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# “Raptor Care, Rehabilitation & Medicine”

Dr Ellen Rasidi

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Raptor care, rehabilitation and medicine:  
applying lessons learnt overseas to raptor care in New South Wales

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## Abstract:

In many countries, birds of prey are deeply entwined in the culture, history and national identity - particularly in the Gulf States and in North America. These countries also lead the way in raptor research, veterinary medicine and rehabilitation techniques.

Drawing on experiences at the Abu Dhabi Falcon Hospital, UAE, and the University of Minnesota's Gabbert Raptor Centre, several key aspects of raptor rehabilitation will be discussed, with a focus on how best to apply techniques learnt to raptor care in Australia, particularly in the author's home state of New South Wales. This presentation is aimed at wildlife carers and rehabilitators, as well as those vets assisting in the rehabilitation of these birds in Australia.

Key ideas discussed will include:

- the importance of prompt veterinary intervention, and collaboration not only between veterinarians, but between veterinarians and carers;
- management of orthopaedic cases, both surgically and non-surgically, with particular regard to the behaviour in captivity of particular species;
- the importance of feather care during rehabilitation, and the impacts of imping, tail guards and bandaging;
- feeding in convalescence, rehabilitation and monitoring intake and weight gain;
- pre-release fitness, and the impact of cage, enclosure and aviary design.

This presentation is aimed at wildlife carers and rehabilitators, as well as those vets assisting in the rehabilitation of these birds in Australia.

Both the United Arab Emirates and the United States of America have long cultural associations with birds of prey, and in both modern societies, raptors are very closely associated with national identity.

For Bedouin Emiratis, falconry is not just a modern sport and leisure activity, but was a necessary survival skill that enabled their people to thrive in the desert environment. Falconry is considered a heritage sport in the UAE and is practised by males of all classes; it is considered a living human heritage on UNESCO's representative list of Intangible Cultural Heritage of Humanity. Falcon ownership is widespread in the UAE and the Abu Dhabi Falcon Hospital (ADFH, [www.falconhospital.com](http://www.falconhospital.com)) is a world-class veterinary facility dedicated to not only the medical and surgical care of these highly valued birds, treating over 5000 patients each year, but runs the Sheikh Zayed Falcon Release Programme, in which native Peregrine and Saker falcons are rehabilitated and released.

American identity has been intertwined with the bald eagle since before 1782, when the bird was selected to appear on the official seal of the newly formed nation by the Second Continental Congress. Culturally and politically, the bald eagle has become an icon of American democracy, virtue, national unity and conquest, and respect for the symbol and in turn fostered deep respect for the species itself. This is seen not only through innumerable cultural references, but also through the creation and enforcement of laws specifically relating to the protection of eagles, such as the Lacey Act (1900) and the Bald Eagle Protection Act (1940).

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The Raptor Centre (TRC, [www.raptor.umn.edu](http://www.raptor.umn.edu)) at the University of Minnesota is another world-class facility dedicated to the treatment, rehabilitation and release of all native raptor species, and treats over 1000 birds each year. Like the Abu Dhabi Falcon Hospital, clinical, biological and epidemiological research are an important part of their program, as well as formal training programs for veterinarians, veterinary students and wildlife rehabilitators.

The author has been fortunate enough to have participated in the internship programs of both these excellent facilities, and has been able to transfer, modify and apply valuable concepts and ideas to raptor care and rehabilitation in New South Wales.

## Prompt veterinary intervention

In the author's experience (and that of her colleagues), the origin of most raptors coming into care in New South Wales tend to be in rural and regional areas, with the exception of some pelagic species - such as osprey (*Pandion haliaetus*) and white-bellied sea eagles (*Haliaeetus leucogaster*) - or species adapted to urban spaces such as the peregrine falcon (*Falco peregrinus*). This has implications for veterinary intervention in wildlife cases, as most avian veterinarians in NSW are located in the major metropolitan and regional centres, though many regional and rural general practitioners have expressed a willingness to treat wildlife, including birds of prey. Rapid transport to a facility for veterinary care is one of the major factors contributing to the success or failure of rehabilitation.

