Husbandry Manual Guidelines
For the
Eastern Long-Billed Corella

Class: Aves
Cacatua tenuirostris

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Certificate 3 Captive Animals
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DISCLAIMER
OCCUPATIONAL HEALTH AND SAFETY RISKS

- Bites and scratches
- Parasites
- Psittacine Beak and Feather Disease. (PBFD)
- Zoonoses
- Manual Handling
- Machinery
- Chemicals.

**Bites and Scratches**
Long billed corellas can be either kept as captive bred pets and exhibit birds, or in the case of a rehabilitation bird, born in the wild and in care while recuperating from illness or injury and waiting release. They are considered to be innocuous, however wild birds in particular are capable of inflicting a noticeable bite if handled incorrectly. Bites and scratches are therefore to be expected from time to time and should be prepared for in advance ensuring adequate first aid equipment is available in the workplace. Appropriate personal protective equipment (PPE) should also be available e.g. thick cockatoo gloves, thick towels, carrier cages and bird catching nets to minimize close contact handling where possible and minimize stress to the bird. All staff should be familiar with applying a basic parrot hold and use if close contact handling is required for medicating and other necessary treatments.

**Parasites**
Long billed corellas, like all animals generally, can be susceptible to parasites, these can be internal (roundworm, hookworm, coccidia etc), or external (mites, lice). This can particularly happen when a bird is sick and its immune system is low. When handling and treating infected birds it is necessary to wear gloves and wash hands and wear protective clothing, to prevent personal infection, or transfer to other birds in any way.

**Psittacine Beak and Feather Disease (PBFD)**
They are also susceptible to viral Psittacine Beak and Feather Disease (PBFD) which is highly contagious – while this disease is not a zoonoses and will not present a risk to keepers, it can be passed on by keepers to other parrots and cockatoos in their care or contact. PPE is absolutely necessary to prevent healthy birds from becoming infected. Strict quarantine protocols and standard operating procedures (SOPs) must be in place to ensure keepers practice high standards of hygiene, both personal and in their enclosure cleaning, and feeding routines. Use of gloves, footbaths, disinfectants, and separation of cleaning implements will assist with the control of this disease.

**Zoonoses**
Chlamydiosis (Psittacosis) is passed from bird to keeper causing a serious respiratory infection. People who are immune-compromised are most susceptible and prevention includes good hygiene and sanitation. Minimization of dust while cleaning will prevent inhalation of contaminated faecal dust or faecal aerosols; however face masks will further minimize the risks of infection and should be used at all times. Also recommended is the
testing of all birds in care to ensure they are not infected (or carriers), thus minimizing the risk of intermittent shedding of the disease by an otherwise healthy bird.

**Manual Handling**
In our day to day duties as a bird keeper we are often required to perform manual handling tasks, these could include carrying buckets, pushing wheelbarrows, bending, lifting, twisting etc – Often we don’t give enough thought to the consequences of not performing these tasks in a safe and physically stress free fashion. All keepers must be trained in the aspects of safe handling and work practices in the workplace to prevent injuries occurring.

**Machinery**
In addition to the above duties, keepers often utilize tools and machinery in the course of their work day. This may include tools for cutting browse, lawnmowers and whippersnippers, as well as tools required for the general upkeep and minor or temporary repair of their enclosures. All keepers need to be fully trained and competent in the use of all mechanical equipment and use the appropriate PPE at all times.

**Chemicals**
Any chemical required to be used in the workplace must be accompanied by a material safety data sheet (MSDS). This sheet will provide information regarding toxicity, first aid procedures, safety precautions and all prescribed uses. The relevant dilution rates (if applicable), and information regarding safe amounts to use of each product are important to prevent product misuse or accidental poisoning to any keeper or bird.
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1 Introduction

A specimen of this species in the London Museum is said to have been taken at Port Phillip Bay (Victoria) on 27 April, 1802. This is outside this cockatoo's present range and no doubt the Long–billed Corella once enjoyed a far greater range than it does at present, although many of the early sighting of the bird are likely to be a case of mistaken identity as they look much like a Little Corella, particularly from a distance during flight. (Sindel, Lynn, Undated)

This species’ range has fluctuated over its history due to several factors: Firstly, over the last century, as farmers established crops and gathered supplies of water for domestic animal farming, the Long-billed Corella and other species of cockatoos were attracted by the plentiful food and water sources. Their persecution by farmers followed, as they were considered a pest that damaged crops and threaten livelihoods (Victoria).

Its population languished at low numbers for nearly 100 years in the wild before a remarkable resurgence began in the 1950s. (Emison et el)

Uncommon in aviaries about 30–40 years ago, aviculturists made serious attempts to breed them, with much success. Then the aviculture world was flooded with 10,000 wild caught Long-billed Corellas and they became difficult to dispose of.

Licensed trappers who obtained trapping permits from the wildlife authorities caught these birds; ultimately ending up in the pet trade, and the subsequent release of unwanted pets and surplus breeding stock (in 1984) was responsible for the establishment of several feral populations, including Sydney’s, that exist today. (HANZAB)

It is not unusual to see these birds flying and living in flocks of 50 – 100 and occasionally more, in the wild.

1.1 ASMP Category
No

1.2 IUCN Category
Least concerned

1.3 EA Category
This bird is a native Australian species. All native species are protected by law in NSW. This species is allowed to be kept without a license, however you are not allowed to trap them in the wild. It is illegal to trap protected birds, anywhere in NSW. The maximum penalty for trapping a protected or threatened bird is a fine of $220,000 and/or a two-year prison sentence.

You require a license to import or export this species from the state of NSW. (www.environment.nsw.gov.au)

1.4 NZ and PNG Categories and Legislation
No
1.5  *Wild Population Management*
No

1.6  *Species Coordinator*
No

1.7  *Studbook Holder*
No
Taxonomy

1.8 Nomenclature

Class: Aves - birds
Order: Psittaciformes - parrots
Family: Cacatuidae - cockatoos
Genus: Cacatua – Latin from the Malay word kakatua for big parrot
Species: tenuirostris – tennis – Latin for slender, rostrum – Latin for bill
(Sindel, Lynn, Undated)

1.9 Subspecies

This species is a specialized Corella which is unlike all other Corellas, even the similar Western Long-billed Corella is related to parallel evolution rather than a close relationship to the Eastern Long-billed Corella. The distinctive long, slender upper mandible of both these cockatoos has developed to assist the digging of roots and bulbs in the almost totally terrestrial feeding mode. (Sindel, Lynn, Undated)

There are no known subspecies.
Relatives in the same genus include: Sulphur–crested Cockatoo (C. galerita) Major Mitchell’s Cockatoo (C. leadbeateri), Western Corella (C. pastinator), Galah (C. roseicapilla), and the Little Corella (C. sanguine).

1.10 Recent Synonyms

Psittacus nasica, Plyctolophus tenuirostrus, Cacatua nasica, Licmetis tenuirostris, Licmetis nasicus (Green)

1.11 Other Common Names

Eastern Long-billed Corella, Slender-billed cockatoo, Corella, Cockatoo, White cockatoo.
Figure 1: Long-billed Corella *Cacatua teunristris*: 1 Adult male 2 Juvenile 3 Adult
Western Corella *Cacatua pastinator*: nominate *pastinator* 4 Adult male 5 Juvenile 6 Adult subspecies *derbyi* 7 Adult female
Little Corella *Cacatua Sanguinea*: nominate *sanguinea* 8 Adult male subspecies *gymnopis* 9 Adult male 10 Juvenile 11 Adult.
(HANZAB)
3 Natural History

The earliest report of his species of cockatoo was described by Kuhl in Nov. Act. Phys. Acad. Leop. Carol, Vol 10, page 88, 1820, from specimens in the Paris Museum and at Brookes in London. It was given the scientific name of *Psittacus tenuirostris*. The first illustration of this species appears to have been by Temminck who described and portrayed it in 1819 as the Nasecus Cockatoo, *Psittacus nasica*. *(et al Dr Carl Russ, The Speaking Parrot, 1884).*(Sindel, Lynn, Undated)

3.1 Morphometrics

3.1.1 Mass and Basic Body Measurements

Length will range from 36cm to 41cm and weigh up to 650gms. Wing span approximately 80-90 cm.

<table>
<thead>
<tr>
<th></th>
<th>Adult male</th>
<th>Adult female</th>
<th>Juvenile male</th>
<th>Juvenile female</th>
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<tbody>
<tr>
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<td>274.3</td>
<td>277.6</td>
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<tr>
<td>Tail</td>
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<tr>
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<td>47.5</td>
<td>46</td>
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<tr>
<td>Toe</td>
<td>35.6</td>
<td>33.6</td>
<td>34.5</td>
<td>32.4</td>
</tr>
</tbody>
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Table 2: Weights gms (averages)

<table>
<thead>
<tr>
<th></th>
<th>Adult male</th>
<th>Adult female</th>
<th>Juvenile male</th>
<th>Juvenile female</th>
</tr>
</thead>
<tbody>
<tr>
<td>620</td>
<td>546</td>
<td>589</td>
<td>545</td>
<td></td>
</tr>
</tbody>
</table>

(HANZAB)

3.1.2 Sexual Dimorphism

**Adult - male:** Wings, bill and tarsus of the males is thought to be slightly but significantly longer than the females. Males weigh more than females. There is an obvious difference in weight between adult males and juvenile males.

**Adult – female:** Shorter wings, bill and tarsus than the male. They are also slightly smaller and weigh less than the males. There is generally little weight variation between female adults and juveniles.

**Juveniles:** Recently fledged juveniles have a slightly shorter bill than an adult, although by about 12 months its thought that the bill will be almost or completely full sized. Some adult birds can have a shorter beak than normal, Schodde, 1984 has suggested that this may be due to wear from digging in hard ground and can be noticeable particularly after prolonged dry periods.

There is no morphometrical variation between populations in different parts of the country. *(HANZAB)*
3.1.3 Distinguishing Features
The Long-billed Corellas main distinguishing feature is undoubtedly its long slender bill (upper mandible) which it uses to dig for bulbs and roots, in the ground, as a food source. This long bill is unique to this species of Corella. It has red-orange markings across its forehead and throat (This colouring is more pronounced in the male). Another distinguishing feature is the bare, blue patch around the brown-black eyes. The crest is white.

Figure 3: Distinguishing features of a Long-billed Corella
(www.parrot-and-conure-world.com)

3.2 Distribution and Habitat
The Eastern Long-billed Corella is normally found only in the extreme south-east of Australia from south-eastern South Australia through western Victoria to southern New South Wales. However, it has managed to established populations in other parts of eastern Australia thought to have been because of unwanted pet birds and surplus breeding stock releases. It is thought by some the population in Perth is in danger of hybridizing with the endangered Western Long-billed Corella. (HANZAB)

Figure 4: Distribution map of the Eastern Long-billed Corella (www.ozanimals.com)
There are 8 main habitats thought to be important to the Long-billed Corella, they are:
1/. **River red gum**; grassy woodlands, along rivers, that form substantial stands with other gums in meadows, foothills, tablelands, coastal and volcanic plains, native tussock grasses and pasture grasses.
2/. **Yellow gum-pink gum and manna gum**; woodland with scattered understory of tall shrubs and native grasses often on farmland and roadides or along streams.
3/. **Greybox-Buloke and Yellow gum and other varieties of gums**; mostly farmland particularly in cereal growing regions. Understories may have remnant native tussock grasses but not be enough to support a resident population. Corellas may visit when food is available.
4/. **Swamp gum-Manna gum**; near coastal areas, with woodlands ranging from stunted to shrubby, near farmlands.
5/. **Yellow box**; also White box, Blakely’s red gum, Candlebark and Red stringybark, around grassy areas.
6/. **Shelterbelts**; Sugar gum, Blue gum and introduced conifers.
7/. **Cropland**; oats, rice and sunflowers.
8/. **Pasture**; mainly introduced grasses, often infested with their favorite food, weed onion grass (*Romulea rosea*). (HANZAB)

### 3.3 Conservation Status

**ICUN is Least concerned.**

This species of cockatoo appears to be quite resilient and has established itself well into suburban areas of Sydney where there are reliable food and water sources, and, presumably nesting sites. It appears that in recent times, as it has enjoyed protection as an Australian native animal, its numbers have increased significantly. I could find little information on whether these birds have established breeding in the local Sydney area, however it seems they have as their numbers have continued to grow. Only studies of the local populations and data collected and compiled will answer these questions and currently very little research (that I can find) is being conducted on these birds. **Peter Chapman**, a successful breeder of captive Eastern Long billed Corellas informs me that these birds are currently breeding in at least 2 Sydney locations. *“Castle Hill Country Club is a good spot – plenty of large mature gums with hollows. The car wrecking yard on the Northern Road (between Penrith and South Windsor), you can see long bills and short bills (Little Corellas) inspecting and protecting nesting hollows.”* (Chapman P.)

### 3.4 Longevity

#### 3.4.1 In the Wild

In the wild these birds can live up to 20 or more years. It is thought that most birds in the wild never actually live to their full natural lifespan as they are required to compete for food. Many would succumb to disease or injury. (HANZAB)
3.4.2 In Captivity

Captive bred birds are more likely to live a long full life. 50-60 years is not unusual for a bird that has been well cared for. At the Wildlife Care Centre we have an Eastern Long Billed Corella called Gonzo of unknown age; obviously not helpful to determine captive life span. However we have a Little Corella that we know for sure is 62 years old and is still in good health.

3.4.3 Techniques Used to Determine Age in Adults

Adults are most reliably distinguished by the shape of their primaries. With each successive moult the tips are thought to become increasingly rounded (see figure 5) (Emerson et al. 1994) and further studies of this character may allow more detailed ageing of birds after their first year. (HANZAB)

Figure 5: A pronounced comparison between primaries in a juvenile and an adult. (a) Juvenile (b) Adult. (HANZAB)
4 Housing Requirements

4.1 Exhibit/Enclosure Design

The main consideration in exhibit design is that the required end product is well researched to meet the natural identified needs of the species and the purpose for having the species. The following points will help to ensure the end result is a well situated, secure and functional enclosure:

- **The type of enclosure** is suitable for the intended purpose eg breeding, display, rehabilitation, Noegel etc; or a combination for a specific purpose.

- **A north facing aspect** is ideal as this provides plenty of natural light (southern hemisphere). North East is also good with shelter on the

Figure 6: A large rehabilitation enclosure with a good northerly aspect. The south and south west are both protected by the shelter. The west is shaded by some of the shelter and by a tall stand of trees outside the enclosure. Primarily used for cockatoos, it is built with pipe tube framing and cockatoo wire mesh (12mm, 16 gauge). The enclosure has an airlock to prevent escapes. It is perfect for pre release flight practice however is very impractical for catching up birds as its roof is too high. The Wildlife Care Centre. (F. Oosthoek)

Figure 7: Used for rehab purposes also. This enclosure is not sited very well. It is open to the south and west making it susceptible to heat and bad weather. It has shade cloth added to part of the west end and the roof to minimise direct sunlight and heat during the summer. However it is still very open in bad weather. The Wildlife Care Centre. (F. Oosthoek)
• The **prevailing bad weather** comes mainly from the SW direction. This requires the shelter to be built with a wind and waterproof material like colourbond steel sheets to provide maximum cover from this aspect. Floor to roof sheets will provide full shelter.

• An **adequate roof** over the roosting perches is required to provide cover in inclement weather. This also needs to be big enough to provide shelter to the feed area to prevent dry seed or pellets getting wet during rain.

![Figure 8](image_url)

**Figure 8:** The aspect of this enclosure is unknown; however it has a full roof and shelter down the far end to provide good shade and protection from the weather. In my opinion this is a good example of a mixed or single species enclosure for a large number of birds. It provides lots of natural light, space, aesthetic appeal, and a good use of perches and visual barriers without compromising good flying space. The substrate is a combination of grasses and plants. (see figure 9) Priam Psittaculture Centre (F. Oosthoek)

• **The west facing aspect** also requires some form of protection to avoid the extremely hot afternoon sun in the summer. Eg a fixed shelter of colourbond sheets or lengths of attached shade cloth may be utilised for this purpose.

• **All enclosure wire mesh and materials** must be sturdy and ‘chew’ proof to successfully house cockatoos. Pipe and steel framing is required.

• The best type of **wire mesh** to use in my opinion is the square 2.5cm (1in, 14 gauge). It’s practically essential to have, and should be hot dipped and galvanised (weldmesh sheets) to prevent rusting. The advantages are: Strength and durability and its chew resistant – once a bird knows it can chew the finer wire mesh, it can quickly become a habit when boredom sets in, this can lead to more maintenance for keepers and potentially toxicity poisoning for the bird. 12mm (1/2 in) 16 gauge galvanised weldmesh is smaller and the minimum requirement for this type of bird.
• An **air lock** needs to be fitted to each enclosure to ensure security and to minimise escapes. The external door also needs to be able to be securely locked to prevent any unauthorised entry.

• Design enclosures to allow a good direct **flying space** (length) between perches for maximum exercise possibilities.

![Image of enclosure](image.png)

**Figure 9**: Shows the shelter end of the enclosure in figure 8. This image shows the keeper entrance and airlock at the far end on the left. Priam Psittaculture Centre (F. Oosthoek)

• **The location** ideally needs to be quiet for rehab animals; a busier location with more interaction is suitable for captive/handraised birds.

• **Site of enclosure** in relation to other animal enclosures, eg don’t house near or next to a predator as that would cause undue stress to the birds.

• In close proximity to **water tap and hose** for cleaning and watering plants. Also consider fixing a sprinkler onto the edge of the shelter roof for use on hot days. Ideally placed it will provide some spray through the open wire and some spray directly onto the roof to have a cooling effect on the air inside the shelter.

• Ensure that **drainage** of the area is given some consideration. Is the site to be built on a natural waterway which may cause problems in wet weather? Is there natural drainage (on a high point) or will this need to be provided for to prevent flooding and undermining of the foundations and floor?

• **Enough space** for the required number of birds to be housed in the enclosure – bigger is always better, have dimensions that allow flying for exercise and social interaction. As per **NSW Exhibited Animals Protection Act (EAPA)**, 3m is a good height as this allows the birds to be above the keepers, while still allowing for easy catch up if necessary and good viewing if required.
• Complies with **OH&S requirements** and also complies with general common sense.

• Ideally all enclosures require **vermin proofing** eg a concrete floor or a dug out earth/sand floor securely lined with rat proof wire then covered with sand or earth to the appropriate height.

