
Australian Hobby	M	213	177 – 250	8
<i>Falco longipennis</i>	F	293	201 – 340	14
Black Falcon	M	664	620 – 710	5
<i>Falco subniger</i>	F	940	879 - 1000	2
Brown Falcon	M	474	417 – 520	14
<i>Falco berigora</i>	F	625	560 – 730	24
Wedge – tailed Eagle	M	3137	2045 - 4000	10
<i>Aquila audax</i>	F	4181	3180 - 5300	19
White-bellied Sea-eagle	M	2875	2700 – 3000	4
<i>Haliaeetus leucogaster</i>	F	3452	2695 – 3900	6
Marsh Harrier	M	632	530 – 740	53
<i>Circus aeruginosus</i>	F	847	740 - 1080	75
Australian Kestrel	M	158	137 – 195	21
<i>Falco cenchroides</i>	F	180	153 – 219	16
Whistling Kite	M	710	600 – 750	21
<i>Haliastur sphenurus</i>	F	830	760 – 900	29
Pacific Baza	M	296	-	1
<i>Aviceda subcristata</i>	F	338	-	1
Black-shouldered Kite	M	261	200 – 300	11
<i>Elanus notatus</i>	F	299	250 – 340	9
Letter-winged Kite	M	259	217 – 312	3
<i>Elanus scriptus</i>	F	-	-	-
Black Kite	M	574	505 – 610	6
<i>Milvus migrans</i>	F	592	529 – 690	9

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Appendix Two

Dietary mixes

NECTAR MIX - To Make up:

Nectar Mix	2 Litres	4 Litres	6 Litres	8 Litres
Honey	700 ml	1.4 Litres	2.1 Litres	2.8 Litres
Hot Water	1.0 Litre	2.0 Litres	3.0 Litres	4.0 Litres
Eggs	3	6	9	12
Soluvet	20 g	40 g	60 g	80 g
Calcivet	20 ml	40 ml	60 ml	80 ml
Cold Water	250 ml	500 ml	750 ml	1.0 Litre
Cereal	70 g	140 g	210 g	280 g

- Dissolve the honey in the hot water.
- Blend together: Eggs - hard boiled - shelled.
Soluvet
Calcivet
Cold water
- Once blended, add mix to the honey and water, together with High Protein Baby Cereal.
- It is essential that the vitamin supplements are thoroughly mixed to ensure even distribution throughout the mix.
- This mix needs to be made fresh on a daily basis. Remaining contents of each day should be discarded.
- The mix can be made up last thing each afternoon and placed in the fridge.

LORIKEET DRY MIX

1.2kg Canary Starter (7 cups)
1.7kg Rice Flower (6 cups)
1.2kg Rice Cereal (14 cups)
800g Glucodin (3½ cups)
80g Pollen (5 tablespoons)

Must be weighed accurately

MEAT MIX

5kg Ecopet Pet Health Loaf grated.
Lamb only due to bones in the chicken loaf.
6 Eggs, grated.
200g Cheese, grated.
200g Fly pupae.

Appendix Three

Injuries in birds, treatment options and prognosis

<u>Bone/joint/nerve</u>	<u>Type of injury</u>	<u>Treatment</u>	<u>Prognosis in experienced care</u>
Humerus	High fracture	May get better with strapping alone, but should be surgically fixed if possible	Good
	Tubercle avulsion	No current technique for repair, bird unlikely to fly again.	Poor
	Midshaft fracture	Requires surgical fixation in most cases	Guarded
	Low fracture	Requires surgical fixation in all cases	Guarded
Elbow	Luxation	May get better with strapping alone, but should be seen by a veterinarian to align and determine if surgical fixation necessary	Poor
Ulna	Fracture	May get better with strapping alone, but will heal more quickly if surgically fixed	Good
Radius	Fracture	Usually requires cage rest alone or strapping if unstable or surgical fixation if open and displaced	Good
Ulna & Radius	Fracture	Requires surgical fixation in all cases	Guarded
Carpus	Luxation	May get better with strapping alone, but should be seen by a veterinarian to align joint	Poor
Carpometacarpals	Single Fracture	May get better with strapping alone, but should be seen by a veterinarian to radiograph	Good
	Both Fractured	Requires surgical fixation in most cases	Guarded
Phalanges	Fractured	May get better with strapping alone, but should be seen by a veterinarian to determine if surgical fixation necessary	Guarded
Shoulder	Luxation	Requires surgical fixation in most cases. Unlikely to repair with cage rest alone	Guarded
Coracoid	Fracture	May get better with cage rest alone, but surgery often needed - must be seen by a veterinarian to radiograph and diagnose	Guarded
	Luxation	Must have surgery to fly again - must be seen by a veterinarian to radiograph and diagnose	Guarded

<u>Bone/joint/nerve</u>	<u>Type of injury</u>	<u>Treatment</u>	<u>Prognosis in experienced care</u>
Clavicle	Fracture	Usually requires cage rest alone - must be seen by a veterinarian to radiograph and diagnose	Good
Scapula	Fracture	Usually requires cage rest alone - must be seen by a veterinarian to radiograph and diagnose	Good
Hip	Luxation	Requires anaesthetic/surgical fixation in all cases	Guarded
Femur	Fracture	Requires surgical fixation in all cases	Good
Stifle	Luxation	Requires surgical fixation in all cases	Poor
Tibiotarsus	Fracture	May get better with splinting alone, but should be seen by a veterinarian to align and determine if surgical fixation necessary	Good
Tarsometatarsals	Fracture	May get better with splinting alone, but should be seen by a veterinarian to align and determine if surgical fixation necessary	Good
Halux	Fracture	Usually requires splinting/bandage - must be seen by a veterinarian to radiograph and diagnose	Good
Spine	Fracture	Some tail fractures have healed, but all higher problems are untreatable	Poor
Radial nerve	Severed	Usually untreatable	Poor
Brachial Plexus	Avulsion	Untreatable	Poor
Any Nerve	Bruised	Cage rest	Guarded