At both the ADFH and TRC, veterinary assessment and triage is considered to be the first major event in any wildlife case. Cases may present to the ADFH after confiscation by officers of the Ministry of Environment and Water, or directly by members of the public. It is an offense to be in possession of a wild raptor (all falconry birds are captive bred and registered), and there is no recognised volunteer wildlife rehabilitation outside veterinary and zoological institutions. The TRC is part of a national network of wildlife rescue volunteers and rehabilitation institutions which field calls from emergency services, rangers and members of the public regarding injured or ill raptors. The public are instructed to only entrap and confine the animal if safe to do so, and volunteers dispatched immediately to collect and return the animal to the TRC for triage and veterinary assessment. It is uncommon for more than 18 hours to elapse between initial call and presentation at the clinic. These practices are in line with the USA's Minimum Standards for Wildlife Rehabilitation (Miller, 2012), which states that "most rehabilitation permits require a cooperating veterinarian as a condition for legitimate operation of a wildlife care facility (of any size)", and that "in most states and under most circumstances, the legal prescription of medical care for wildlife patients is the responsibility of a veterinarian".

Initial veterinary triage at both ADFH and TRC includes full physical examination, radiographs (full-body, minimum two views), blood work (minimum CBC, possibly biochemistry if indicated, lead testing for all eagle species in the USA), ophthalmic examination, and microscopic examination of oropharyngeal (for all bird-eating species) and faecal samples (if indicated). This initial examination, which can easily be conducted in less than 30 minutes by a veterinary professional, is invaluable in diagnosis and essential for guiding initial medical treatment and care. If the animal is not considered releasable, then humane euthanasia is performed immediately.

Unfortunately, it appears that raptor cases in Australia are rarely presented to an experienced veterinarian within a similar timeframe, and nor are veterinary triages as thorough as those described above. The NSW Office of Environment and Heritage (OEH) Code of Practice for Injured, Sick and Orphaned Protected Fauna (2011), section 4.1.2. states that "rescuers must arrange for fauna to be assessed by a veterinarian or experienced fauna rehabilitator within 24 hours of rescue to ensure accurate diagnosis and prompt treatment or euthanasia. If this is not possible due to the remoteness of the location, expert advice must be sought via telephone or email". In some cases, such as obvious untreatable traumatic wounds in which euthanasia is the only viable options, triage in discussion with an experienced carer is certainly acceptable.

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However, many common injuries seen in raptors, in particular fractures and other musculoskeletal injuries, and ophthalmic disorders, are not able to be accurately identified or diagnosed without clinical instrumentation (radiographic suites or ophthalmoscopic equipment), and if left unidentified or untreated, pose grave threats to the animal's wellbeing and prognosis for release. In the absence of prompt and thorough veterinary triage/assessment, treatable injuries become infected, malaligned, more painful and may become untreatable, leading to death in care or euthanasia. At best, failure of early diagnosis results in the wastage of already limited resources; at worst, in prolonged suffering of an animal.

Raptors coming into care often have concurrent medical issues, and thorough assessment enables identification of all, avoiding the common trap on focussing on one to the detriment of the other(s). It is heartbreaking to all involved when the recovered ophthalmic patient is discovered to have developed osteoarthritis in a severe humeral head luxation, only identified several weeks into the rehabilitation process when it is noted that the bird cannot fly; or when a patient with a painstakingly mended and rehabilitated ulnar fracture succumbs to an unidentified *Trichmonas* infection.