• **Vermin proofing** may also be achieved by laying concrete footings deep (up to 50cms) in the ground during building to prevent rats gaining access by digging down and under the enclosure.

• **Security** – ensure both doors have an adequate locking system (inside and out) not able to be opened by birds eg while cleaning and during the night. Some birds are very clever and having a long thin upper mandible is just the advantage they need to free themselves! Gonzo, the E Long –billed Corella at the Wildlife Care Centre has freed himself (and others) on several occasions so security is a priority for his enclosure.

• **Ensure the dimensions of the entry is large and wide enough to fit a standing person and a wheelbarrow**, this particularly applies if you have a sand or earth substrate floor or like to sprinkle a layer of sand over your concrete floor. This is a mistake that can easily be made and expensive to rectify at a later date. If you decide to live with the mistake, it becomes a constant source of frustration for keepers who are required to add new substrate to the enclosure floor on a regular basis once the enclosure has been completed.

![Figure 10: A run of 6 breeding enclosures. They are designed with the mesh to be off the ground at the front for ease of cleaning. They provide good social interaction, natural light, shelter, security and flight space. The rear of the enclosure has holes that allow access to the breeding boxes that are contained in the airlock behind. One disadvantage of this set up is the possibility of a dominant bird upsetting its neighbours and reducing the pairs chances of good breeding results. This is minimised to some extent by the addition of removable sheets of metal between each flight. Priam Psittaculture Centre. (F. Oosthoek)](image-url)
• **Breeding** (where applicable), requires the addition of one or more breeding boxes with substrate that enable the keeper to check on eggs-young without stressing the parents. This is best achieved by fixing the boxes on a wall that enables the keeper to access externally from an air lock. *(see exhibit design)* Breeding pairs need to be housed separately from other birds. A quiet, low foot traffic, area to minimise general stress is good for this purpose.

• **Social behaviours**: the space must allow for all inhabitants to interact without fear and perform natural behaviours like feeding, self grooming, allopreening.

• **Visual barriers – fixed or removable**, allows new or timid birds to escape from the view of dominants birds, this can be mechanical like a hanging wooden pallet, or natural like browse and planted flora. (Priam Psittaculture Centre uses a combination of visual barriers including wooden pallets to great effect in their aviaries for this purpose – see image below).

![Figure 11: A removable hanging wooden pallet used as a visual barrier in a mixed species enclosure for young recently weaned handraised parrots and cockatoos. The wire mesh used is 2.5 cm. Priam Psittaculture Centre. (F. Oosthoek)](image)

• **Must contain suitable substrates and furniture**, this would include a suitable location for food to be placed. Ideally food containers and areas should be designed for ease of cleaning, and able to be sanitised for hygiene purposes. Suitable perches and feed dispensers should be both fixed and swinging to add complexity and to promote agility and dexterity. Also perches placed in a desirable location to provide social and exercise opportunities. Be sure to include pipe holders that are able to be fixed to the wire or pipe frame and also dug into the ground for holding browse.

• Accommodate **flightless birds** with fixed ramps, perches and food areas accessible from the wire mesh and the ground.
- **Functionality** and safety for birds and keepers, eg no sharp corners or rough edges, loose wires etc. Doorways to provide reasonable head room to prevent keeper collisions.

- **Water and bathing opportunities**, clean water out of the sun for drinking. A sprinkler mist and/or a ground bath for bathing (fixed or removable).

- **Flora**, is a good addition to an enclosure, seriously consider adding some as it can serve many purposes. However care has to be given to the following, plant toxicity if eaten, birds reaction eg a gum would be chewed to bits and this would kill the tree – it may be better to use browse instead of a live tree or plant. Or keep plants potted so they are easily replaced. Ease of cleaning is important, is it able to be hosed to get rid of faecal matter? Also consider the following: Will it provide perching and hiding opportunities? Will it grow too big for the enclosure? Will it provide a natural food source and foraging opportunity eg *Romulea rosea* bulbs. (See appendix 2 – poisonous plant species)

### 4.2 Holding Area Design

For enclosures off exhibit and for rehabilitation purposes, Long Billed Corellas can be housed in a basic rectangular or square aviary. Providing their spacial requirements etc are met and they are provided with a good and varied diet, and some natural enrichment. Cockatoos have very powerful beaks and are remarkable chewers. They have been known to make quick work of any form of housing constructed of unsuitable materials, temporary or permanent, on or off exhibit.

The Eastern Long-billed Corella is not the worst chewer by any means however an aviary constructed of steel/pipe framing and colourbond sheeting is the accepted minimum. (See figure 6) Anything constructed of timber will be eaten over time and timber should not form the basis of framework for this reason.

The best type of wire mesh to use is square 2.5cm (1in, 14 gauge). It’s practically essential, and should be hot dipped, galvanised weldmesh sheets to prevent rusting. Larger squares can be used as it will certainly keep in birds of this size; however it may allow a variety of small visitors eg finches and sparrows etc, access to the enclosure which may not be desirable. For this type of cockatoo you could use 12mm (1/2 in) 16 gauge galvanised weldmesh, however it would be advisable to monitor carefully as frequent repairs may be necessary to prevent escapes and/or injuries and prevent the entry of wild snakes and rodents.

Sometimes the destructive nature of this bird may vary per individual, and giving the birds plenty of good furniture and browse for enrichment is likely to limit the amount of damage to enclosures. For sand or earth floors/substrate it is important to build any framework in concrete footings as a minimum. These should extend entirely around the circumference of the enclosure and extend into the ground to a depth that will not allow the bird to dig out of the enclosure or allow vermin to dig their way in.
Enclosures should have an air lock attached to the entry/exit door and adequate lock security to prevent unnecessary escapes.

Figure 12: This net shows a 3 door security system on an enclosure; there is an airlock through the door behind the netting to prevent escapes. Priam Psittaculture Centre. (F Oosthoek)

4.3 Spatial Requirements
The size and shape of an enclosure has to take into consideration the following points:
- The birds enclosed must have the space to provide them with the freedom of movement for exercise, both vertically and horizontally.
- Each bird housed must have the freedom from domination from other birds and be able to withdraw from people during cleaning and feeding times (fright, flight, fight).
- It’s social, breeding and husbandry needs must be met by the dimensions of the enclosure to minimise stress.
- Be of a size that will encourage exercise and behavioural enrichment and not exceed the carrying capacity of the aviary. (EAPA)

Sindel and Lynn 1996 recommends the minimum aviary dimensions for small cockatoos (from Sulphur Crested Cockatoos down) is 5.4 m (18ft) long, 0.9 (3ft) wide, and 2.15m (7ft) high. Presumably these dimensions would apply to a breeding pair. I could find no reference to this in the text, however Sindel is a renowned breeder of cockatoos so I believe this is a fair conclusion to make. A flightless bird will happily live in a smaller enclosure than a bird that flies as their requirements for flight and exercise are different.
4.4 Position of Enclosures

In the southern hemisphere ideally enclosures should have an open wire, north facing aspect to allow adequate all day sun and natural light without the full strength of the afternoon sun from the west. The sheltered end of the enclosure should be on the south end. This will provide the best protection from the prevailing winds and cold weather that comes from the south.

4.5 Weather Protection

Colourbond sheets on the roof and south end of the enclosure, wrapping around the corners and part way down the east and west sides, will provide shelter from winds and rain. It will also provide shelter from the hot afternoon sun in summer. If sun from the west is a problem, this can be minimised by applying shade cloth (see figure 7) to the west side to minimise the effects or plant a tree or grow a vine on this side of the enclosure, or part of. If you are fortunate you may be able to utilise an existing shade tree, just be sure that it will not block out the north sun, particularly in the winter months.

Another strategy could be to provide more browse on the hot side in summer to minimise effects of the heat or attach a sprinkler to the roof of the aviary so that it might be turned on, on a hot day (above 28-30 °C). (In my opinion sprinklers are well worth the minimal cost and effort to install. The Wildlife Care Centre often reaches temperatures in the high 30s and low 40s.) This would reduce the temperature of the colourbond roof while also reducing the temperature inside the shelter. Also providing the birds with a bathing opportunity and reduce the possibility of heat stress. Always provide perches under the shelter end to ensure the birds are able to escape any extreme and inclement weather. This also applies to seed containers which need to be placed where they will remain dry, however not under perches where they are likely to be contaminated by faecal matter.

4.6 Heating Requirements

Heating is not required in a standard aviary/enclosure for this adult species. Heating would only be required if a chick without feathers was being hand raised by a keeper. The reason for this is because they are unable to regulate and maintain their own body temperature until they are feathered. In my experience, a sick or injured bird may benefit from being housed in a warm area in the initial stages of convalescence. Eg a purpose built hospital box or cage.
4.7 Substrate

This can be varied depending on personal preference; there are pros and cons for most substrates as follows:

**Concrete** - easy to clean can be scrubbed and hosed and disinfected if necessary. Is less likely to spread disease or parasites to future birds if inhabited by a sick bird at some point. Is not a natural looking substrate and can be hard on the feet of a bird that chooses to spend a considerable amount of time on the floor eg a bird that doesn’t fly either for rehabilitation reasons or has never learnt to fly due to space restrictions. Is colder in winter without adequate sun and will hold heat in the summer causing extremes in temperature without adequate shade. Can be covered in a sprinkle of sand, soil, leaf litter, pebbles, mulch, gardens etc to look more natural and aesthetically pleasing. The trade off here is that the more additional substrate you add to the enclosure, the more difficult it is to keep clean and sanitised etc. Drainage also becomes a problem as floors can become water logged in heavy rain. Concrete is vermin and snake proof.

**Sand** - looks more natural and is easy to clean providing this is done regularly (daily-weekly, when dry can be easily sieved to minimise waste and easily raked over to provide an aesthetic finish.) It provides good natural foraging opportunities for the birds eg digging and a natural source of shell grit (some grades). This substrate is susceptible to tree root growth and damage if the enclosure is near large trees. Sand floors require deep concrete footings around the outer circumference of the enclosure (or wire netting dug into the floor around all edges) to prevent vermin gaining entry. Sand floors also need adequate drainage to prevent becoming waterlogged. Can sustain some form of garden planting if desired (suitable potted plants in their pots dug into the ground below the surface).

**Compacted earth** - is much harder to keep clean and disease/parasite free due to its porous nature. It will be a constant media for the reinstatement of intestinal worms. It can be very slippery in the wet providing a safety risk to keepers. It provides enrichment opportunities for birds that enjoy digging. Natural looking and provides a more natural temperature range in extreme weathers eg cold...
winters and hot summers. Ideal for planting a garden or adding some submerged pots if desired. Easy to rake but will become uneven over time. In this instance, sand may be added to the troughs to restore to a level surface.

This substrate is susceptible to tree root growth and damage if the enclosure is near large trees. Earth floors require deep concrete footings around the outer circumference of the enclosure to prevent vermin gaining entry. Alternatively, wire matting should be buried under the substrate, lining some or the entire floor, securely affixed to the inside of the aviary wall before covering with substrate. Again to prevent vermin burrowing into the enclosure.

**4.8 Nestboxes and/or Bedding Material**

Sindel says he has had more trouble breeding this species of cockatoo than any other. He says that rather than recommending any one type of nesting box or orientation etc, he suggests trying a variety of nest sites (garbage bins, barrels or nest boxes on floor, vertical, inclined, horizontal, small, large, etc..) just in case. He does however say that when he finally achieved success the nest was a log containing fine wood shavings as a bedding substrate. **Sindel and Lynn 1996**, say breeding birds in captivity appear to like natural hollow logs (which are resistant to their destructive chewing abilities). **Sindel and Lynn 1996** say in the wild they prefer to nest in hollows of the eucalypt high above the ground (more than 15m) near water and have been known to burrow into cliffs and high banks when suitable hollows are scarce. **Sindel and Lynn** 1996 say that the logs should be adapted to provide access for inspection and cleaning through strategically placed doorways or removable lids (accessible through a service area behind the enclosure for minimum disturbance of the birds). This can be done by cutting a section of wall out of the log and adding hinges and a catch so that it is an almost undetectable door or cutting a hole and adding a metal door. Faced towards the service area entrance, this makes the exercise of inspecting and cleaning quick. (Sindel, Lynn 1996)

**Peter Chapman** has similar views; he says “My preferred nesting hollow is a double entry log about 1200-1500 mm high and internal about 30-40 mm. The double entry allows the sitting hen to leave the log as the cock bird enters. I have found all white cockatoo species cock birds tend to become a bit aggressive at breeding time, sometimes killing the hen”. (see illustration appendix 1)

Figure 15: The type and dimensions of the breeding boxes used for cockatoos at Priam Psittaculture Centre. Bottom right photo shows boxes attached to an outer wall backing onto an area accessible to keepers only that minimises stress to parents while checking the progress of eggs and young. (priam.com.au)
Cockatoos are clean dry nesters in the season and require very little cleaning, however in preparation for the breeding season all logs must be cleaned. Start with removing at least the top 10cms of the old substrate. Wash the log inside and out with a disinfectant then spray with a mite repellent (Duramitex Plus – this has been used extensively in the poultry industry for the control of red mites, however it is no longer available). Alternatively a maldison based product could be used like Malathon. It is a garden spray that controls, aphids, thrips and caterpillars etc for up to 12 months, diluted at 50-1 (50 parts water) it is non toxic to birds. Add new substrate to the nest. It is normal for a nesting bird to excavate some substrate from the nest, replace some if they take out too much as an egg resting on the bottom of the nest is likely to break or crack.

4.9 Enclosure Furnishings

In my opinion, thick barky perches for chewing opportunities are great therapy for captive cockatoos. Long billed Corellas are not considered to be the most destructive of the cockatoos by any means, but they will still shred bark off perches and chew through the wood over time. Keepers should always resist the temptation to replace natural wood perches with a hard composite or round metal pipe as these will cause considerable damage to the feet. **Peter Chapman** says “With perching I have found all cockatoo species like upright perches. I try to use timber with a couple of branches off the main trunk, which is about 125-150mm in diameter” (see appendix 1 illustration)

As Long Billed Corellas are specialised diggers, it would also be therapeutic to provide this opportunity within the enclosure e.g garden area or earth floor. It needs to be mentioned though that any bird that does dig needs to be wormed very regularly. Perches should be securely fastened by screws or wire to prevent them falling down on people or birds. (see figure 5). Alternatively, for captive birds moving perches assist with agility and dexterity, particularly for young birds.

![Figure 16: Ideal perches are covered in thick bark and fastened securely with bolts or wire. The Wildlife Care Centre. (F Oosthoek)](image)

Benches if used should be made of a durable metal frame and sheeting. These have more use in a rehabilitation environment as they are ideal for standing bowls of seed and water and can be accessed by log ramps. They provide stability and accessibility to food for the injured bird. For a rehab bird not flying, I would
use barky logs for ramps as they provide grip and allow easy access to perches and food areas above the ground.

Ideally perches in an enclosure will be situated high enough to provide flight room above for the birds and away from the rear of the enclosure to prevent feather damage while perching. They should also be high enough, if possible to prevent keepers walking into them and should be spaced at each end of the enclosure, and in between to provide flight opportunities.

Some imprinted or hand raised birds may have an attachment to an inanimate object like a bell, mirror, swing, house box, bedding like an old sheet etc and in some situations may feel more secure and settled if housed with these items.

Plenty of browse with a variety of nuts, leaves and bark can also be provided for aesthetics and enrichment opportunities. These are best placed in PVC pipe holders wired to the wire or frame of the inside of the enclosure. A cap on the bottom will allow the holder to retain water keeping the browse fresher for longer. Holding vessels may also be buried in the ground of a sand or earth floored enclosure (see figure 19) some suitable varieties may include, gums, paperbarks, grevilleas, banksias, bottlebrushes, pines etc. In my experience, native plants are generally the safest option to feed to cockatoos if you are unsure. (see appendix 2 – poisonous plants)

(See figures 17 to 21) (F Oosthoek)
5 General Husbandry

5.1 Hygiene and Cleaning
In my experience, while this section is primarily about cleaning and hygiene, the fact remains that it is important to check so many other things on a daily basis and while your cleaning regime is in process, this is the ideal time to perform these basic checks. Depending on the number of birds per enclosure and your personal requirements, there may be variations to how often these tasks are performed and this is intended as a guide only. Some may not be daily, rather bi-weekly, or even weekly.

Daily:
Visually check all birds (health, numbers and general condition) on entering the enclosure.
Visually check all mesh, gates, floors etc for damage from birds and possible vermin entry.
Check locks are serviceable and secure to prevent escapes.
Check enclosure for vermin activity eg droppings near food and/or food containers.
Check any pest baits set around or in the enclosure for vermin activity.

A daily cleaning regime may consist of:
Check seed supplies, blow off husks on top into a bucket, leave bowl in a dry place until cleaning is complete. If seed is in a suspended feeder take care not to wet if hosing or remove from enclosure until cleaning is complete.
Remove any food items with a limited life from the day, or days, before eg sprouted seed, apples etc.
Empty water bowls; scrub with diluted disinfectant eg Avicare or another animal/food safe disinfectant. Do not use bleach as it is not considered animal safe. Rinse and refill ready to return to the enclosure.
Add water to browse holders to prolong life of the browse, particularly in the hot weather.
If applicable, scrub and hose any food areas or benches with disinfectant. Rinse with fresh water.
Sweep, scrub, hose, or rake the floor to remove all faecal matter and any old food or leaves from browse that have fallen. Large amounts should be raked or swept into a pile and put into a waste bucket before hosing.
Return water and food bowls to the enclosure making sure none are positioned under perches to avoid contamination from faecal matter. Add any fresh additional food items to the feeding area eg vegies, fruit, nuts.
For concrete floors, sprinkle sand lightly over the floor after hosing. This prevents the faecal matter sticking to the concrete making cleaning easier next time.

Weekly: In addition to the daily checks listed above these can be performed weekly.
Scrub perches with diluted disinfectant or bleach.
Replace any browse that have been chewed, gone brown, or lost all their leaves.
Empty and completely clean and disinfect the seed dispenser (dependent on type used and size etc, this may need to be done more regularly. Refill with new seed.
Perform any necessary maintenance on the enclosure if required.
Change pest baits as required.
Wash any pebble type substrate in enclosure.
Water garden areas, pot plants etc in the enclosure.
Clear and flush any drains to remove debris and prevent blockages.