Part of the author's goal in association with Australian Raptor Care and Conservation (ARCC) Inc. is to encourage communication between veterinarians (and other veterinarians) and carers (and other carers), regardless of experience or affiliation. One of the most important relationships within wildlife rehabilitation is the relationship between the carer and the local, or primary-care veterinarian. Due to scarcity of rural clinicians, the closest clinic may not have the expertise to perform complicated fracture repairs or avian biochemistry panels, but will have access to inhalant isoflurane anaesthesia, radiography and microscopy. Armed with baseline data, the primary care veterinarian should feel comfortable in seeking guidance from experienced colleagues in regard to recommended treatment, or whether referral is more appropriate. If the primary care vet cannot or chooses not to perform a thorough triage, referral is strongly recommended. The author feels strongly that good relationships and open communication between carers and veterinarians should ensure that all cases are assessed thoroughly and treated appropriately in a timely fashion. It is the carer's responsibility to seek out and develop a relationship with an appropriate veterinarian, that veterinarian's responsibility to seek advice when required, and the referral veterinarian's responsibility to be available to their colleagues and to take referred cases when appropriate.

The author currently works in a primary accession and referral clinic which sees a large number of wildlife cases, and for all raptor cases collects a minimum database of physical examination, radiographs, CBC (with biochemistry if indicated, funded by sponsors), ophthalmic examination, and microscopic examination of oropharyngeal (for all bird-eating species) and faecal samples (if indicated). Other clinics associated with ARCC do the same, and have generally found that while rates of euthanasia at triage appear to have increased, successful rehabilitation rates seem to have increased. On discussion, there is an increase in the identification of disease or disorder at triage, and more targeted treatment being prescribed from the outset.

## Management of orthopaedic cases

Orthopaedic injury is a common presentation in raptors all over the world, and the Australian caseload is no exception. TRC are considered to be the world leaders in the field of avian orthopaedics, and have developed general guidelines for the surgical and non-surgical management of different fracture types. Accurate diagnosis during initial triage, enabled by full-body, two view (with additional anterior-posterior views of the pectoral limbs if indicated) radiographs, allow prompt surgical treatment, and facilitate planning of surgical repair. Successful rehabilitation of all raptor species with orthopaedic injury depends on excellent surgical repair, to ensure correct anatomical alignment and avoid shortening.

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However, equally important is post-surgical management, designed to not only restore normal function, but prevent tendon and soft tissue contraction, maintain joint mobility, prevent ankylosis and the formation of synostoses. It is not acceptable to simply bandage or 'strap' a fracture and leave it thus restricted for three or four weeks.

At both the ADFH and TRC, post-operative physiotherapy begins 3-10 days after fracture alignment. If the fracture is uncomplicated and has undergone surgical fixation with minimal soft tissue trauma, this may begin after 3 days; if the fracture has been managed conservatively with bandaging or splinting, physiotherapy may wait for 10 days to allow fracture stabilisation.

At TRC, physiotherapy is a combination of passive-range-of-motion (PROM) and stretch-and-hold procedures, and is conducted in short sessions every three days. At first, PROM is performed under general anaesthesia (inhalation isoflurane) and opioid analgesia is administered prior to joint manipulation. The bandaging is removed and any wounds examined for monitoring of healing. The entire limb is gently manipulated, starting with the distal joint and progressing to the proximal joint, throughout its entire range of motion, as far as possible. The limb is extended and held in maximum extension for 10-20 seconds, then flexed and held in maximum flexion for 10-20 seconds. Any wounds are treated and dressed, and any bandaging replaced. Once recovered from anaesthesia, the bird is returned to the hospital cage. Physiotherapy sessions continue every 3 days throughout the recovery period, until all external and internal fixators (bone pins etc.) are removed and the bird graduates from a hospital cage to an aviary. At this stage, it is expected that the bird will be able to move normally and gain strength and fitness, either in an aviary large enough to permit free flight, or through regular creance flying sessions.