Monthly:
Scrub all walls and roof (if necessary).
Perform any repairs and maintenance if required.
Replace any natural wood perches or logs and stumps in the enclosure (may be done monthly – 6 monthly depending on need).
Add sand to a sand (or earth) floor enclosure as required.
Attend to or replace any plants or garden areas within enclosure.
To prevent the spread of disease after a sick bird has been housed in an enclosure, wash down entirely with Avicare, household bleach or F10 disinfectant. In some cases bleach may be used for the walls and wire etc, however care needs to be taken to rinse and allow ample drying time and sunshine (it is natures steriliser) before the next bird is put into the enclosure. All perches and substrate should be removed and replaced. If cleaning up after an area has been contaminated with Psitticine Beak and Feather Disease, a strong solution of bleach should be used several times. Leave to sundry (even several days) in between applications rather than rinsing with water.

Annually:
Replace any perches, logs or stumps that require changing.
Paint enclosure wire and frame with black paint.
Clear and clean, top of roof to prevent a build up of leaves and twigs etc.
Clear any guttering if necessary.
Replace sand in sand enclosures.
Use chlorine or bleach, a broom and elbow grease to remove algae from concrete if necessary. Always rinse thoroughly with clean water.

5.2 Record Keeping
Daily record keeping could include any of the following using these codes:
• food and water consumption and any changes occurring in the diet (OTH)
• Any veterinary examinations, treatments given and the amounts given (Rx, VET, Tx).
• movements to a different enclosure or external location (INT, DIS)
• General appearance of health and wellbeing or lack of (OTH)
• Behaviour and any behavioural problems or observations (OTH)
• Any new arrival (ACQ)
• Any bird that dies in care (D/30, D/E)
• Any identification method used should be noted eg microchipping, leg banding (TAG)
• Any form of measuring, weighting etc (W/L)
• Any other notable event (OTH)

**Records** should also be kept on breeding and breeding cycle information if breeding is an objective. (Including sexing, eggs laid, birth of young)(B/H, BRD)

Regular worming for parasite (internal and external), and health checks and tests for known cockatoo diseases like Psittacine Beak and Feather Disease (PBFD) and the bacterial diseases Salmonella and Psittacosis (Chlamydophilosis).

For rehabilitation birds, a full know history recording should be undertaken when it arrives and continuously update to ensure the bird is given the best possible chance for recovery.

Records would include details of any injuries (minor or serious), the reason it has come into care and the date, the location it was found and under what circumstances and any treatment received by a vet. Close monitoring would follow to ensure the bird was eating, what is it eating (native foods or other), was it eating on its own (juvenile or adult and is it cracking seed or not), is it drinking (keeping hydrated is important), where is it housed (Heated hospital room or an aviary).

Record keeping is an important part in the effective management of any animal. All should be comprehensive and accessible by keepers. It provides a good means of communication if the birds are cared for by more than 1 keeper. Other advantages of keeping records are: to provide a reliable and accurate history of the bird which can be put collectively with the information of other birds of the same species and be used for research purposes. The information could be used by others at a later date by providing archival information.

### 5.3 Methods of Identification

As Long-billed Corellas are sexed alike, they are often hard to identify from other same species birds. There may be subtle differences in beak length, colour, feathers, or speech and behaviour (in captive birds or pets). Often keepers or owners who care for these birds will be able to identify individuals by certain behaviours and speech relatively easily. However the following methods are the only recommended for use as a reliable and permanent means of identification.

**Injectable microchips:** Are inserted under light sedation and are usually placed in the left breast muscle. This method is safe for the bird and is a reliable method to identify any bird and verify ownership.

**Leg bands:** These come in a variety of sizes for different types of birds at different ages. They come in a range of colours with numbers and letters for ease of identification. These
can be applied easily with the correct tools. For young birds, an 11mm leg band can be slipped over the foot and the bird will grow into the band over time. It is applied by folding all forward facing claws gently forward and holding the back claw flat to the leg with a toothpick or similar, as the band is eased on. Bands should always be checked regularly to ensure they are not too tight and restricting function and blood flow to the foot. For methods on applying bands to adult birds, see appendix 7.

5.4 **Routine Data Collection**

Records of weight, height and length are all useful data to understand the bird in any environment, captive or wild. They provide information variations that may be useful, particularly as part of a long term study on growth and development. Other field gathered data like surveys and studies in the field, locations of birds in the wild, dates of sightings, captures, diseases, condition of the birds, release dates and locations.
6 Feeding Requirements

6.1 Diet in the Wild

The Eastern Long Billed Corella has a specialised beak that is very long, pointed and slender, (it is sometimes referred to as the Slender Billed Corella). This distinguishing feature enables the bird to dig in the ground for its food. It has adapted to the loss of its native foods by feeding on a variety of introduced species of plants. Many of these plants have bulbs, roots or corms which of course require digging from the ground. These birds appear to consume about 90% of their diet from introduced species including grain crops, planted by farmers like sunflower seed, oats etc. This makes them considered to be a pest in farming areas.

Studies have shown that in Victoria, several species of parrot, including the Long billed Corella have been blamed for damage to the following; cereal, oilseed, fruit and nut crops including wheat, barley, oats, canola, safflower, citrus, apples, grapes, walnuts, chestnuts, hazelnuts, pistachios and almonds. (ENRC, 1995) Presumably this means they were attracted to these crops as a food source and not just as an object of destruction.

Figure 22: Milk Thistle (www.herbwisdon.com)

As these birds have been so successful at adapting their natural diet, they have been able to establish feral populations outside of their natural range. They are ground foragers and are often seen in NSW in built up and rural areas on park grounds, lawns, medium strips, ploughed and football paddocks foraging for grass seeds, corms and roots etc. They will also feed on any spilt grain from other animals or birds in a captive or farm environment. Therefore it is really not surprising how well they appear to have established themselves into the Sydney Basin. Other native diet foods can include fruits, leaf and flower buds, and nuts from native trees and shrubs. One known species is Murnong, Microseris lanceolata. Insects also form part of their natural diet.

Figure 23: A variety of flowers and nuts make up a natural diet. (F Oosthoek)
Introduced species include their favourite, the weed onion grass, *Romulea rosea*. Some other known foods include thistle seeds, nut grass, rice. (HANZAB)

6.2 Captive Diet

A basic seed diet is ok for this species of bird. Most aviculturalists recommend a mixture of maize, wheat, oats, milo with little or no sunflower seed. Some may also suggest canary seed, millet etc mixed in. Most consider sunflower seed to be too high in fat to be good in large quantities. Sindel and Lynn (1996) says he has never had problems with obesity in birds that get adequate exercise in their enclosure who are eating a sunflower seed diet. Therefore he does indeed feed sunflower seeds in quantities that others would find excessive.

(2 birds housed together, when available and when accepted):
- sprouted sunflower seed (1 handful),
- sprouted corn, or mixed sprouted seed and legumes (1 handful)
- raw peanuts or almonds (12 in shell),

The following vegies - green peas (2-3 in the pods), silverbeet, sweet corn, broccoli, cauliflower, carrot, and pumpkin, (small chunks or cubes)
- Apple (a slice) and melon seeds,
- small quantities of wholemeal bread (1/4 of a slice),
- dog kibble, (6 pieces)
table scrap bones (with some meat on),
seeding grasses fresh or dried (1 bunch).
The value in feeding sprouted sunflower seeds, legumes and corn is that once the seed sprouts, it becomes a living thing and its whole chemical make up changes. They provide essential vitamins as part of a balanced diet. A basic seed mix should be offered by those who feel their birds are unlikely to get the necessary exercise for such a high fat sunflower seed diet, particularly those birds that are not showing any interest in supplementary foods given. This however, shouldn’t prevent perseverance as in my experience, nutrition through variety is an important aspect of any bird’s diet.

Figure 26: A variety of soaked seed and legumes ready to be fed.
Prian Psittaculture Centre (prian.com.au)

Avian pellets may also be feed, they are a balanced and palatable food source that is nutritious, however acceptance could be a problem for some birds. Pellets are also a more expensive option than seed so may be fed in small quantities as opposed to as a complete diet. A fresh diet consisting of a variety of foods captive and natural foods will meet the necessary nutritional requirements of the bird, and will also provide enrichment.
The average bird is likely to eat between ½ and ¾ of a cup of seed per day. This amount will depend on several variables eg exercise, supplementary food consumed and whether favourite foods have been offered or not. To begin feeding a new bird, offer too much food and maintain a variety. Gradually reduce the amount until there is a small amount of food left and most is eaten. Continually monitor and make further changes if necessary.

6.3 Supplements

Sindel and Lynn (1996) says he has attempted to produce nutritious, vitamin packed mashes for his cockatoos over the years and the hardest thing he has found is to get the birds to eat his offerings. Often cockatoos have an appetite for the things they like, eg sunflower seeds are a favourite, and not the things they need for a nutritionally balanced diet. There are many commercial vitamin and mineral mixes on the market for various uses.

Ornithon – a vitamin and mineral supplement.
Calcivet - a calcium supplement.
Poly aid plus – helps recolonise the gut after stress, injury or disease.
This is not an exhaustive list as there are others available for different purposes. See appendix for more information.
6.4 Presentation of Food

Food can be presented in bowls, hoppers, suspended feeders etc. There are a variety of different feeders on the market and of course with some imagination you can make your own. Depending on the look you require, a metal garbage bin lid inverted and suspended from the roof will provide a stable area for a bird to stand while feeding from a bowl or tray. This is a good system provided it can be taken down and washed and disinfected on a regular basis and is under cover from the weather and is not under a perch.

Figure 27: A suspended feeder for a large aviary that contains 8 feeding bowls. Birds are able to land on to feed from bowls while faecal matter falls through to the floor. Two sheets of wire mesh (holes are cut above each bowl) are joined together with clips to enable separation for easy cleaning. This design also minimises wastage and disease, and the attraction of vermin. Priam Psittaculture Centre (www.priam.com.au)

Figure 28: Food tray and seed hopper (Sindel and Lynn 1996)

Utilising a swinging suspended feeder will minimise the chance of rats getting to the food and contaminating it. A wooden feed station on top of a post dug into the ground is another option, not so easy on an existing concrete floor as you would need
to create a stand for it, ideal for an earth or sand floor. **Sindel and Lynn (1996)** have a
good design of a food hopper suitable for sitting on a flat surface above the ground. (See
figure 28)

Not all birds can get to a suspended feeder as the bird is required to fly to it. Therefore
flightless birds, whether permanent or temporary, need their food and water placed in an
area that is accessible either by a bench or log ramp etc.
Supplementary food may be scattered around perch areas, however vermin activity would
need to be monitored and it would need to be kept out of direct sunlight to prevent spoil
etc.
Browse holders affixed around the inside of the enclosure allows the introduction of
natural food sources, particularly a rehabilitation bird, and provides enrichment to any
captive bird. Ideally presentation of food should remain as natural as possible for rehab
birds. A variety of browse, nuts, and grasses including the clod and root system will
provide natural foraging opportunities. Clods can be laid periodically on the floor. This
may also introduce insects that are naturally occurring into the enclosure
7 Handling and Transport

There are several different types of restraint recommended for this species:

**Physical capture and restraint** (which is detailed in this section and is the most utilized method for most purposes eg catch up for moving enclosure, transport, detailed examination etc.)

**Chemical restraint** (can be used in conjunction with physical restraint for more invasive procedures eg trimming beaks, strapping wings and surgical procedures etc.)

The third method available to keepers is **Conditioning**. This process allows a trained keeper to shape a desired behaviour to assist with the veterinary and husbandary care of the animal in a way that causes minimal stress to the animal. This can include any of the following, standing on weigh scale to record weight, walk into a carry cage, open wings for examination etc.

7.1 Timing of Capture and Handling

Capturing is best done in the cool of the morning to minimise stress to the bird. However certain factors should be considered:

What is the reason for catching up the bird? Eg routine examination for weighting on site, or an off site vet appointment in an emergency situation? Is it being moved somewhere permanently or temporarily eg an exhibit upgrade?

Is the bird housed in an institution open to the public or a rehabilitation sanctuary? An institution open to the public may have an early morning catch up policy and a sanctuary may catch up as required to prevent birds sitting in small cages too long awaiting trips to the vet etc. Most large institutions are fortunate to have on site vets, or vets who come regularly onsite to examine animals. Any bird going somewhere permanently will require prior examinations and a suitable box organised in advance etc and the timing of catch up will also be planned. This would also apply to an exhibit/enclosure upgrade.

Considerations may also be given to the bird itself, is it a handraised bird, a wild caught rehab, a tame pet? This may indicate how stressed the bird may become and how quickly. Wild caught birds, rehabs or not, in my experience, will always tend to stress more around humans and need to be monitored closely. All birds, even tame pets have no appreciation of being captured and physically restrained so any equipment and techniques used will be the same for all birds. The larger the enclosure, the more likely you will require more than one person to quickly and successfully complete the task.

Ideally what ever time you decide to catch up, you must avoid the heat of the day (particularly summer) as birds can quickly become stressed and die in these conditions. Catching up at night is definitely an option as darkness will subdue the bird somewhat, likewise so will a darkened room. This needs to be balanced with keeper safety and their ability to see clearly enough to attempt this without injury.
7.2 Catching Bags

For a bird the size of an Eastern Long Billed Corella, the bag required would need to have some depth, about 65cms and be constructed of a light, but tightly woven fabric. A polyester cotton or cotton drill fabric would be suitable. It is also useful to have a dark coloured fabric as the bird will be calmer in the bag once caught as it will be unable to see light through the fabric. The hoop side of the catching net needs to be about 35cms in diameter for this sized bird. The handle can be smooth wood to prevent splinters in the hand, and be about 1.2 ms long to enable the keeper to reach near the roof of a tall enclosure. It also needs to have some form of thick foam padding around the wire or metal loop to prevent injury to a bird if a keeper is over zealous in their catching techniques. Also very useful is the addition of Velcro so the bag can be easily taken off, and washed. Use a different bag for different birds to prevent the spread of disease.

![Figure 29: A catching bag with Velcro sown around the top for easy removal. (F Oosthoek)](image)

7.3 Capture and Restraint Techniques

The first thing is to plan the capture; who will assist, are they familiar with the species and this bird in particular, when will it happen, what equipment is required, what is the purpose or procedure that will proceed after the capture? What if something goes wrong and someone gets hurt, bird or human? When these things have been ascertained, the allocated keeper or keepers can make their way to the enclosure with the appropriate equipment. This may include any or all of the following:

**A sturdy cockatoo carry cage** for transporting (short distances and short periods of time- see figure 30). May be lined with a form of substrate (newspaper) and contain a perch to allow the bird to get off the floor of the cage and perch. This is particularly important for travel as it provides grip and stability for the bird and means they don’t have to stand in their own faecal matter. A top opening cage is much better for easy access to the bird and you are less likely to be bitten.

**A thick towel, in my experience**, is an invaluable tool when catching and handling birds,
it can be thrown over a bird in a small cage to capture, over a bird on the floor of an enclosure, or over a bird holding onto the wire of an enclosure. It will give your fingers more dexterity than gloves and you can detect the birds’ movement and position under your hands easier, it’s harder to exert too much pressure on bones, wings and internal organs etc, and you are less likely to stress the bird generally. The other option of course is to use a towel for the catch up and then use your bare hands, this is likely to be the preferred method of experienced bird handlers. Use of a towel is definitely my preferred method where possible, particularly where injured rehab birds are concerned.

Figure 30: Standard bird capturing equipment, this cage with perch is suitable for short term holding and transporting (3-4 hours maximum). (F Oosthoek)

A catching net (see 7.2 Catching bags). Depending on the size of the enclosure and the number of people involved you may use more than 1 for the process.

Thick gloves while these may be useful for handling wild rehab birds, they are far from useful with tame or pet birds. Gloves can be traumatic for these birds and will teach the bird to be afraid of hands. As a holder you are less able to monitor movement and resistance of the bird, and generally, the loss of dexterity is not worth the trouble. Thick towels are a far better option.

In my experience, to catch a bird in a large flight enclosure, 2 people are necessary. On entering and securing the enclosure with all the catching equipment, you must identify the correct bird to be captured, with whatever means is necessary eg tags, distinguishing features etc. Armed with a net, or towel, work together and attempt to corner the bird, capitalising on any time spent on the ground or on the wire to net or towel the bird. Some that are strong fliers will be more difficult and will definitely require a long handled net and a mid air capture may be required. This takes practice and skill to do successfully without injuring the bird. If at any time during the catch up, the bird appears to be getting stressed, stop immediately and devise a different tactic. Nothing can be gained from stressing a bird so much that it dies from capture myopathy.

At all times monitor the bird for signs of stress. They are as follows:

Increase in heart rate- more noticeable once you are holding the bird.

Panting –with mouth open, particularly in warm weather- heat stress. Will increase as the bird gets tired.
Also watch for the following defensive behaviours:

**Vocalisation** – loudly, decreasing as the bird becomes tired.

**Excessive struggling** – subsides as the bird becomes tired.

**Defecation** – likely to happen in the early to middle stages of handling, if stressed.

If a bird displays any of these things then stops, it is not always a good sign. This can mean that the bird is ill and has a poor stress tolerance, or is very stressed.

Figure 31: (clockwise from L to R) Holding head, wings and legs with bare hands. The thumb is placed to exert upward pressure to jaw. – Approaching a cockatoo with a towel. – Holding with a towel. (Fowler)

Once captured, to restrain a bird caught with a towel or net; through the fabric encircle the birds’ neck from behind with the fingers on the right hand, preventing the bird from moving its head. This hold is called the parrot grip. The purpose of this hold is to prevent the handler or examiner from being bitten. Once the head is controlled (from a posterior aspect), ensure both wings are tucked neatly bu the birds side and encircle the legs (from an anterior aspect), this hold is called a pigeon grip, with your other hand to prevent the bird thrashing around and injuring itself or scratching someone. To get the towel or net out of the vicinity, transfer both grips to the second person ensuring maximum care is taken to protect all feathers. (see figure 31)

For rehab birds, utilize the towel to cover the eyes and ‘wrap’ the bird so it is covered other than the area you wish to focus on. Also use a corner of the towel for a foot to grip while treating or medicating. This may be useful while checking a wing for injury. Often in my experience, these practices will minimize stress while handling.
7.4 Weighing and Examination

The following is my recommended procedure for weighing and examining: To perform a general examination a minimum of 2 people is required, one to perform the examination and the other to hold the bird, it may be advantageous to have a 3rd for recording the result of the examination. Working as quickly, and thoroughly as possible, start by examining the head, checking the eyes, nasal cavities, check and, open the beak to see mouth colour. Check general feather condition on upper body. Run finger down centre of breast to check body condition (known as the keel bone). Check and extend each wing individually, holding by the middle joint (elbow) to prevent injuries if the bird struggles and tries to pull away. Check for the presence of all feathers, particularly the primaries. Then check the vent area to ensure it is clean and check the tail for missing feathers that may hinder flight etc. Lastly check the feet and claws for any abnormalities.

After handling a bird, I always like to notice if there is a presence of feather dust on my hands or not. Feather dust is a fine white dust similar in appearance to talcum powder, a healthy bird has this in abundance and it will be clearly visible on your hands.

Weighing a bird is best done after the physical examination to avoid double handling the bird. Using a thick pillow slip which has been turned inside out to prevent claws getting caught in the stitching and has been ‘tared’ on the scales. With the assistance of a second person, slide the pillow case over the bird’s head, while still maintaining a parrot grip on the head and with feet restrained. Lower arms until bird is close to the table or ground, even on the scales, carefully and quickly releasing grips and extracting hands from the slip. Block end of slip by twisting and securing with a rubberband. Leave enough room in the slip to allow the bird to stand comfortably on its feet but not to walk off the scales.

Arrange bird on scales, remove hands and read the weight, record and lift off scales. While most birds won’t be happy being secured in a bag, they will come to no harm using this method and will tolerate the procedure, some may even quieten in a darkened environment. However to minimise feather damage and abrasion, this process needs to be completed quickly and then release the bird again.

7.5 Release

The best methods of release in my opinion are those which allow the bird to find its bearings and feet in its own time. Nothing is gained by rushing this process if the bird is not ready to go. In fact quite the opposite an injury to yourself or the bird and additional stress may result.

To release a bird from a pillow slip after weighing, lift the slip off the scales, undo the rubber band, carry the slip to the proposed release site eg, enclosure, box etc. Lay the slip on the ground with the opening end facing away from you; peel back the top of the slip to expose the opening to the bird inside. Grasp a bottom corner and lift to gently encourage the bird to move away from you, most will walk out of the pillow case when they see daylight.

To release a bird from a parrot grip and leg grip, take the bird to a secure area, enclosure or cage etc. Take bird to the ground and release the feet grip first, once it is standing on the ground, then the parrot grip, ensuring the bird is facing away from you for safety.
reasons. Do not attempt to release a bird in midair as it may still be disorientated and fall to the ground injuring itself. To release a bird from a small cage or transport box into an enclosure, place the cage on the floor of the enclosure with the door facing away from you, ensure all external doors of the large enclosure are closed, open the door or lid and stand back to allow the bird to come out in its own time. A top opening cage may be put on its side to allow the bird to walk out without having to climb to the top. If the bird refuses to come out of the cage, you may lift the end furtherest away from the door, off the ground for a gravity assisted release. If this still doesn’t work, visually check the bird to ensure it is not physically caught up or injured in any way, put the cage in the shade with the opening away from sight, with a towel draped over the rest of the cage. Add some favourite food and water in sight then leave the enclosure and allow the bird to come out when it is ready. This will allow the bird to acclimatise to a new environment in its own time and will avoid any additional stress. Again, any procedure that is likely to cause a bird stress is best avoided during the heat of the day, particularly in the summer months.

7.6 Transport Requirements

7.6.1 Box Design

It is imperative that all transport boxes are built of materials that can withstand willful beak damage. Strong plywood or solid wood with a minimum thickness of 0.6cm or metal sheeting. The internal walls must have no projections the bird can get hold of or injure itself on. The box design must incorporate good ventilation with all openings and holes being covered by wire mesh that will provide good air flow. A perch must be provided for cockatoo species that provides grip, stability and comfort to the bird. Boxes can be of various design see figure 32.
7.6.2 Furnishings

Minimal furnishings are required for a Long Billed Corella. The most important would be a perch that will enable the bird to sit comfortably off the floor, and situated so that the bird has enough room to turn completely around without catching or damaging its tail feathers. The perch must be round enough for the bird to grip firmly and comfortably. Also care needs to be taken to ensure that the perch is installed at such a height that the bird will have adequate head room to ensure it will not bang its head on the top of the cage during travel. The perch must also be placed so that faecal matter cannot fall into food or water containers. The recommended substrates for short term travel would be shredded or flat newspaper/ printers paper for ease of cleaning. For longer distance travel, substrate which cannot harm the bird in any way must be used eg newspaper, a false floor to allow faecal matter to drop through to a lower tray or some form of floor liner that is secured in place and won’t shift about. Not recommended are things like towels in my opinion, (they have many loops) birds can become entangled in them while travelling. The only time an item like this may be of use is after a procedure when a vet has chemically restrained a bird to perform a procedure like trimming a beak, or strapping a leg on a rehab bird. The bird may be wrapped in a fabric item while still recovering from the anesthetic to prevent the bird rolling around in
the bottom of the cage and injuring itself while it is still groggy. Newspaper can also be used successfully in this case. (see figure 33 below) (Fowler)

![Figure 33: Recovering from anesthesia wrapped in a newspaper. (Fowler)](image)

7.6.3 Water and Food
For a trip less than 24 hours, but more than 4-5 hours, water and a basic seed mix, or other desired foods should be provided. For birds travelling more than 24 hours, additional feed may be required and must be provided to the carrier in the case of unforeseen delays. Birds will not feed in the dark so dim light must be present to allow the bird to see its food.

**IATA container requirements** state water containers must have flanged sides and be narrow enough so that the bird cannot wet itself while drinking, all water is filled at shipment time and presumably, not again within a 24 hour period.

7.6.4 Animals per Box
**IATA container requirements** state that up to 6 birds may travel together. **Sindel and Lynn (1996)** strongly recommend that no cockatoos (more than 1) should ever be placed in a small confined space for any period of time together, even the most devoted pair of birds may get so fearful and stressed that they may attack each other in this type of situation.

The Long billed Corella is generally known as the docile clown of the cockatoo world, they give an impression of being very laid back and not very aggressive. However while this may be generally true there will always be one occasion when this is not the case. Even the mildest mannered birds can turn aggressive in stressful situations. In large groups of birds there are aggressors and victims so taking the risk wouldn’t appear worth it to me.

As **Sindel and Lynn (1996)** point out it tends to be the birds of little value who get subjected to these types of arrangements. Trappers and bird dealers accept that losses are an inevitable part of their business and are likely to think less of the individual’s welfare.
7.6.5 Timing of Transportation

Care should be taken transporting birds in the heat of the day, particularly in summer. All transport should be air conditioned and well ventilated. Birds can be particularly susceptible to heat stress. A catching towel can double as a visual barrier by draping it over the cage to keep the bird calm. Early mornings, late afternoon and evening are the best times of the day to transport birds. It is recommended that all birds be given ample opportunity to drink before any length of travel. An anti stress tonic before departure can be beneficial for long distance travel.

Ideally wild birds should be held for at least 30 days before shipping to overcome capture stress and become accustomed to the new diet.
8 Health Requirements

8.1 Daily Health Checks

Birds are very skilled at hiding the signs of disease and often by the time a keeper has identified any signs of ill health, disease is established and advanced. (Hunt 1999). Most important is to know what is normal for that particular bird. Any variation from this may suggest signs of a problem. A basic visual inspection of the entire enclosure and its entire occupants must be conducted on a daily basis. One of the most beneficial things we can do is to observe the bird/s, initially from an inconspicuous place.

Through observations ask yourself the following questions:

Is the bird bright and alert and perching well with tight feathering?
Is it perching in an unusual/usual location?
Is the bird able to fly in its normal way, are its legs moving normally?
Is the bird displaying its normal behaviours eg preening, feeding, socialisation and vocalisation?

On closer observation:

Are its feathers clean looking and contain feather dust?
Is the birds faecal matter normal – normal colour and consistency and no blood present?
Are there any unusual discharges eg cloacal, nasal or ocular (eye)?
If the bird shows variations to the considered norms, further investigations should be conducted;

Some other physical and behavioural signs to look for that would be considered abnormal are:

- feathers ruffled and fluffed up on the perch, bird spending a lot of time on the floor of the aviary, loss of appetite, unable to perch correctly, excessive fluttering/pacing, getting picked on by other birds in the enclosure, lethargic and non-responsive, excessive or lack of vocalisation, panting, abnormal flight patterns and unsteady landings and takeoffs, swellings in the joints, pupils abnormal, ill fitted leg bands, abnormal distension (including crop), vomiting/regurgitating food, excessive (or not) drinking, stunted growth, and any unexplained aggressive behaviour.

Standing in a different (or abnormal) position in the enclosure for a prolonged length of time or bird not flying to greet keeper if this is a normal occurance.

8.2 Detailed Examination (Physical and Chemical)

Generally a physical exam should start at the head of the bird and continue systematically through to the feet and tail feathers so as not to miss anything. The following is a check list of things to look for.

Check eyes, cloaca and nasal cavities for any discharges – Check that vent is clean, eyes are bright and alert with no swellings or discharges. Nostrils should be dry and clear of debris or feather matting.

Check the beak – ensure it is properly formed and growing normally. It should be smooth and free of cracks, grooves or bleeding. The upper and lower mandible should meet correctly and not be distorted.
**Assess body condition** – run your finger down the keel (breast bone). Birds with poor body condition will have a prominent keel and very little breast muscle present. An obese bird will have a breast that is oversized and that creates a channel at the keel.

**Wings/Feathers** – Open out the wings and check the underside of the flight feathers. Check for missing flight feathers, abnormal feather growth, and damage caused from small cages/enclosure wire. Look along the central vein for lice. Ensure the presence of feather dust. Observe general cleanliness and colour of feathers. Look for bald or rubbed patches that may indicate mites or self mutilation. Check that feathers are well zipped (not split to the shaft and frayed).

**Legs/Feet** – check that the bird is able to perch properly. Check for leg and joint deformities. Notice the general appearance and colour of the feet, with the presence of feather dust the feet should be a matt/grey colour, if the feet look black and some what shiny this could indicate an absence of feather dust and possible PBFD. Check all claws are present and that the toes are facing the correct way. Check the underside of the foot for redness, flaky skin, tenderness, and smooth pink skin which may indicate Bumblefoot. Check for wart like growths and lesions. Lesions may be a sign of advanced Bumblefoot.

For detailed examinations and more intrusive routines like beak and claw trimming or other procedures which may cause some stress, some birds may benefit from light anaesthesia. The gas Isoflurane (at 3% induction) (J Salkeld) is widely used by most vets. Ketamine is another common analgesic that is used for immobilisation purposes in cockatoos. (Iowa State Uni. 2010)

### 8.3 Routine Treatments

**Vaccinations:** It is not common to vaccinate birds in Australia, however there is a vaccine available, it is for: Avian Polyomarvirus. First vaccination at 20 days of age and 2 additional boosters about 2-3 weeks apart. (birdnways website 2010)

Scientists are still working on a vaccine for Psittacine Beak and Feather Disease (PBFD). (exoticpetvet website 2010)

**Worming:**

**Panacur 25 TM** - Recommended for treating roundworms and some strains of threadworms. Suggested dose is 1-2ml per 500gm body weight – ideally for 3 consecutive days. Dosing should be repeated in 10-14 days. Shake well before use, not suitable for in water use. It should not be used in birds when moulting as it may cause feather deformities. **Panacur** 10 should not be used as it has been related to deaths.

**Avitrol Plus TM** - Contains levamisole, effective against roundworm and some strains of threadworm. **Avitrol Plus** contains praziquantel and will also treat tapeworm. Give 1ml direct to the crop per 240gm body weight. Repeat in 10-14 days. Can be given orally but is bitter and birds may regurgitate. Accurate dosing is important as overdosing can lead to toxicity problems eg lack of coordination, leg and wing paralysis and even death. In water dose rates – 12 drops to 20ml or 25ml per litre of drinking water.

**Ivermectin** – (Ivomec TM) Is available as several preparations, suitable for the treatment
of roundworms and some threadworms. The effective dose rate is from 0.2mg per kg body weight to 0.8mg kg body weight for resistant cases. Repeat in 14 days.

**Direct doses of some common worming medications for the Long Billed Corella.**
Av. weight 640gms –
- **Panacur 25TM** 1.3-2.6ml.
- **Avitrol Plus TM** 2.7ml.
- **Ivomec TM** 1.7ml#

#This dose is for Ivomec Liquid TM for sheep (0.8g/L) diluted in 1 in 10 with water immediately before use. (Hunt 1999).

**Disclaimer:** Very few drugs on the market are registered for use in birds, therefore most usages and doses have been derived from mammalian therapeutics. For this reason, be aware that manufacturers will not accept responsibility for the off the label use of their drugs. The above dose rates are based on clinical trials and experience, but side effects may occur. (Hunt 1999).

Be guided by your Veterinarian in making a final decision on what to use.
In my experience it is beneficial to get faecal samples analysed by your vet before dosing to avoid dosing when it not required. Unnecessary dosing will only contribute to building a resistance of worming medications.
The frequency in which you worm will also depend on the following: the stocking level and size of the enclosure, the substrate used and how much contact the bird has with other birds.

**8.4 Known Health Problems**

a. **Avian Polyomavirus: Contagious**
- **Cause:** A viral pathogen which can cause widespread deaths among parrot species nestlings. This is particularly prevalent in a hand raised environment. (Hunt 1999). A vaccine is available.
- **Signs:** Parrot chicks will usually die quickly, some may show signs of pale skin, bruising, weakness and yellow urates shortly before death. Cockatoo chicks tend to be less affected, sometimes only getting abnormalities with feathers and temporary illness. Adult birds are often resistant to the disease unless they are suffering from an immunosuppressive disease such as PBFD (Hunt 1999).
- **Treatment:** Generally supportive care is the best form of treatment. Hygiene should be improved eg feeding droppers for each bird, separate birds in terms of space and ensure ventilation is adequate. A vaccine is available. (Hunt 1999).
- **Prevention:** Improved hygiene, use disinfectant for all feeding utensils, maintain quarantine environment in the nursery to prevent new chicks from bring in the disease. Keep hand reared chicks away from adult birds. Maintain tight control over all bird movements in and out of the collection and between the nursery and the outside enclosures. (Hunt 1999).
b. Psittacosis (Chlamydiosis) – ZOONOTIC and Highly CONTAGIOUS

**Cause:** Is an organism called *Chlamydia psittaci* that can infect in its own right or as a secondary infection when a birds’ immune system is already low such as PBFD, or stress due to transportation, new environment, moulting, during extreme weather conditions etc. This disease is spread by the organism being shed in faecal matter, eye or nasal discharges and feathers. (Hunt 1999).

**Signs:** Include mild depression, lethargy, rough plumage, sneezing, weight loss, occasionally fits and tremors, inflamed watery eyes, yellow-green or watery droppings and diarrhoea. (Hunt 1999).

**Treatment:** Usually long term treatment with tetracycline antibiotics (or it derivatives eg Doxycycline – *Psittavet TM* is the most commonly used one on the market.) (Hunt 1999).

**Prevention:** Preventing infected birds from coming into the collection in the first place by having quarantine measures in place for all new birds, regular and effective hygiene practices, good ventilation, eliminate overcrowding and ensure a stress free environment and good diet. Birds that have had the disease will not build immunity and are likely to succumb at a later time or become carriers. These birds may be better culled. (Hunt 1999). **Always wear adequate PPE when handling an infected bird and cleaning as this is a zoonotic disease. (gloves, face mask, overalls, glasses and boots.)**

c. Bacterial infections- eg Salmonella - ZOONOTIC

**Cause:** There are many different species of harmful bacteria, *Salmonella sp.* is the most common but still not too common in psittacines. Free ranging birds, flies, rats and other vermin can be vectors of this disease. (Avian Biotech 2010)

Microbiological culture (faecal) is the standard method used.

**Signs:** Salmonella can be quite similar to other diseases. Lethargy, off food and fluffed up, tail bobbing, diarrhoea (often bright green), blocked nostrils, soiled vent, sneezing, noisy respiration, discharge (nasal and ocular), weight loss, and excess urine production leading to dehydration.

**Treatment:** Is antibiotics, however all bacterial infections require different antibiotics as no one is effective against all strains. This type of infection needs to be diagnosed by a vet to ensure the correct antibiotic is given as the over use and misuse of antibiotics will lead to resistance. Culling may be required.

**Prevention:** Often bacterial infections can be avoided by good management and husbandry practices. Eg Hygiene, adequate pest prevention measures, fresh and good quality diet and water, adequate quarantine measures for new birds, enclosures with good shelter and good ventilation, and providing a stress free environment for all individuals free from intimidation.

d. Psittasine Beak and Feather Disease (PBFD) – Highly CONTAGIOUS

Figure 34: Advanced PBFD in a sulphur crested cockatoo (www.awarewildlife.org.au)
**Cause:** Is a viral disease that is endemic to the wild parrot population. Cockatoos are particularly susceptible to this immunosuppressive disease. There are 3 known forms Peracute (neonates), Acute (young or fledgling birds – death in 1-2 weeks) and Chronic (birds 6-12 months undergoing their first adult moult and can also effect older individuals. (AWHN 2010) Is transmitted by feather dust, faecal matter, feathers and on vectors such as hands, towels, catch up equipment, and carry cages etc. The virus is very stable in the environment and can survive for long periods on contaminated equipment which must be treated with a strong peroxygen (Virkon-S) disinfectant with exposure for a minimum of 10 mins. (Cross 2006)

![Figure 35: This bird has a seriously deformed upper and lower mandible. Likely to be the result of chronic PBFD](www.10000birds.com)

**Signs:**
- **Peracute** – septicemia, pneumonia, enteritis, rapid weight loss and death.
- **Acute** – depression, diarrhoea, crop stasis, feather abnormalities and death.
- **Chronic** – Begins with a loss of feather dust, the progressive appearance of abnormally developed feathers during each successive moult, retention of feather shafts, haemorrhage within the pulp, fractures of the rachis, deformed curled feathers and constrictions at the base of the feathers. Beak changes may occur, including elongation, fractures, palatine necrosis and oral ulceration. (AWHN 2010)

**Treatment:** Unfortunately there is no cure and infected birds often succumb to secondary infections and die. (AWHN 2010)

**Prevention:** Always maintain high husbandry hygiene practices eg cleaning and feeding to provide a disease free environment. Provide a nutritional diet, where possible prevent wild birds from landing on enclosures and shedding the disease in their faecal matter, replace nesting boxes regularly and ensure they are clean before the commencement of the breeding season. If chicks are born with PBFD, don’t attempt to continue breeding with the parents. Always maintain high standards of personal hygiene eg hand washing, use of PPE to minimise the spread of the disease.
e. Aspergilliosis - *Aspergillus fumigatus*:

**Cause:** Is one of a range of fungi that causes respiratory infections in captive birds (predominately). It is considered to an opportunistic pathogen that causes disease in birds that are otherwise debilitated by bacterial, viral, nutritional, traumatic, or toxic disease (secondary infection). (Rose 2005) Inhalation of high levels of the spores in bedding and nesting materials is a major cause and a bird that is already immunosuppressed due to stress, handling, transport, poor ventilation, age (young or old), abuse of antibacterial and corticosteroid medications, respiratory irritants, underlying disease and a poor nutritional diet would be predisposed to this disease. (Hunt 1999)

**Signs:** The first form signs are obvious breathing difficulties, open mouthed breathing and tail bobbing, particularly after exercise and stained green droppings. Also depression and weight loss. The second form is more sudden with the onset of breathing difficulties without weight loss. Many die quickly without any previous signs of illness and hence often no treatment is given. (Hunt 1999) This is the organism most commonly responsible for mycotic lesions (respiratory tract), (Rose 2005)

**Treatment:** Prevention is far easier and more successful than treatment. The antifungal drug itraconazole (Sporonox TM) has been used to treat this condition in animals.