While this regime of physiotherapy is considered gold-standard in rehabilitation facilities with an on-site veterinary clinic, this is not always possible, practical or even advised in the Australian system. As most care facilities operate outside the zoo network, there may be a considerable amount of transport time (and stress) and cost between the hospital cage and veterinary clinic to enable physiotherapy under anaesthesia. At the facility managed by ARCC, the local veterinary centre is a 20-minute drive away, and with 25-30 birds in care at any one time, the benefits of the recommended post-operative physiotherapy are outweighed by the regular stress of handling and transport. We have found that by utilising different aspects of the recommended physiotherapy regimes, and with careful attention paid to staged housing and husbandry requirements, post-surgical orthopaedic cases can be managed successfully without extensive PROM physiotherapy.

Post-surgically, birds are maintained in an ICU unit, in hospital cages with solid walls and sized to prevent wing extension. Birds are maintained on soft flooring (towelling) and allowed to perch only on rolled towels. During the immediate post-surgical period, bandages are maintained as directed by the treating veterinarian. At 7-10 days post-operative, the fracture is re-radiographed under general anaesthesia, and if signs of healing are present, the bandaging is lightened or removed, depending on superficial wound healing and the tolerance of the bird to limb restriction. Some birds are highly tolerant; some individuals refuse food when bandaged and remain dull and depressed, despite adequate analgesia (with both non-steroidal anti-inflammatory drugs (NSAIDs) and opioids if necessary). We consider a willingness to feed independently to be a key prognostic indicator of successful rehabilitation, and so reducing a bandage's bulk or leaving it off altogether (provided there is relative stability at the fracture site and indications of healing) is preferable to continuing assistance feeding longer than 7-10 days post-surgical.

At this stage physiotherapy is performed while the bird is under general anaesthesia, and the limb assessed for signs of stricture or contracture. If bandaging is replaced, it is made as light as possible. Bandaged birds are seen by the vet at least once a week for PROM under general anaesthesia. Birds without bandaging are moved to small aviaries with room to perch, walk, stretch and feed themselves, but which are not large enough to encourage gliding or flying. The ARCC facility has numerous aviaries in a range of sizes (SIZES L x W x H: 7m x 5m x 4m)

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through which all orthopaedic cases progress. In this way, bird's activity can be modified by controlling the amount of space available to it. Thus, the convalescing bird conducts his own physiotherapy, beginning to stretch and move his own limbs as he feels comfortable to do so. Naturally, anti-inflammatory and antibiotic therapy continues throughout this period.

The fracture is radiographed again at 3 weeks post-surgery, to establish whether healing and callus formation have occurred. Depending on the type of surgical fixation, destabilisation of the fracture or partial removal of the external fixator may occur at this time, and the bird will continue to progress through the facility, moving to a larger aviary as the limb becomes stronger. Once the fracture is completely healed and no further medical treatment is necessary, the bird is moved to the pre-release flight aviary for free flight and development of fitness in anticipation of release (description of this aviary later in the text).

Using this modified program, we have found that with minimal bandaging, proper and continual assessment from veterinarians and carers, and careful management and appropriate housing, most birds conduct their own physiotherapy quite well. Initial surgical repair and continuing analgesia is key to this process.

## Feather care

It is an inescapable tenet of raptor rehabilitation - feathers, particularly those of the tail and wings (remiges and retrices) must be preserved in as best condition as possible. The survival after release of so many of these birds depends on the quality of these feathers and poor quality feathers directly affects the ability to fly, hunt, and mate successfully.

Unfortunately, the rehabilitation process is fraught with events that negatively impact feather condition.

The bird may be grounded before coming into care, or may be housed inappropriately by a well-meaning member of the public. Many a feather is broken in this fashion. It goes without saying that housing, transportation and handling should be carried out with due consideration to feather damage: transport cages and aviaries must be lined with shade cloth; perches and foliage removed from transport cages (an old towel on the floor is sufficient for the bird to grip); handlers should be experienced, move calmly and quietly, and towels used to hold and wrap the bird. The eyes of the bird should be covered at all times when handling.