**Prevention:** The spores may be present within food, bedding and nesting material. (Rose 2005) Agricultural grasses, straws and hays (rotting organic matter) should not be used as nesting or bedding materials. Don’t feed mouldy, old, dusty or contaminated seed.

f. Bumblefoot-Ulcerative Pododermatitis:

**Cause:** Is a bacterial infection that causes inflammation or infection of the weight bearing surfaces of the foot. It is common in captive cockatoos. Often inadequate perches, diet and hygiene are the causes. (Bird Veterinarian, 2010)

**Signs:** It may show as reddened and sore skin, continuing to ulcers if the case worsens. Perching may become difficult and the bird may show signs of obvious leaning to one side, even total disuse of the infected foot. Extreme cases can spread to the bones. (Hunt 1999).

**Treatment:** In early cases, supplementation with multi vitamins (vitamin A and Biotin) and a nutritionally balanced diet will help. Reduce obesity if this is an issue. (Hunt 1999). If serious lesions are present a course of antibiotics may be required. Maintain supportive care, and antiseptic application. (Bird Veterinarian, 2010)

**Prevention:** Providing good quality natural wood perches (not plastic, concrete or dowelling wrapped in sandpaper etc), not too smooth, rough, small or large, will help the problem. A balanced diet is essential as this problem is linked to a Vitamin A deficiency (add dark green vegies) and improved hygiene will also help prevent the problem. (Hunt 1999).
g. Candidiasis

**Cause:** Is caused by the yeast Candida albicans. Normally found in a bird’s digestive system, it only becomes a problem in some cases e.g. young chicks with an underdeveloped immune system, hand-rearing environmental factors – humidity, fluctuating brooder temperatures, food caked on face of chick, unsuitable formulas (temperature, texture, nutritional content, decomposition) and the abuse or overuse of antibiotics in chicks. (Hunt 1999).

**Signs:** Vomiting and regurgitation, crop emptying times slow, depression and refusal of food. Sometimes the crop becomes impacted. In older birds the crop may be filled with a sour-smelling mucous. Birds with a Vitamin A deficiency are predisposed to an infection. (Hunt 1999).

**Treatment:** Correct any underlying husbandry and hygiene issues or procedures that may be present and also any other underlying diseases or deficiencies that may be a cause, then treating with the appropriate medications e.g. nystatin (Nilstat TM and Mycostatin TM), Severe or non-responsive cases can be treated with ketoconazole (antifungal, Nizoral TM). Supportive therapy, fluids and Vitamin A may also be required. (Hunt 1999).

**Prevention:** Do a critical assessment on all hand-rearing techniques, particularly if this is a reoccurring problem. (Hunt 1999).

h. Parasitic worms (roundworms/ascarids, threadworms/capillaria, and tapeworms)

**Cause:** Can affect all birds, captive and wild. However, a crowded captive environment is a platform for these to multiply if not controlled and contained. (Hunt 1999).

**Signs:** Infected birds may show signs of weight loss, anaemia, lack of appetite, vomiting, ill thrift, lethargy, diarrhoea, be susceptible to other diseases and show poor breeding results. Extreme cases may be emaciated and even pass seed in their faecal matter. Some birds may die suddenly. Others may not appear ill but shed many eggs in their faecal matter which can reinfect themselves and other birds. (Hunt 1999).

**Treatment:** Worm treatments are available for White Cockatoos Avitrol TM and Avitrol Plus TM, Ivomec TM and Panacur 25 TM are recommended. (Hunt 1999).

**Prevention:** Ensure all faecal matter is...
cleaned regularly from your enclosures (daily to weekly). Quarantine and worm all birds before adding to the main collection, get regular faecal floats done to ensure reinfection does not become a problem. Worming is best done orally (crop needle) to ensure each individual bird gets the correct dose. Weigh each bird before dosing to ensure you don’t underdose. Underdosing leads to resistance. Communal dosing in a water bowl is often unreliable and can lead to underdosing. Over crowding will only add to a worm problem. For birds identified to have a heavy worm burden, a repeat worming may be necessary.

### i. Protozoan Parasites

**Cause:** A single celled microscopic organism that lives in the digestive system of birds, most likely to be *Giardia spp.* that would cause a problem in Australia. Microscopic examination of fresh faeces or scrapings from a dead bird’s intestine is needed for a diagnosis. (Hunt 1999).

**Signs:** Smelly mucoid diarrhoea, anorexia, depression, weakness and death, particularly in young or immunosuppressed birds. *Giardia spp.* has been associated with plucking and self mutilation. Some birds may be carriers and appear normal. (Hunt 1999).

**Treatment:** Antiprotozoal drugs eg metronidazole (Flagyl TM) or ronidazole (Ronivet-S TM) for approx. 7 days and supportive care with fluids, antibiotics and/or antifungals, multivitamins etc. (Hunt 1999).

**Prevention:** The environment must be kept dry to prevent the survival of the cystic stage of the organism’s life cycle and therefore preventing reinfection. (Hunt 1999).

### j. Ecto-parasites (external parasites - ticks, flies, lice and mites)

**Cause:** Scaly mites are occasionally seen in cockatoos. These are spread by direct contact or through the flaky skin of an infected bird. *Mites* in large numbers are often evidence of an underlying immunosuppressive disease (always check for PBFD in cases like this). **Flattened flies** can live on a cockatoo’s body beneath the feathers. They are generally harmless though may be involved in the transmission of blood parasites. **Ticks** can occasionally be found on cockatoos (Hunt 1999).

**Signs:** Scaly mites burrow into the skin producing a crusty reaction which is seen as a honeycombing effect on the skin around the bare patches of the face and potentially the whole body. **Mites and lice** may cause skin irritations, excessive preening, poor feather quality, abnormal moult and in extreme cases anaemia. The eggs of lice can be seen as a grey/white dust on the feather shaft. Adult lice are likely to move away from light sources. **Mites** look like a reddish-brown fine powder on the underside of the bird’s feathers or its body. Some mites actually live inside the feather shaft. (Hunt 1999). **Ticks**, if left on can cause anaemia, lethargy and in some cases paralysis.

![Figure 38: Bird Lice](www.theyrtoast.com)

**Treatment:** Scaly mites can be killed with ivermectin or moxidectin. It is important to wear gloves and change clothes etc after handling these birds as mites and lice can crawl onto keepers clothing and into hair. Bird specific insecticidal sprays and powders may be used to eradicate lice.
and mites. The use of an environmental cleaning insecticide is recommended for mite infestations. All ticks should be picked off if found. (Hunt 1999).

Prevention: Keeping birds in a generally healthy and disease free environment will help to limit exposure to ecto-parasites. Minimise overcrowding and stress in a captive environment. (Hunt 1999).

k. Heavy metal toxicity

Cause: Zinc, lead and to the lesser extent copper and mercury are the ones to watch. Can be common in pet and captive cockatoos as they live in small cages made of wire (with a galvanised coating) that they are inclined to chew and climb on. It contains 98-99% zinc and 1-2% lead. The shiner the wire the higher the zinc content, and avoid wire with excessive lumps in areas where the welds join. Other sources can be old paint, jewellery, leadlight windows, bird toy weights and galvanised food and water dishes. (Hunt 1999).

Signs: Excessive drinking, watery faecal matter, greenish diarrhoea, show vomiting or regurgitation and crop slow to empty. In some cases, depression and weight loss, possible seizures. Fertility may be decreased, and some may pick at feathers and feet. In advanced cases blood may be present in faecal matter. (Hunt 1999).

Treatment: Hospitalisation to stabilise their condition. X-rays and blood test to diagnose the condition. Time is of the essence, signs should not be ignored as toxins will do irreversible damage. (Hunt 1999).

Prevention: Be fully aware of any metals present within the enclosure. Scrubbing the wire with a vinegar solution and a wire brush will help to dislodge any loose bits of galvanised matter and will remove ‘white rust’ but will not prevent it from reforming. ‘Weathering’ the wire for 6 month doesn’t reduce the risk. Top quality wire is expensive but much safer. (Hunt 1999). Always add natural browse, a healthy selection of foods (including native if possible) and safe natural enrichment toys and other items to your enclosures to reduce the time the birds will spend chewing wire.

Figure 39: This cockatoo mesh has been weathered outside for a considerable period of time, some for as long as 10 years. This reduces the effect of heavy metal poisoning if chewed. Rolls may also be soaked in a bath of vinegar. Priam Psittaculture Centre 2010. (F Oosthoek)
1. Trauma and aggression injuries

**Cause:** Aggressive male birds may attack other birds including their own made in certain situations. High risk times include the breeding season, confined spaces eg carry cages (always travel separately) and partner incompatibility. Even in proven breeding pairs with a long history, aggression can happen (normally towards the hen). In a mixed species enclosure or multi bird, non-breeding enclosure can have aggression problems as males assert dominance over territory. (Hunt 1999).

**Signs:** Injuries are likely to be around the face and beak area and the feet. Skin may be broken and feathers pulled out and causing bleeding (Hunt 1999).

**Treatment:** Remove bird from enclosure to avoid further injury. Wounds that bleed persistently and/or are deep may require veterinary attention and antibiotics. Superficial wounds may require topical antiseptic application such as Betadine™. A severely traumatised or injured bird may need time in a hospital box. Warmth, quiet, and slightly darkened environment with the necessary food and water supplied. (Hunt 1999).

**Prevention:** Carefully monitor and assess which birds can be put in an enclosure together and consider seasonal variables. Always provide natural browse and forms of enrichment as this can help distract aggressive birds and minimise problems.

m. Nutritional problems and diseases (Vitamin A deficiency, Rickets, Obesity and Secondary Nutritional Hyperparathyroidism [SNH])

**Cause:** Obesity - One of the commonest reasons for ill health in cockatoos is from a poor diet (one of predominately seed and a high % of sunflower seeds [fat content is 47%].) All seed diets are never nutritionally balanced. Often they are high in fats, low in protein, low in amino acids, minerals, trace elements and vitamins. Vitamin A deficiency – often seen in cockatoos as seed diets contain minimal vitamin A. Rickets is a disease made worse by an imbalance of phosphorus and calcium in the diet. Secondary nutritional hyperparathyroidism (SNH) the body uses calcium faster than it can absorb from the intestine. In growing chicks it can lead to fractures and deformities. In breeding hens, egg binding, soft shelled eggs and fragile bones. High phosphorus levels in the diet worsen the condition.

**Signs:** Obesiy can cause fatty deposits (lipomas) under the skin on the feet and the lower abdomen. These can become raw and bleeding over time, causing the bird discomfort. Obese birds may also have fatty livers – failure of the liver may result, or spontaneous rupturing and bleeding of the liver, enlarged liver, poor liver function, breathing problems and even death. A high fat diet may also cause diarrhoea, infertility, oily feathers and interference with the absorption of some nutrients such as calcium. Vitamin A deficiency can cause poor immune function, poor breeding (early death embryos), Bumblefoot, upper respiratory tract disease eg sneezing, wheezing, swollen eyes and blocked nostrils. Rickets in young birds results in improper bone formation, soft bones and beak and deformities. SNH- bird is weak, thirsty, lacking appetite and sometimes regurgitating.

**Treatment:** Obesity. Surgically remove lipomas. Gradually change diet over time, adding vegetables, pulses, avian pellets, fruit and green food. Vitamin A Deficiency- Add vegies high in vitamin A eg greens, red capsicum, carrots and sweet potatoes. Can be supplemented but avoid over supplementation as this can be dangerous. Rickets - early detection may allow corrective splinting and a diet correction is a must. SNH –
make dietary changes, supplement calcium and/or Vitamin D (indoor birds), calcium particularly during times of high demand eg breeding season to prevent egg binding and in young chicks to assist with correct bone growth and formation.

**Prevention:** Provide a wide range of nutritionally balanced supplementary food for your bird including green vegies. Add natural bush foods, flowers and browse when possible to provide additional nutritional balance to the diet. Supplementation of minerals and vitamins should only be necessary if the bird resists eating anything but 1 or 2 varieties of seed eg sunflower. Be careful not to over supplement as this can do more harm than good. **Always feed a nutritionally balanced diet.**

**n. Plucking and self mutilation**

**Cause:** Plucking is the name given to a bird that pulls its own feathers out, causing damage to the feathers and skin. Self mutilation is when the feathers, skin, the tissues and muscles etc. are damaged by the bird itself. (Hunt 1999).

**Signs:** Any signs of damage to the feathers, witnessed, observed, eg tips of the feathers, the shaft split, feathers pulled out by the follicle, or feathers bent and broken. Most pluckers look the same eg no feathers. However the underlying reasons may be very different. Eg behavioural like boredom, disease, possible mistreatment or neglect, trauma, pain, anxiety and stress, nutritional problems, poor socialisation, aggression, etc. A bird with only its head plucked is unlikely to be a plucker, most likely it has been mate-plucked. Feather plucking has also been associated with heavy metal poisoning, psittacosis and fatty liver disease. (Hunt 1999).

**Treatment:** In the short term, damaged feathers may need to be plucked, wounds stitched and treated topically and antibiotics given. To find the underlying reasons, a complete physical examination and history, further tests for infectious diseases and allergies etc may be necessary as a process of elimination. (Hunt 1999).

**Prevention:** A collar may be used to prevent the bird doing any more damage to itself. Also supervise a bird for the first 24-48 hours wearing a collar to monitor their ability to cope with the new addition. The collar should remain until the wounds have healed and the feathers have grown back. (Hunt 1999).

**o. Egg Binding:** (see reproduction section)

**8.5 Quarantine Requirements**

The general objective of quarantine is to ensure that no infectious diseases are introduced to the main collection. This includes keeping all new birds isolated from all other birds in the collection and maintaining a contamination barrier between the quarantined bird/s and the main collection. This is achieved by the use of footbaths, gloves, face masks, clothing changes etc when handling, cleaning and feeding the quarantined bird. Ideally the person caring for the quarantined bird should not also care for the birds in the main collection, however this is often not feasible in small operations and effective use of PPE and barrier nursing is essential to prevent the spread of any kind of disease or contamination.

All new birds must be quarantined for a period of at least 30 days and often as many as 45 days. This allows for a thorough opportunity to perform a physical examination, and
perform tests for known cockatoo diseases, and assess all ecto and endo-parasites present etc. This also gives a window for treatment procedures. The period of the quarantine should be extended if treatment can’t be adequately provided in the 30 days with a full health clearance.

A quarantine period is also a valuable time to be able to observe a new bird and monitor its behaviours, transition into a new environment, general appearance, and eating habits. (Sindel, Lynn 1996). It is possible wild caught birds will not recognise seed in a bowl as a food source. In cases like this it would be helpful to provide as much natural foods and browse as possible at least until the bird is observed cracking seed. All old food, browse, newspaper etc should be disposed of in a sealed bag and not put out with the other general waste.

Also recommended is the addition of a daily mandatory dose of Psittavet in the birds’ drinking water for the duration of the quarantine period. See bottle for dosage rate. **Specific test that should be carried out:**

Feacal floats analysed to look for (internal) endo-parasites (veterinarian). Dose on arrival, test and re-dose in 2 weeks. For heavy worm burdens re-dose again in a further 2 weeks.

Blood, tissue and feather analysis can be performed to identify this virus.

**Psittacine Beak and Feather Disease (PBFD).** (veterinarian) (Avianbiotech 2010)

Incubation time can be 3 weeks to 12 months.

Faecal, blood, immunofluorescent, PCR (Polymerase Chain Reaction) and nested PCR testing.

**Psittacosis (Chlamydiosis)**- Incubation period 3-10 days. (veterinarian) (Avianbiotech 2010) Whole blood analysis and cloacal swab.

**Polyomavirus** Incubation period – 2 weeks or less. (veterinarian) (Avianbiotech 2010)
9 Behaviour

Figure 40: An interesting picture, friends or foes?

(www.forum.weatherzone.com.au)

9.1 Habits

In the wild, Eastern Long Billed Corella’s live in large social flocks of 50 to 100 birds (sometimes more). Prior to the breeding season, parents may be part of these flocks to introduce their previous years young to other young non breeding birds, before returning to their nesting site for the following breeding season. The young birds that form these large flocks will stay until they reach sexual maturity and choose a compatible mate at about the age of 3-4 years. They are noisy, active, and conspicuous, and tend to travel greater distances than the breeding adult pairs who generally don’t move far from their nesting site during the breeding season. Breeding pairs will return to the same nesting site if suitable, year after year. Many Corella breeding pairs may share the same tree if there are numerous nesting sites available. Younger pairs will fill the lower sites and older birds nest higher. (HANZAB)

Non breeding birds will roost communally and leave the roost early to forage for food and return at dusk. During the day they rest in leafy trees to escape the midday heat. Most
feeding sites will be within 5km of their roost but they have been known to travel up to 12 kms for their favourite foods. (HANZAB) Vocalising calls are loud and distinctive. There is likely to be much aerial activity at the nocturnal roost site both in the morning and before settling for the night, circling, flying between trees etc and much vocalising between individuals and the group. Flight is interspaced with periods of gliding, particularly when intending to land. The number of sentinels employed for lookout will depend on the flock size. Being a ground forager, the flock will not always have a sentinel for lookout, however all feeding birds remain alert to predators and danger. Large flocks have been known to chase encroaching predators eg raptors, until they have left the area. Birds often grasp clods and sticks in feet, sometimes rolling on back with feet in the air and biting at the object as a form of play. (I have personally witnessed this type of playful behaviour on many occasions, mainly from wild birds foraging on a grassed area with sticks and twigs lying about on the ground). While standing, either foot can be used to hold food to eat. (HANZAB) White cockatoos walk with a distinctive waddle that rolls their body from side to side as they walk. In captivity these birds are known as the best talkers of the cockatoo family and their clown-like appearance and behaviours are very much part of their charm and make up for their lack of visual appeal. (Sindel and Lynn 1996) Antagonistic behaviour towards others may be displayed by a raised or arched neck and head, and the crest and neck feathers raised to make the bird appear larger and more threatening. This may also be accompanied by vocalising. (HANZAB) Alarm may be displayed by vocalising, raising of the wings and crest, and rapid take off to flight or running on the ground.

9.2 Reproductive Behaviour

In captivity the preparation of the nest is often accompanied by vocalising and courtship displays by the pair. Some of these displays may include:

- The male preening the female, especially around the neck and head area then he will feed her and attempt copulation. (HANZAB)

- Bowing, both birds sit side by side and take turns bowing low with wings fully spread. This is accompanied by much vocalising and will likely take place on a favoured perch close to the nest entrance. (HANZAB)

- The male may also sidle up to and from the female several times with wings outstretched, then attempt copulation. (HANZAB)

- The male may approach the female with a strutting motion, crest raised, and tail fanned, bobbing head and uttering guttural yodel. (Sindel & Lynn1996)

- Beak clicking is also thought to be part of the courtship display. Males rapidly open and close their bills to create a clicking sound. However this behaviour has also been observed in newly captured (wild) birds and thought to be a
displacement activity. (HANZAB)
(I have also observed a pet Little Corella of unknown gender displaying this same beak clicking, which appears to be a show of friendly behaviour).

Copulation can occur often from 4 weeks before laying commences. (HANZAB)
(See Reproduction section for more details).

9.3 Bathing
These birds enjoy bathing in the rain, often sitting on an exposed perch with wings drooping and feathers fluffed. In the wild they will also flap through wet foliage in trees etc. (HANZAB)
In captivity it is most important to provide some form of bathing opportunity as this will also encourage preening. A ground level water tub that is not too deep, a roof sprinkler for the summer months, a light spray with a hose on the mist setting or a build in misting system will all be useful solutions.
In drier areas where water is not so readily available these birds have been known to also have dust baths. (Walker, B.)

9.4 Behavioural Problems
Undesirable behaviours seen in captive birds are often the result of the following: eg, boredom and frustration, anxiety and insecurity, changes in routine, large variations in weather conditions, and poor socialisation. (Hunt)
Sadly in some extreme cases, neglect, mishandling and abuse from humans may also be a factor. The end results can often be aggression towards keepers and other birds, stereotypic behaviours such as pacing, swaying to and fro in one spot etc, and in some cases, the extremeness of feather plucking and self mutilation. Obviously the longer the behaviour has been allowed to persist the harder it will be to cure. If disease and illness, housing, dietary and compatibility issues have been ruled out, the implementation of other immediate environmental enrichment may be the only option to restore some form of quality to the birds’ life. Results may not be immediate and may not be entirely successful; however any distraction provided will be beneficial in some way. Be persistent and keep regular records of enrichment provided and make observations recording before and after reactions and results of all individuals.
In my opinion enrichment should form a big part of every bird’s life from a very young age in captivity. It is our responsibility as keepers to ensure this as it will drastically reduce the incidence of these undesirable behaviours and minimise the risk of them developing in the first place.

9.5 Behavioural Enrichment (see 30 day Enrichment Chart – Appendix 3)
To minimise captive stress and undesirable behavioural problems, it is important to offer the birds in our care with opportunities, or as close as possible, to mimic natural behaviours.
By providing our animals with enrichment we offer complexity, choice and change (the 3 Cs). (M Hawkins 2003)

**Complexity** provides natural occurrences which lead to natural responses. (M Hawkins 2003) eg housing birds outdoors with exposure to the natural elements, seasonal variations and natural setting. This may also include a range of appropriate furniture and fittings.

**Choice** and control are elements often lacking in captivity. A lack of behavioural choice can be a major cause of undesirable and abnormal behaviours. (M Hawkins 2003) eg no choice of companions, lack of natural foods, freedom to move and fly etc.

**Change**, some is necessary to enable birds to cope with environmental challenges. (M Hawkins 2003) eg exposure to a wide range of natural temperatures and elements in an outdoor environment.

“To much variation leads to stress: too much familiarity leads to habituation. A predictable basic routine is important but unpredictable schedules can be added for some events”. (M Hawkins 2003)

To assist with and implement successful environmental enrichment for this species we must consider the usefulness and appropriateness of the following:

- **Exhibit Design** (see section 4.1)

- **Mechanical Devices**

These are generally unnatural but may provide stimulation to prevent stereotypic behaviours from forming. They may include any of the following for this species:

- **Swings** to test balance and dexterity,
- **Mirrors and radios** for lone birds that are imprinted and noisy when left on their own.
- **Mannmade devices for enrichment purposes** eg **hanging log** on a rope or chain with holes drilled in it which can be used to hide food eg fruit, sprouted seeds or beans and seeds and nuts. Natural nuts, leaves, flowers and seeds may also be used. This item can be used without food. (B Walker 2010)
- **Nesting boxes**, for breeding and can also be used as a hide for some birds.
- **Swinging platforms** for food and water.

Figure 41: A hanging food platform that has no bottom. This structure provides interest and motion for a curious bird. Priam Psittaculture Centre. (F Oosthoek)
**Manmade hides and logs**, eg boxes and visual barriers like a wooden pallet hung from the roof with chain that allows the bird to stand on, hide behind and chew (not tanalised timber). (Priam 2010)

**Surrogate soft toys** for baby or young birds.

- **Social Grouping**

Long billed Corellas are very social and gregarious birds that live in large groups in the wild and often require the social company of their own or a similar species to minimise stress in captivity. They can be very noisy if left on their own, particularly if they have been handraised and are dependent on humans for social interaction. Because of his beautiful personality, Gonzo the Long billed Corella at the Wildlife Care Centre had been tried in many suburban homes. None of which were suitable because of his dislike of being left on his own. He enjoys attention and is definitely stimulated by all the activity going on around him; therefore when left on his own, he became a very loud ‘screecher’ who upset the neighbours. In his current home he is happy and settled; he is housed with a Little Corella, and shows no evidence of this previous behaviour other than the occasional alarm call. He has successfully taught all the other pet birds to say “hello” which he says constantly, to everyone who walks past his enclosure and stops to interact with him. For this type of captive bird, mechanical devices are often used to provide stimulation while the owner is absent, however results can be mixed as often the environment is the real issue.

For captive birds living in a large mixed species group or a breeding pair this is not such an issue as they have this basic social need met. Considerations need to be given to compatibility issues in the group/pair and keepers must ensure frequent observations are undertaken to ensure that no bird is being stressed and/or attacked and living in constant fear. The end result of this can be severe weight loss, self mutilation, and even death. The large group should be made up of birds of a similar age to minimise aggression and individuals should not be added to the group on their own. (Priam 2010)

**Addition of natural browse and visual barriers** will help as will adequate space for flying, perching, feeding, preening and breeding.

**A selection of different breeding boxes** for breeding pairs.

**A selection of good natural perches** and ramps in the enclosure are provided to ensure all birds have perching space under cover. Ideal are those with thick spongy bark like melaleuca. This type will also reduce the risk of Bumblefoot which is often brought on by the use of unsuitable perches in a captive environment.

- **Feeding Strategies**

Long billed Corellas are natural ground forages who use their long bill to dig in the ground to find their favourite food the romulea bulb as well as other roots, bulbs and corms. Foraging is one of the major differences in behaviour between captive and wild
animals and the more we can simulate natural foraging for our captive animals and birds the better. The following enrichment ideas all use food as an incentive to encourage natural foraging behaviour. The key to good enrichment is to not leave the items in with the birds for more than 2 days at a time, and to provide a variety of different ideas.

**Substrate piles**, a pile of any kind of substrate added to the enclosure will be appreciated by this species and if nuts, seeds, roots and insects are hidden within it will provide great foraging opportunities that will keep them occupied for extended periods. (Willemsen, Hawkins 2003)

**Clods of grasses** with soil and roots to encourage natural foraging behaviour by this species.

**Scatter feeds of seeds**, particularly sunflower seeds. Also other nuts. Eg peanuts in the shell, almonds, walnuts and other exotics.

**Hanging log** – see mechanical devices

![Figure 42: A seemingly happy pairing in a good environment. (www.geocities.ws)](image)

**Native browse with nuts and flowers** eg eucalyptus, banksia and callistemon varieties are good (as above). These provide chewing opportunities and will minimise damage done to perches and the enclosure itself.

**Browse may be used as a visual barrier, a natural food and enrichment item.**

**Pine cones** can be given green (closed) or dried (open). Dried cones may have crevices that enable seeds to be lodged inside or small pieces of fruit. This may encourage the bird to use its beak to retrieve the food. (Willemsen, Hawkins 2003)
Cuttlefish and shell grit added for good digestive health and chewing. Pineapple tops provide a different and interesting item for the birds to explore. Fear and apprehension may be an initial reaction to something new like this, however some pineapple left on the top will encourage the birds to make the association with a food. (Willemsen, Hawkins 2003) Egg cartons and cardboard boxes make excellent enrichment items. Egg cartons can contain some wood shavings with some nuts, dog kibble or sunflower seeds inside. Cardboard boxes must have all tapes, staples etc removed and waxed boxes can’t be used. Hide whole fruit inside, secure the top and bottom by folding. Fruit/nuts on a wire, food can be threaded on to iron wire that is strong enough to resist the bird’s beak. Add kinks to the wire as opposed to keeping it straight. Add foods like banana, grapes, melon, apple and pear. (Willemsen, Hawkins 2003) For interest you could also add broad gum leaves and non toxic herbs interspaced with the fruit. Extra feed areas are necessary to ensure all birds have access to enough food without fear of other dominant birds.

- Exhibit Furnishings

Perches are the most important furniture to the cockatoo species as they rely on suitable perches (branches in tall trees in the wild) for safety during the night and times of rest. Their placement in the enclosure is important, particularly the height, for providing shelter and allowing full range of flight within the enclosure. They serve many other purposes; locomotion and movement (flying and walking), perching and rest, social interaction with other birds, breeding, support while feeding and drinking, support to land on while landing from flight. All perches and furniture can be moved around the enclosure if suitable and safe to provide change. Natural wooden perches with a good bark cover to provide grip are ideal. These provide locomotion, even when used as a ramp for birds that don’t fly. A sense of safety and security (from perceived predators) when installed at the correct height. Swinging ropes and perches. Ropes must be very thick to provide climbing opportunities. The instability of moving ropes and perches simulate the natural movement of branches in trees in the wild as a bird lands on it. Move furniture to prevent stereotypical pacing to and fro on the ground. Hides, logs and stones may be useful on the ground as this species likes to get down on the ground and dig in soil. Often a bird will dig under the log or hide, this must be monitored to ensure the ground doesn’t become unstable and cave in trapping the bird.

- Human Interaction

In my experience, all birds vary in their initial reaction to people. Wild caught and captive bred birds that have had minimal interaction with humans tend to want to stay away from all people and their stress levels need to be assessed during any type of handling and interaction.
Hand raised and captive raised birds that have been pets have less fear and apprehension towards humans. This can cause them to act in an unpredictable way and may lead to undesirable behaviours like biting and scratching which have been learned through human mishandling.

In my opinion, we as humans are inclined to want to put our hands (and fingers) straight up into the comfort zone of these types of birds, they naturally are startled and respond by biting out of fear of predation. Talking to a bird first allows it to hear and become familiar with our voice. This will gradually build trust and allow us to do more with that bird at a later time and minimise their stress during any handling procedure. This approach will allay their natural fear that we are a predator that may want to harm them. The next step is to introduce a closed fist towards the bird just out of strike range, speaking in a soft but confident voice and observe their response. This way you are protecting yourself from bites and allowing the bird to come to you if they feel confident enough. Often a natural curiosity will take over and they will soon engage particularly if they have had human interaction in the past. Build a trusting bond with each individual bird and showing no fear or apprehension is often the key to successfully interacting with individuals.

- **Training and Conditioning**

  Cognitive learned behaviours happen through training and conditioning. These learned behaviours allow keepers to manage bird health and welfare eg a bird can be conditioned to go into a box or carry cage with minimal stress, using food treats to allow easy movement for relocation and medical procedures. While these are not natural behaviours for a wild caught bird, hand raised captive birds enjoy the interaction and attention received from keepers, particularly if they have bonded with this keeper. Birds can be taught to do many things including:
  - Learning to talk – words and phrases. Carrying stones and other items in their beaks.
  - Lifting and spreading their wings on cue. Stepping up onto a keepers hand. Dancing, head bobbing, whistling, flying and speaking on cue.

- **Sensory Stimulation**

  **Browse and bunches of native nuts and flowers** in the enclosure to stimulate olfactory senses. Most browse collected from the bush will have the scent of other animals on them. This is also a food item and will definitely minimise stereotypic behaviours as boredom will significantly decrease. These will provide, shade, a visual barrier, and some humidity in the summer (particularly if misted with water).

  **Thick bark and logs**, drill holes into these and put mealworms into the holes. This will provide visual stimulation for the birds and will likely be food enrichment as well.

  **Herbs, spices and scents**, sprayed and placed around the enclosure. Eg Vanilla essence, eucalyptus and tee tree etc diluted and sprayed in some areas. Non toxic herbs like, parsley, even catnip may be interesting to try. All will stimulate the olfactory senses.

  **The presence of water for bathing**, in the form of a ground level tub, a bird bath, a mister in the enclosure or a sprinkler attached to the roof for hot days. All birds will enjoy the mist and it will encourage grooming and preening.
**Location of the animals.** Provide sensory stimulation by housing animals found together in the wild, in similar grouped areas in the Centre. The exception to this would be predators and prey together. Eg Australian birds and mammals would be ok, goannas and small mammals would not.

**Outdoor housing location** to replicate the natural environment and seasonal changes in the weather, particularly for breeding pairs. Humidity, temperature, ventilation etc.

### 9.5 Introductions and Removals

In my experience, there are some general rules that need to be observed to minimise stress and aggression while introducing and removing birds from an enclosure. The most important thing to remember about captive birds is that their life depends on their ability to escape therefore all introductions must be carefully planned, observed and monitored.

**Introductions:**

- Introducing a new bird (wild) to a population of other (wild) birds in a captive environment eg a rehabilitation for release situation, is fairly easy as wild birds will accept a new bird of the same or a similar species as long as it displays the same wild behaviours that they themselves know and display. It may not be so easy if the new bird is in some way imprinted and shows more interest in people than the other birds. This may cause it to be picked on by the others. The exception to this may be a young bird as the adults are less likely to pick on it.

- In a captive environment containing captive bred birds that are imprinted, dominant birds particularly may become possessive over certain keepers and attack other birds or keepers that are introduced to the enclosure. Care should be taken and incidents of this nature should be recorded to inform others.

- Care has to be taken to ensure that no bird is introduced on it own – groups of birds, preferably of similar age are better introduced together, particularly in a group enclosure.

- If this cannot happen, I would recommend that the new bird be housed next door for a period of time or housed in a smaller holding enclosure within the enclosure to allow the birds to familiarise. Always provide ample visual barriers within the enclosure for the new bird to escape any unwanted attention and provide extra food and water away from the other birds.

- Remove all birds temporarily from the enclosure, once it is empty, add the new bird first and then put all the other birds back into the aviary. Observe and monitor for any problems. Be ready to remove any bird that appears to be under stress and unable to escape from others. This may be even more effective if all the
birds are removed to an entirely different enclosure where none of them have existing territory.

- Territory can be a contentious thing between individuals, even birds that live beside each other and have for a long period. I recall an incident at the Wildlife Care Centre where a male Galah wandered through a door which had been mistakenly left open, into an adjoining aviary where Gonzo the E long-billed Corella was housed. Gonzo’s sunny disposition immediately disappeared as he lunged at the Galah. The Galah was taken by surprise and didn’t even have a chance to react and fly away; Gonzo had latched onto his foot and wing, drawn blood and pulled out several feathers in the process. Luckily the birds were able to be separated fairly quickly as a prolonged attack could have been fatal for the Galah.

- Refrain from housing large numbers of males and females of breeding age in one enclosure, during the breeding season and attempting to introduce more individuals. You are asking for trouble.

- To exhibit, a mixed species or all of-one-sex approach may be a good solution. This Corella can be housed with many other cockatoo species and galahs quite successfully.

Removals:

- When removing individuals from any enclosure, always consider the following; does this bird have a mate in the enclosure that if separated from will cause undue stress? If part of a breeding pair, is there any evidence of breeding activity eg copulating, eggs layed or chicks in the enclosure? If you are able to eliminate these as complications, removal will be far easier.

- If the bird is being removed for a short time eg a medical procedure, it is likely to be easier to re-introduce than if it is to be away for a longer period eg going out on exhibit.

- If a bird is removed due to ill health or disease, ensure that the causes are well established and rectified, as well as the health of the bird is restored before an attempt is made to re-introduce the bird.

- The removal of an individual or pair/family group may require the use of nets and towels etc. (see capture and restraint) To move a breeding pair with young or eggs, in my opinion, the least stressful way is to wait until the parents are in the box, block the hole with a towel or other and remove the whole box to the new location if possible.
9.6 Intraspecific Compatibility
Compatibility among individuals of the same species is referred to as intraspecific compatibility.
In the wild there is more than likely competition between birds of this species for things like nesting sites, food sources etc, particularly in an area where they are scarce. It appears there is a nesting hierarchy system in place where the older birds have won the territorial right to nest higher in the trees. Presumably these are better sites as they are further away from ground predators, and may be more secure and offer more protection to the young generally.
In captivity this equates to different challenges. Males can be aggressive towards each other as they protect their territory. For this reason it is advised to keep all breeding pairs separated from other birds. Young male birds may become less tolerant of each other in a group environment (particularly if females are present) as they approach sexual maturity. Sex ratios for stocking for non breeding birds should be equal males to females or more females than males to minimise aggression and fighting.
In captivity breeding males can be aggressive towards their mates during the breeding season.(Chapman)
It is also interesting to note that in my experience wild birds and pet birds of the same species are not compatible in an aviary environment. Wild birds will often turn on and attack a pet bird as a pet does not always relate to the natural behaviours exhibited by the species. Eg preening, bonding and associating with birds.