Veterinary treatment, particularly bandaging and surgery, is often the cause of feather loss or trauma. Vets and vet nurses often remove feathers in the quest to create a sterile surgical field or to better examine a wound, without realising the consequences of their actions. Pulling and forcibly removing a flight feather is painful, as the root is anchored in the periosteum of the underlying bone, and forcible removal can traumatise the feather follicle, resulting in abnormal, delayed or cessation of feather regrowth. In many situations, the area can be prepped by wetting the feathers and directing them away from the site, and by judicious use of low-adhesive tape to keep them out of the way. Where removal of feathers is unavoidable, cutting flight feathers at the superior umbilicus to allow impingement at a later stage is preferred.

When bandaging, take note of the feathers involved and incorporate, rather than cut them. Most standard bird-bandaging techniques (such as the figure-8 wing bandage) accommodate the flight feathers. It should also be noted that adhesive bandaging such as Elastoplast should never be placed directly on the feathers, and a non-adhesive layer used underneath such adhesive products.

At both TRC and the ADFH, tail feathers are protected during rehabilitation using tail guards. Tail guards are a flat sheath of thin plastic folded over and enclosing the tail feathers. The sheath extends a centimetre or so beyond the end of the longest feather, and is secured to the base of the tail feathers with low-adhesive tape such as Micropore or paper tape. At TRC, tail guards are placed on all birds housed in hospital cages, except owl species (as they find that their owl species do not tolerate them well) and juveniles with tail feathers still partially in blood.

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At the ADFH, tail guards are placed on all birds with difficulty perching, including those with orthopaedic injuries of the feet and legs, recumbent birds or those undergoing treatment for pododermatitis/bumblefoot.

We have trialled the routine use of tail guards, but have found that in our facility they are usually unnecessary; however, this is not to say that in different circumstances they are not extremely useful. At the ARCC facility, hospital cages have solid walls, towelling is used to line the floor and rolled towels are used for perches. This eliminates feather damage due to catching in caging and elevates the bird to prevent tail damage. We note that some birds may become distressed when tail guards are applied, and if weakened, may have trouble lifting the tail, particularly when defecating.

The use of tail guards is likely highly case-dependent and will vary according to the cage or hospital facilities available. The bird's response should be monitored closely and the guard removed if it causing distress. As with any management technique, tail guards should be applied with care and only by those with experience in their use.

Imping, or feather transplantation, is another common technique used in the Middle East and North America, which should only be performed by experienced practitioners. Imping is not often performed in Australia, though there are no reasons why the practice should not be learnt and developed. There are several veterinarians trained in imping, and a few feather banks available to the rehabilitation sector if required. However, the caveat for the use of imping, is that when performed by the inexperienced or ill-informed practitioner will cause more harm than good. Poor imping technique results in splitting of the remaining feather shaft, meaning that the imping process cannot be repeated, and the feather will need to be moulted and regrown. As previously mentioned, intentional removal or pulling of flight feathers is not recommended.

## Feeding and weight gain

Feeding birds of prey is usually fairly straight forward: whole food (entire animals) should be fed, and the species and size of the animal fed should be appropriate to the natural diet of the raptor being fed. Adult animals should be used as food rather than juveniles - if pinkie mice/rats or day-old-chicks are used, they must be dusted with calcium powder, and should be fed only for temporary periods of time. The bones of these animals are not fully developed and can lead to calcium deficiencies in the birds that eat them. Otherwise, when whole animals are fed, no further supplementation is required.

There are a few exceptions to this rule. Debilitated birds or those undergoing intense convalescence may require a diet more appropriate to their needs. At the ADFH, a staged feeding regimen has been developed, the details of which can be found in (ref: Dr Margit's book). Summarised, this staged feeding begins with an electrolyte (such as Spark®) mixed with egg yolk, used for initial crop feeding, and moves through more substantial crop feeding mixtures made of blended offal (chicken or quail liver, chicken hearts) and chicken meat. The bird is then offered small pieces of chopped liver and meat (chicken, quail, rat or fish, depending on the species); then bigger pieces with small, then larger pieces of bone left in. Whole food can then be trialled. At TRC, whole food is initially offered 'opened' - slit down the front to expose the viscera. Both facilities recommend offering food items warmed to body temperature to increase palatability.

It is important when feeding to be aware of any impediment to normal feeding behaviour. Birds with coracoid fractures in particular often find the ingestion of large pieces painful, and may be reluctant to bend or tear whole prey. These patients are often best offered small pieces of boneless food to begin with, and then slowly advanced through the recommended feeding regimen as they recuperate. Careful monitoring of these birds is necessary as uneaten food may not be an indicator of a loss of appetite, but an inability to cope with the food in the form presented.

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Birds with significant or extensive injuries or bandaging may also find it difficult to tear whole food items and may require their food in pieces, and presented on a raised platform to eliminate bending.

As pain is a significant appetite suppressant, analgesia is paramount (as always!).

While encouraging raptors in rehabilitation to feed is of great importance, preventing excessive weight gain is of equal importance. There is no hard and fast rule regarding the amount that should be fed. Some guidelines state that raptors should be offered 10% of their body weight in food every day. I would state that the amount of food offered should be tailored to the species of bird, their current physical and medical condition, and the amount of daily physical activity that bird does. For example, a bird coming into care in an emaciated condition and chronic underlying issues would likely be fed *ad lib* initially, without restriction (in the early stages only); a bird with an acute presentation in good condition would be offered a limited amount of food, to avoid excessive weight gain. Wedge-tailed eagles tend to not overeat even when offered an excess of food, whereas falcons have a tendency towards obesity, and become overweight very easily in captivity. This is likely due the differences in natural behaviour - falcons expend huge amounts of energy in hunting and acquisition of food in the wild, and are therefore likely to eat when and wherever they can. Eagles and other carrion eaters are more likely to have a constant supply of food in the natural environment, and less likely to be driven to eat everything in front of them.

This is a very important consideration, particularly in relation to pre-release fitness. A bird may eat well, and appear to be in good body and feather condition, but in fact be significantly overweight. Obesity will obviously lead to poor release outcomes, and leads neatly into the need for the development of appropriate fitness before release (addressed later in this text).

In the monitoring of the bird's condition during the rehabilitation process, there is no substitute for physical handling and examination. Regular weighing gives valuable information about overall body weight, but over any period of time in captivity, muscle mass is lost and a significant portion of this body weight may be fat deposition. Most birds of prey naturally carry very small amounts of internal fat, and fat deposition during rehabilitation can be fatal on release. Carers and vets should ensure they take every opportunity to palpated the keel and the pectoral muscles either side to evaluate muscle mass, as well as palpating the soft tissue in the neck, thoracic inlet (at the upper end of the keel) and the coelom or abdomen to identify accumulations of fatty tissue.

## Pre-release fitness

Pre release fitness is one of the biggest concerns in raptor rehabilitation, and much is made of the dramatic reductions in muscle strength and cardiovascular fitness that occurs in birds of prey in captivity. It is for this reason that there appears to be reluctance among vets and carers in Australia to keep these birds in care for longer than a few weeks, or to treat conditions which require lengthy convalescence. However it has been shown, both overseas and in Australian facilities, that fitness can be built and maintained, and successful releases can be achieved after periods in care of over 12 months - provided two housing conditions are met. Firstly, pre-release aviaries must be large enough to enable free (or relatively free) flight, as well as allow ample room for taking off, landing, and basic aerial manoeuvres (turning, braking etc.). Secondly, aviaries must be designed so as to encourage flight and other natural behaviours, including social interaction, feeding, bathing and interaction with the natural environment.