9.7 Interspecific Compatibility
Interspecific compatibility, in ecology, is a form of competition in which individuals of different species vie for the same resource in an ecosystem (e.g. food or living space). All animals in the wild have to compete to secure their place in the food chain and the ecosystem that they live in. This species has to compete with other similar species eg the white cockatoos and the galahs for nesting spots in particularly. As a specialised feeder it is less likely to compete with the Sulphur Crested Cockatoo and more likely to compete with the Galah as they are both ground foragers. In captivity, there is less need to compete for food, however their hard wired need for a territory will always cause some aggression between males of similar species. (see Gonzo and the Galah - 9.5 Introductions and Removals)
Are known to flock with Sulphur crested Cockatoos and Galahs in the wild.(Emison et el)
10 Breeding

10.1 Mating System

Monogamous. The Long Billed Corella forms close pairing bonds with a bird of the opposite gender and mates for life apart from the occasional divorce. Individuals have been known to form new pairings after the death of a partner or divorce. If possible, natural mate selection is better as compatibility is more likely to occur. A breeding pair is best kept in a suitable enclosure on their own to minimise stress and aggression, both to and from, other birds as this species is known for its aggression. They will produce better results due to having more privacy and fewer distractions. Colony breeding may be possible, however often the dominant pair will produce good results while other pairings may not produce any eggs at all. Not recommended for this species. Regular observations are crucial in any colony environment to prevent individuals and pairings being stressed and bullied. (Hunt)

The most common environmental cues for breeding are availability of nesting sites and substrates, availability of food, water, temperature and sunlight hours. (Avian repro doc) A pairing may display any of the following breeding behaviours: Allopreening, allofeeding, the male being particularly aggressive to other cocks in the enclosure or neighbouring enclosures, an increased closeness between the pair, increased activity in and around the nest/hollow eg. movement of nesting substrates, twigs and leaves. (Avian repro doc) Also courtship displays (see behaviour section for more detail.)

The cock and hen copulate to fertilise the eggs to be laid by the hen. The hen and the cock both incubate the eggs and care for the young by providing food. The chicks are born with pink skin and full down that is a dull colour tinged with yellow. From about 7 weeks the chicks fledge, they continue to be fed, usually by the male, for about a further 3 weeks. (HANZAB)

10.2 Ease of Breeding

These birds have been bred in captivity since the late 1950s by a number of breeders and aviculturalists. The first recorded breeding was a hand raised chick at San Diego Zoo in 1959. (Sindel and Lynn 1996) They can be a difficult species to please and are not known as the easiest to breed, however this could be due to any number of factors, particularly the availability of suitable nesting sites.

The birds’ natural instinct would be to breed and they have been known to reject the provided nests and burrow into substrate to lay. In captivity up to 3 nesting boxes of different shapes, size, height, orientation, materials and substrates etc should be offered to allow the birds to choose their own nesting site. Natural materials are likely to be favoured eg log hollows and shavings as substrate. (Sindel and Lynn 1996)

In the wild an adequate nesting site for the hen would be less of a problem as the pair would find their own site. It is not uncommon for up to 5 pairs to be found nesting in the same tree. The younger birds will nest in the lower parts of the tree.
Other factors to consider for a successful partnership include: sex, pair compatibility, diet, ideal body condition, adequate privacy, no or minimal physical defects or deformities, good general health and well being, and age. (Hunt) (These birds are monomorphic and need to be surgically or DNA sexed to establish a true breeding pair in captivity.)

Peter Chapman agrees this is a bird that is difficult to breed in captivity.

10.3 Techniques Used to Control Breeding
Separation of breeding age birds is probably the most reliable method to control breeding if that is the desired outcome. The withholding of breeding boxes in the enclosure is likely to have the same effect as Long Billed Corellas are particular about where they nest, unless they are able to dig into a substrate floor to lay.

10.4 Occurrence of Hybrids
Hybrids have been known to occur between all the white cockatoos. (Hunt) In particular the similar species, Eastern Long Billed Corella and the Little Corella, Cacatua sanguinea. Figure 43 shows two birds of this pairing in a tree trunk hollow, presumably their nesting site. This is likely to happen where their ranges overlap in the wild. (HANZAB)

There are fears that the Western Australian feral population of the Eastern Long Billed Corella may hybridise with the endangered Western Long Billed Corella Cacatua pastinator. Whether this would happen or whether the young would be fertile is unclear. (Sindel)

Figure 43: The picture to the left shows a Little Corella and an E. Long-billed Corella sharing a nesting site. (www.exoticfarm.net)
10.5 Timing of Breeding
In the wild, breeding activity may commence from July and continue through to about December in NSW as they are considered to be spring breeders. Laying would commence July and finish early October. And even at other times if conditions are ideal. (HANZAB) In captivity they will breed on a similar schedule.

10.6 Age at First Breeding and Last Breeding
These birds are considered sexually mature and ready to breed at about age 3-4. For males this may be longer. Minimal data and information is available on the reproductive age span of this species however, Sindel and Lynn (1996) breed from a male bird in 1985 that was in excess of 35 years old.

10.7 Ability to Breed Every Year
In the wild, given the right conditions and factors, these birds are capable of breeding each year. In a captive environment, the previous year’s young should be removed from the enclosure before the commencement of the new breeding season.

10.8 Ability to Breed More than Once Per Year
Long Billed Corellas will normally only breed once a year in the wild. Eggs may be predated by other wild animals under some circumstances which may prompt the hen to lay again. Her ability to do this successfully would depend on food availability, conditions, time of the year and the security of the nesting site. (See appendix 8) In captivity, double clutching is very successful, with the first laid eggs taken away and artificially incubated; the birds would then likely lay a second clutch. Alternatively the birds may be allowed to incubate the eggs then the young could be taken at an early age and hand reared depending on requirements.

10.9 Nesting, Hollow or Other Requirements
In the wild they prefer tall tree hollows (limb or trunk) of the eucalyptus species. They also have been known to use nest cavities in Scoria cliffs (Vic.) (HANZAB) The aspect of the entrance to the nesting hollow appears to be unimportant. Nest height above the ground may reflect the demand for nesting hollows eg an expanding population in some areas. The lowest hollow was 1.5m above ground and some were 5-16 meters of the ground.(Emison et el) As this species appears to be hard to please in a captive environment, trying wooden hollow logs as breeding nests may be the best solution. The advantages of a solid wooden nesting log are:
• They are better insulated than a man made nest which may overheat in the warm weather. This will provide a better ambient temperature during any weather variations.

• They offer a more natural environment for the birds.

• They provide a stable humidity level within the nest.

• They are able to be modified in any way as necessary and can be used with most types of substrates.

• They are able to withstand the chewing of a cockatoo. (Hunt)

• Natural wood hollows are the preferred breeding nest of successful E. long billed Corella breeders Stan Sindel and Peter Chapman

Whatever nest is used, it must be large enough to fit the parents and any chicks as they grow. (See housing section for further information).

10.10 Breeding Diet

In addition to a plentiful supply of natural browse (with nuts and flowers where possible), grasses, milk thistle and nut grass, it is important to ensure a nutritionally balanced diet consisting of a variety of foods. A standard seed mix (about 15% sunflower seed) and a variety of sprouted seeds eg sunflower, corn, white millet, and legumes should be offered. (There is an exceptionally good video on how to sprout seeds on the Priam website (see appendix for details). Additional supplementary foods may consist of avian pellets, raw nuts (in the shell), green peas in the pod, silverbeet, apple, pear, corn on the cob, dog kibble and some good quality wholemeal bread in any amounts that the birds will consume. See diet section. While breeding, (particularly if double clutching) it is important to ensure that a water soluble calcium supplement is added to the drinking water. Extra supplies of cuttlefish and shell grit should also be provided. This is very important to help prevent Egg Binding.

**Egg Binding** occurs when an egg in a gravid hen gets lodged in a part of the reproductive tract. If the egg’s shell has a soft and rubbery shell or thin shell, this can cause complications; an egg breaking up in the hen’s body may cause peritonitis to develop. Possible causes of egg binding include a shortage of calcium in the diet, cold surroundings and also an immature hen. The recommended immediate care is a warm hospital box as sometimes the egg will pass on its own within an hour. More serious cases will require a vet as untreated cases can end in death. The hen should not be bred from until the cause can be identified and rectified. (Coburn)


10.11 Incubation Period

Both the male and the female prepare the nest, incubate and feed the young. In the wild they will each incubate for periods of 4-5 hours in the day then swap to allow each bird to feed. Both birds spend the night in the nest. (HANZAB)

In captivity, it is likely that the male will incubate during the day and the female will incubate during the night. (Hunt)
The incubation period is approximately 24 days. (Hunt)

10.12 Clutch Size

Generally 2-3 oval, white eggs are laid at a time. Incubation of the eggs begins with the second egg being laid about 2-3 days after the first, however much longer gaps have been recorded. For a 3 egg clutch, the second egg was laid 11 days after the first and a further egg laid 4 days after the second. (D’Ombrain) (HANZAB)

Table 3: Below is a table for the Corella species: (for comparison)

<table>
<thead>
<tr>
<th>Cockatoo Species</th>
<th>Eggs per clutch</th>
<th>Approx Egg Size</th>
<th>Egg laying interval (days)</th>
<th>Incubation (days)</th>
<th>Fledgling Period (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern Long Billed Corella</td>
<td>2-3</td>
<td>51mm x 30mm</td>
<td>2-3</td>
<td>24</td>
<td>7</td>
</tr>
<tr>
<td>Western Long Billed Corella</td>
<td>1-3</td>
<td>51mm x 30mm</td>
<td>2-4</td>
<td>26-28</td>
<td>6-8</td>
</tr>
<tr>
<td>Short Billed Corella</td>
<td>2-4</td>
<td>41mm x 29mm</td>
<td>2-3</td>
<td>26</td>
<td>7-8</td>
</tr>
</tbody>
</table>

(Hunt)

10.13 Age at Fledging

About 7 weeks of age for fledging. A further 3-4 weeks until the chick is weaned. This requires a good diet provided to the parents to ensure the gradual introduction of solid foods. The chick needs to be cracking seed and eating a substantial amount and variety of other foods by weaning time.
10.14 Age of Removal from Parents

Young can be taken for the bird market at 5 weeks of age; however the chick is still dependent at this age and requires feeding until independence at the age of about 10 weeks.

10.15 Growth and Development

Table 4: Weight Chart: (For comparison) Shown in grams and subject to variation depending on the individual (handraised data only). (Chicks would stay in brooder for the first 2 weeks and would be pin feathered before being taken out.) (Hunt)

<table>
<thead>
<tr>
<th>Day</th>
<th>Short billed Corella</th>
<th>E. long billed Corella</th>
<th>W. long billed Corella</th>
<th>Description of development (E. L. B. Corella)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>264</td>
<td>205</td>
<td>116</td>
<td>Pin feathers</td>
</tr>
<tr>
<td>16</td>
<td>281</td>
<td>205</td>
<td>130</td>
<td>Eyes opening</td>
</tr>
<tr>
<td>17</td>
<td>270</td>
<td>204</td>
<td>143</td>
<td>Bill pink-white</td>
</tr>
<tr>
<td>18</td>
<td>273</td>
<td>220</td>
<td>161</td>
<td>Iris black brown</td>
</tr>
<tr>
<td>19</td>
<td>298</td>
<td>237</td>
<td>177</td>
<td>Toes/tarsus appear purple</td>
</tr>
<tr>
<td>20</td>
<td>305</td>
<td>254</td>
<td>184</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>314</td>
<td>271</td>
<td>199</td>
<td>Eye ring blue grey</td>
</tr>
<tr>
<td>22</td>
<td>338</td>
<td>286</td>
<td>209</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>360</td>
<td>303</td>
<td>228</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>354</td>
<td>319</td>
<td>250</td>
<td></td>
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<tr>
<td>25</td>
<td>349</td>
<td>330</td>
<td>255</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>367</td>
<td>348</td>
<td>273</td>
<td></td>
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<tr>
<td>27</td>
<td>376</td>
<td>375</td>
<td>289</td>
<td></td>
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<tr>
<td>28</td>
<td>372</td>
<td>381</td>
<td>307</td>
<td></td>
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<tr>
<td>29</td>
<td>380</td>
<td>385</td>
<td>337</td>
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<td>384</td>
<td>408</td>
<td>341</td>
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<td>31</td>
<td>385</td>
<td>413</td>
<td>369</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>380</td>
<td>421</td>
<td>374</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>380</td>
<td>440</td>
<td>390</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>379</td>
<td>444</td>
<td>401</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>375</td>
<td>447</td>
<td>412</td>
<td></td>
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<tr>
<td>36</td>
<td>375</td>
<td>451</td>
<td>422</td>
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<td>37</td>
<td>373</td>
<td>447</td>
<td>444</td>
<td></td>
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<tr>
<td>38</td>
<td>371</td>
<td>452</td>
<td>464</td>
<td></td>
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<td>39</td>
<td>350</td>
<td>453</td>
<td>476</td>
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<tr>
<td>40</td>
<td>346</td>
<td>457</td>
<td>487</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>357</td>
<td>468</td>
<td>492</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>357</td>
<td>478</td>
<td>497</td>
<td>Eye ring light grey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
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</tr>
<tr>
<td>43</td>
<td>359</td>
<td>483</td>
<td>501</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>357</td>
<td>492</td>
<td>517</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>350</td>
<td>492</td>
<td>528</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>351</td>
<td>496</td>
<td>553</td>
<td></td>
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<tr>
<td>47</td>
<td>349</td>
<td>497</td>
<td>558</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>350</td>
<td>493</td>
<td>574</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>349</td>
<td>485</td>
<td>582</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>weaned</td>
<td>weaned</td>
<td>599</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>weaned</td>
<td>All weaned</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Limited developmental data is available for this species.**

#(Young need to be cracking seed and self feeding before a successful weaning can be achieved. Monitor food intake and weight until 10 weeks old to be sure.)
11 Artificial Rearing

Much information for this section has been taken from the practices of the experienced staff at Priam Psitticulture Centre. While they do not breed Eastern long billed Corellas, they have breed and hand raised the Western long billed Corella and the basic concepts for most cockatoos are the same. These guidelines are therefore a general guide. Ultimately keeper experience, diligence to record keeping, and the ability to read and assess situations and individual chicks will go a long way to having success in artificial rearing.

Figure 44: Eastern Long billed Corella chicks approximately 3-4 weeks old. (www.avesint.com)

11.1 Incubator Type

An incubator must provide the five critical functions listed below. If you have found yourself in a situation where parent rearing or cross fostering is not an option; that leaves the only other outcome, human and machine intervention. Incubating eggs and hand raising chicks is a labour intensive practice (eg turning eggs, hatching and hand feeding until weaning takes place). It requires precise conditions, and a range of specialized equipment that will definitely make the task of egg and young management easier. Successful egg incubation will depend on these things being achieved in the appropriate construction of an egg management regime. They are: (The listed % gives an indication of each function’s importance in the process.)

- Temperature (20%)
- Humidity (10%)
- Egg turning (60%)
- Hygiene (5%)
- Airflow (5%)(Priam)

A popular model is the fan forced, auto turn incubator, the Brinsea Octagon 20. It comes as an economy and advanced option. (eco and adv).
Fanforced (moving air) means it circulates the air inside the chamber as opposed to a still air model. This generally means a more even temperature is maintained. It is a standard feature in these models shown. 

Auto turn ensures that eggs are continuously turned without the necessity of a person having to be there and doing it manually. This is a huge time saving option, especially if you are incubating large numbers of eggs at a time or over the period of a season. This function also means that hand washing (hygiene is important – one of the 5 critical factors to success) is not required unless opening the incubator to record measurement data so the incubator will easier maintain a stable temperature and humidity rate. All important information can be monitored from outside the incubator and recorded e.g. relative humidity and temperature. Some older models come in a manual turn function which is obviously more labour intensive requiring considerable turning by hand. There is no evidence to suggest that this method of machine turning is detrimental to the development of the eggs or more likely to increase the death rate and often to the contrary as it removes the element of human error to a certain extent, e.g. forgetting to turn the eggs manually numerous times a day. (Digney)

**Priam uses an AB incubator – AB NL 75 MK6** fitted with “O” rings on every second roller for the first half of the incubation process. They believe this has given them
excellent results over a wide range of species. This machine has extremely precise control
over the core incubation parameters e.g. temperature, egg turning and humidity. In the
second half of the incubation they use a Brinsea Octagon 20 auto (see above models).
(Priam)

**Egg turning management:** Priam turns their parrot and cockatoo eggs 180 degrees every
15 mins, 96 times a day, at the start of incubation. (Priam)

**Aggressive, high frequency** turning (in a horizontal position) is required until 100%
coverage of the inner cell membrane by the allantoic membrane is achieved which should
be by 50%-52% of the incubation period. After this time a gentler rocking, less
frequently is maintained to prevent the separation of the allantoic membrane from the
shell, which can lead to severe inhibition of embryo growth or death. Normally at 100%
allantoic development the air cell is visible during candling and can be marked with an
HB or 2B pencil. (Priam)

**In the second half of the incubation** the gentle rocking back and forth slowly regime is
employed also to enable the correct positioning of the chick at hatching time. Position in
the tray is near the vertical with the pointed end down in a rocking incubator that is offset
45 degrees to the vertical axis. (Priam)

All eggs must be checked for damage before placing in the incubator. (Digney)

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### 11.2 Incubation Temperatures and Humidity

**For fan forced incubators** the temperature should be 37.2°C. An acceptable variation is
+ or - 0.5°C, however a greater fluctuating temperature than this is not absolutely crucial
to the chick’s survival. Eggs generally are better able to survive lower temperatures as
opposed to higher temperatures. High temperatures are more likely to be fatal more
quickly while lower temperatures may cause a delay in development.