As real estate is limited at the University Campus on which TRC is located (and a large roster of volunteer carers ensures plentiful labour), falconry techniques are used instead of free flight to ensure birds are exercised and fitness is maintained. Birds are treated in the clinic and housed in hospital cages similar to the ICU cages described above. Once medical treatment is complete, they are moved to outside aviaries which range from SIZE SIZE depending on the species housed. Conspecifics are housed together.

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Once settled into these, creance flying training is initiated, starting with short sessions once or twice a week, and then gradually increasing to longer sessions more frequently. In the weeks leading up to release, creance sessions occur every day.

Real estate is not an issue at the ADFH, and they have taken a different approach to building and maintaining pre-release fitness. After medical treatment (during which birds are housed in hospital cages, as at TRC), wild peregrine and saker falcons are placed into a single aviary reserved for the Sheikh Zayed Falcon Release Programme. Birds are released along the natural migration path once a year, and so may be housed for up to 12 months.

Major relevant design aspects include the circular nature of the aviary, and an enclosed central pavilion which acts as a visual barrier. These two features combine to encourage birds to fly around the aviary, by preventing visual fixation on an end point, and creating a curving space with no corners of sudden ends. Whereas in a rectangular space, birds fly lengths up and down, and the length of flight is determined by the length of aviary, in a circular aviary birds fly around and around, and the length of flight is determined only by the bird's fitness or inclination. Perches, baths, feeding stations and alcoves for privacy are arranged within the aviary space.

The pre-lease flight aviary at the ARCC facility is based on the Abu Dhabi model, as falconry techniques such as creance flying are restricted in NSW and are labour-intensive. The main design points are the same - the aviary is circular and has a maximum height of 8m and a radius of about 16m, giving an internal circumference of 100m. The central pavilion is about 4m wide, and covered in shade cloth to form a visual barrier to the inhabitants.

The differences compared to the ADFH aviaries lie in the construction and materials. In Abu Dhabi the aviary is of solid construction with insulated walls and roof, to protect the birds from sandstorms and extreme temperatures. Air conditioning units are fitted to the walls. In the Southern Highlands, drainage is of highest importance to prevent nosocomial fungal infections. The aviary has a steel frame, with UV-resistant shark-proof netting used for roof and walls. Cyclone mesh is sunk several meters below ground, with solid walls 1.5m high for predator protection. The walls are lined with shade cloth from ground to roof. Perches, baths, and feeding stations are placed at intervals around the space. There are native plantings of various heights, and several tree stumps and logs. There is an alcove with a solid roof to provide shelter from the worst weather, and the central pavilion also has a solid roof and door, and can serve as a shelter, or as a separate aviary space. For optimal hygiene and drainage, the floor is washed river sand (about 500mm deep) over a similar depth of blue metal gravel. Details regarding the design and construction of this aviary can be found at [australianraptorcareandconservation.com](http://australianraptorcareandconservation.com).

Many species have been successfully rehabilitated in this space and released, including some individuals who have been in care for over 12 months. Birds are not considered fit for release until they have demonstrated the ability to take off and land with accuracy and confidence, manoeuvre mid-air, and fly reasonable distances, depending on species. The assessment process is greatly assisted by the CCTV system which was installed to allow carers and vets to monitor the birds' activities. This aviary has allowed us to accept cases which required extensive or long-term treatment, and has alerted us to shortcomings of the current minimum housing requirements for rehabilitation of Australian birds of prey. We have had several cases referred to us, both from carer and zoological organisations, where the bird had been housed according to these national standards and was deemed fit for release. However, there had been enough concern to warrant referral to the ARCC facility for assessment. Not one of these birds was able to fulfil the prerequisites of release (accurate take-off and landing, mid-air manoeuvring and distance flying).

We have found that an aviary of this size and design is not only the best option for pre-release fitness but also allows enough space for practice of essential behaviours, which is vital in the rehabilitation of young and orphaned birds, as well as those with anatomical alterations (such as an amputated phalanx).



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