**Humidity target** is variable and is directly dependent on the egg shell thickness and
weight loss trends. To achieve the desired weight loss, an egg with a thicker shell may
require a lower humidity to ensure the correct weight losses are maintained and an egg
with a thinner shell may require a higher humidity etc. Priam has several incubators set at
different relative humidity. Normally one at RH =35-40% and one at RH=70-80%. They
move the eggs between these incubators to regulate the required weight loss they are
targeting. When multiple incubators are not an option E long-billed Corella eggs should
be started at RH 40%. (Priam)

If more than one egg is to incubated and they are laid several days apart eg from the
same clutch – it is possible for the oldest egg to be washed and stored at a cool place to
prevent the embryo developing, which it will do if conditions are too warm. The egg
needs to be rotated as normal while waiting for the next egg to be laid. (Lakeland)

The key is to monitor and reassess to maintain the desired weight loss throughout the
incubation period and to keep thorough and accurate records on all aspects of the process.
(See data recording)
11.3 Desired % Egg Mass Loss
This is commonly 13.5% to 15% but a variation between 10% and 20% is allowable and should not cause any significant problems. Daniel Gowland has been targeting a % weight loss to external piping of between 11% and 14% and he believes that this has produced more consistent and stronger chicks. These chicks tend to have greater supplies of oxygen available to them at the critical time approaching hatching than the higher weight loss eggs. (Priam)

11.4 Hatching Temperature and Humidity
The target temperature is 36.7°C for a fan forced incubator. Again + or − 0.5°C and a fluctuating variation is ok unless extremely high temperatures are reached. (Priam) Relative Humidity (RH) around the 60% - 70% is normal, however Daniel Gowland now thinks that we should be hatching eggs at a RH relative to their weight loss trend over their incubation period i.e. high weight loss eggs at high RH and low weight loss eggs at low RH. In recent years he says they have been using 60% across the board with excellent results. (Priam)

11.5 Normal Pip to Hatch Interval
Days to external pip is generally = to the incubation time (24-25 days [Sindel and Lynn 1996]) less 48 hours. (Priam) Internal pip (happens first) to external pip is usually about 2-2 ½ days. Internal pip to hatching time can be around 4 days. (Lakeland)
As soon as external pip occurs, weight the chick to determine the weight loss to this point and mark the current aircell line with a pencil and move to a hatcher to be maintained at 36.7°C + or − 0.5°C and with a RH level of 60%. Position the egg on the base of a soft tissue lined container with a diameter approximately equal to twice the length of the egg. The external pip site is elevated to the highest possible point (top of the egg). (Priam)
During the hatch process, humidity must be maintained as this prevents the membrane from drying out and trapping the chick. (Digney)

11.6 Brooder Types/Design
There are a number of different brands on the market. Brinsea has a good lower budget model shown below:
This unit’s features include:
A thermometer, fans and a reservoir for water to create humidity and temperature control.
An optional wire cage to enable it to be used also as a hospital box for sick or injured birds.
It is fairly lightweight and portable with a top handle for carrying.
Has a good air filtration system for good clean air flow and extraction of feather dust.
Is fan assisted for even air flow
Simple, tough, easy to clean, safe (for young) and hygienic inside and out.
(Brinsea)

**Priam currently uses the AB Newlife 75 GP Hatcher/Brooder MK3. (as shown below)**

**Its features include:**

- Proven with all types of Parrots.
- The latest solid-state proportional thermostat accurate to +1-0.50C, with coarse and fine controls.
- Digital dry-bulb thermometer reading to 0.10C with a multi positional sensing probe.
- A single large removable hatching tray fitted as standard, (400 x 400mm).
- A six compartment tray is also available to order. Maximum humidity available at all times, and adjustable by removing an evaporation pad from inside the machine.
- Water supplied from outside the machine.
- Double-glazed see through lid, fitted to a thermally efficient cabinet, sprayed with a special hard wearing paint, allowing easy cleaning for hygiene.
- Moving air humidity is quickly restored after closing the lid
- Large chick capacity (numbers).

**AC Consumption:** 100 Watts
**Size Unpacked:** H 300mm W 560mm D550mm Wt. 7.1kg
11.7 Brooder Temperatures

At Priam they use 3 brooders (above example) and after hatching the neonates are transferred into the first brooder which is set at 36°C and 70% RH. The second is set at about 2°C – 2.5°C lower at 34°C or just under and so on. By the time they reach the third brooder they have pushed through down and they may be housed at a temperature as low as 29°C. Generally the lower on average the temperature is, the quicker the neonate will grow down and begin the process of pushing through pin feathers. The neonate room that houses the brooders is maintained at about 19°C and about 79% RH. (Priam)

The following is also a reasonable guide of temperature range to progress chicks through the brooder stage:

**Newly hatched:** 36.6°C

**5-12 days:** 35°C – 31.6°C

**12 days – pin feathers:** 31°C – 28°C

**Once feathers begin to cover most of the body:** 26.5°C (Digney)

Once fully covered in down and with eyes open, the young chicks move to flight school where the temperature is reduced to about 25°C. They are housed in open boxes with a newspaper wrapped heat pad slid in between 2 boxes to provide different temperature gradients within the environment to encourage self thermo regulation and the growth of feathers. A sheet of cardboard covers the back half of the box and a towel can also be draped over partly at night. See Fig 50 below. (Priam)
11.8 Diet and Feeding Routine

**Rehydration:** After hatching, many chicks are actually dehydrated from their ordeal. It is necessary firstly to rehydrate it with an electrolyte solution (which is also an energy source), before introducing the handraising formula. When given a solution for the first 48 hours (at least 12-15), a chick can often make large weight gains as its body tissue is absorbing the water back into its system. Its weight may then plateau out for several days after normal feeding has commenced. This is considered normal. Depending on the condition of the chick at hatching, rehydration can be started immediately or within a 6-8 hour period. A dehydrated chick will look wrinkly, and sunken in the body but with bulging eyes. An older chick may also have dry flakey skin. A dehydrated chick will fail to empty its crop. (Digney)

A number of solutions may be used; Lectade is good and available from most vets. It comes as a powder and can be made up into liquid with cooled boiled water. Glucose diluted with some Hartmans fluid may also be used.

**Crop stretching:** This is an important practice particularly in the first few days of life and throughout the growth phase. It involves feeding slightly more in volume every feed, which will increase the entire volume for every 24 hour period.

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**Figure 50:** Flight School. The heat mat is just visible between the red and black box under the towel. This is evidenced somewhat by 2 of the young chicks huddling on that side. Cardboard is in place over the top opening of the box to help retain warmth. Also note that the chicks are classified and housed by age and not breed at this stage (to minimise aggression) and that the cleaning of all food from the feathers is not such an issue anymore. Some wood shavings are now introduced with the shredded paper as substrate. Priam Psittaculture Centre (F Oosthoek)

**Figure 51:** Shows a Crimson Macaw chick with a full crop after feeding. Priam Psittaculture Centre (F Oosthoek)

A lone chick may be brooded with a soft toy for companionship. (Digney)
The desired result is a full, tight crop by virtue of inward and downward pressure which will speed up digestion and produce a more robust chick with better overall weight gains. The larger the crop capacity is, while still emptying in the same time period, the more nutrients that are available for the chick to grow. Good record keeping will ascertain that stretching has occurred over a number of days. (Digney) Care must be taken to not over stretch the crop by over feeding too much too soon. Weighing the chick before feeding to ascertain its body weight will ensure that the 10% of total body weight margin (average target) is eventually achieved during feeding time. E.g. for a chick weighing 20gms – 2mls of formula is fed at each feed time. (Priam)

**Feeding Equipment and Method:** The most common feeding equipment used is syringes, crop needle and syringe, and a bent spoon. All have advantages and disadvantages:

**Syringes:** Are a more precise feeder as they accurately measure all formula and solutions given, the feeder has volume control and overfeeding or underfeeding is less likely, it is less messy than a spoon, and it encourages a feeding response. They are easy to sterilize, keep clean and replace when worn out. A cannula can be put on the end to feed very young or small chicks or the end of the syringe can be filed down to accommodate the size of the chick’s mouth.

On the downside an inexperienced or impatient feeder may aspirate (food down the windpipe) the chick if it’s not displaying a feeding response and swallowing the formula or solution as its being fed. Syringe feeding should always be done from the left side of the mouth.

**Crop needle:** Is best used by an experienced feeder. This is a very quick and clean way to administer any type of formula, liquid or medicine orally, however it requires the right kind and size crop needle to begin with, the knowledge of how to insert the needle without putting it down the chick’s windpipe and having it die from aspiration. The other disadvantage is that it is easy to overfill the chick as it bypasses the feeding response. This can overstretch the crop causing it to sour. The longer the formula remains in the crop the more likely this can happen. Before feeding always check and make notes on crop status. If the crop is more than 25% full at the next feed, particularly more than once, there will be a problem with it emptying so do not feed. If it is less than 25% full at the next feed time, retop the chick with formula and note how well it empties overnight. (Digney)

To manage a crop that is an ongoing problem (10% or more still in the crop at each feed) the following may be used: vegetable enzymes, diluted apple juice or probiotics (also found in yoghurt). (Priam)

**Spoon:** This is a safe but very slow, imprecise and messy method. It may be suitable for someone with 1 chick and lots of time but otherwise not very practical. A normal teaspoon may be used. Squash up each side to form a channel to put food into. The chick will feed off the end of the spoon.

The formula is more likely to cool quickly so may have to be reheated during feeding. Be sure to have a supply of tissues on hand. Young chicks in particular can get very tired.
very quickly; therefore each feed needs to be achieved in a timely fashion to ensure the chick intakes an adequate volume of formula. Enables thick formulas to be fed.

Figure 52: A young neonate chick with emerging down being fed with a cannula and syringe. Notice the small container, relative to the chick’s size that is transportable to and from the brooder, scales and bench for feeding. This also means the chick is more likely to stay upright and less likely to regurgitate its food and aspirate between feeds. Note the use of shredded paper used as a substrate and the use of a peg to hold the tissue in place to prevent the chick becoming tangled in it. Also see the syringe is fed into the left side of the mouth and the feeder is careful not to hold the chick’s beak while feeding as this will cause a deformed beak. The beak is very soft at this age. Priam Psittaculture Centre (F Oosthoek)

Other necessary equipment for feeding includes:

An electric jug and/or a microwave
A good thermometer, metal is good, one that can be heated to a high temperature
A good set of scales (digital for measuring small amounts)
A small desk lamp (for light to see and warmth for the chick while feeding).
A pen and recording sheets or an exercise book.
A flat surface or bench for feeding, weighing and recording data,
Sterilizing solution and a container with a lid to soak items in,
Measuring and mixing equipment (bowls and spoons) including a number of 1-10 ml syringes, spoons and crop needles if you use them.
A supply of gloves and a box of tissues.
A metal or pyrex jug for cooling boiled water and lidded containers for storing and mixing formula in. small glass jars are good for mixing formula as they are easily sterilized and can go in a microwave. They can also easily withstand a temperature of 44.C.
Access to hand washing and cleaning facilities and equipment and access to a fridge nearby is ideal (for storing made up Lectade and boiled water).

Formulas – Commercial: These formulas are nutritionally balanced and easy to mix and feed.
Follow the manufacturer’s instructions when mixing formula and never use very hot water as this can cause the formula to go gluggy and it may diminish the nutritional value. All handrearing formulas should be stored in a cool, dry place, refrigerated or placed in a deep freezer. Properly stored, they will remain fresh until the expiration date printed on the package.
There are several types suitable for cockatoos. See appendix information for more details.
VETAFARM: NEOCARE
PRETTY BIRD: 19-8 HANDRAISING FORMULA
HARRISONS: JUVENILE HAND-FEEDING FORMULA:
The first feed: The first formula feed is best given first thing in the morning when the crop is completely empty from the night. (Digney)
Most chicks will have a feeding response even if it is a bit weak to start with. These are fairly easily fed and the chick’s response will improve with each feed. For those with little or no response, it means that feeding may be slow and tedious for a few feeds until a feeding response is shown. Initially it may be less stressful for the chick to be fed in the brooder without moving it. Most important is to ensure it stays reasonably warm throughout the process as a chilled chick is more likely to have problems emptying its crop. The ideal feed temperature is 40.5°C-41°C. However the range between 37.7 and 43.3°C is tolerable. Food sitting in a bowl or spoon will cool more quickly than in a syringe and a chick is unlikely to feed if the formula is too cold. (Digney)
Place a drop at a time onto the chicks tongue and allow it to swallow before adding more food to ensure it doesn’t breathe in formula causing aspiration. (Digney)
Be careful not to place any pressure on either side of the beak while holding the head from behind to feed. Feeding is best done on the left side as with most chicks the windpipe is situated more to the right side. Take care to wipe any spilt food off with a tissue. (Priam)
Corella species are renowned for making incessant begging calls between feeding times, even when they have a full crop and are obviously not requiring food. (Digney)
Feeding intervals:
Young chicks require feeding every 2 hours and after the rehydrating period the following is a general guideline for spacing feeds:
Day 1: 2 hour feeds (9-10 feeds a day)
By day 8: 31/2 hour feeds (5-6 feeds a day)
By day 14: 5 hour feeds (4 feeds a day)
By day 24-30: 8 hour feeds (3 feeds a day)
At peak: (2 feeds a day)
Variable – depending on progress of individual (1 evening feed a day)
Complete weaning (80-90 days) (No Formula)
(Digney)

Stages of Growth: (See Growth Graph next page)
- From day 1, the first few days, minimal weight gains are seen outside of rehydration period and minimal visible development is seen.
- From day 7 the chick will enter a growth phase where fairly rapid weight gains may be recorded.
- The peak phase (just before weaning) where weight of the chick reaches a peak, fluctuating up and down for several days before dropping as weaning approaches. The chicks’ weight is likely to peak at higher than the average adult weight.
- The weaning phase shows a distinct drop in weight that can last from 2 weeks – 2 months which ends when the chick no longer requires any kind of hand feeding. Natural weight loss occurs in this phase as the chick prepares to fly. (Digney)
Graph 6: This graph is a growth graph for an Eclectus Parrot not a Long billed Corella, however it does show the different development stages that can be expected in any parrot or cockatoo. (Digney)
Average adult weight of a Long-billed Corella is 550-650 gms.

Graph 7: Measurements (mm) and weights (g) of nestling Long-billed Corellas at Coomallo Creek.

<table>
<thead>
<tr>
<th>Age (days)</th>
<th>No. in sample</th>
<th>Culmen length Mean</th>
<th>CL Range</th>
<th>Length folded L wing Mean</th>
<th>LFLWing Range</th>
<th>Weight Mean</th>
<th>Weight Range</th>
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<tr>
<td>8-14</td>
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<td>_____</td>
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<td>32-28</td>
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<td>15-21</td>
<td>4</td>
<td>19.7</td>
<td>18.9-20.0</td>
<td>50</td>
<td>34-60</td>
<td>398</td>
<td>290-470</td>
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<td>22-28</td>
<td>6</td>
<td>22.2</td>
<td>18.8-23.4</td>
<td>74</td>
<td>33-96</td>
<td>453</td>
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<tr>
<td>29-35</td>
<td>9</td>
<td>25.2</td>
<td>20.6-27.7</td>
<td>107</td>
<td>53-139</td>
<td>546</td>
<td>350-460</td>
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<td>5</td>
<td>28.2</td>
<td>25.0-32.4</td>
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<td>89-170</td>
<td>566</td>
<td>360-650</td>
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<td>34.2-34.8</td>
<td>248</td>
<td>245-252</td>
<td>573</td>
<td>510-630</td>
</tr>
</tbody>
</table>

(Saunders)
Figure 53: A fully feathered African Grey being fed from a 10ml syringe in flight school. Note the clothes pegs used to secure the towel onto the cardboard that partially covers the box. The 2 chicks in the red box have recently been moved from the neonates brooder room. Their grey down is visible. Priam Psittaculture Centre (F Oosthoek)

11.9 Specific Requirements

Chicks are required to eat, sleep and grow!

Correct temperature, humidity, complete nutrition, companionship, good hygiene and husbandry, and a range of specialized equipment will assist in this process.

In addition to incubators and brooders there is a range of equipment that is used for different purposes at the different stages of development.

**An external heat source:** This becomes necessary when the egg or chick remains outside the incubator or hatcher for any length of time. This may be for weighing, checking, repairing or candling (egg) or feeding for a chick, particularly when they are very young and in cooler weather. (Digney)

As the chick grows and moves out of the hatcher environment, another heat source is required. This is useful in the form of an electric heat pad that can be wrapped in newspaper and applied to the outside, or bottom, of the container, never inside, as this may overheat or burn the chick. For this reason the chick needs to be able to get away from the heat source where ever it is placed. One heat pad can adequately heat 2 boxes when slide between the 2 (see figure 9). (Priam)

**Wet Bulb Thermometer/Humidity Gauge:** Records the levels of humidity. Can be mechanical or digital. Digital are very accurate and can record high and low levels between you visit. A wet bulb thermometer only records the humidity temperature not the dry temperature. (Digney)

**Candler:** Is a purpose built light source with a concentrated beam used to examine eggs for interval developments. Eg determine fertility and development of the air cell etc. (Digney)

**Tweezers:** May be useful if an assisted hatch is necessary eg where external piping has not occurred in a timely fashion and the chick is unable to break through the shell itself. Care is needed to ensure the chick is not harmed in any way. Use tweezers with a rounded or square end in preference to through with a pointed end. Sterilise before use. (Digney)

**Distilled water:** Recommended for the water jackets of the incubator and hatcher. (Digney)

**Betadine:** Diluted 1:10 with sterile water, it can be used to treat the navel of a newborn chick. Administer with a cotton bud. (Digney)

**Specimen containers:** Are sterile until opened and are used for holding sterile water or preparing a mix of Betadine. (Digney)

**Sterile Gauze:** Used in the repair of damaged eggs. Available from a chemist. (Digney)
Cauterising Agent: Silver nitrate sticks or ferric chloride solution are used to stop bleeding in the chick. (Digney)

Glue: Water based and non toxic. Use either clear gum glue or PVA woodworking glue - for egg repair. (Digney)

11.10 Pinioning Requirements

This practice is illegal and therefore is not performed on cockatoos. It requires surgically removing the wing tips on each wing to prevent the growth of important flight primary feathers. The end result is the bird will never fly and will only be able to run along the ground. There may be special permission granted for this practice in very limited circumstances eg water birds in an open water exhibit in a zoo or fauna park. (Bellamy)

11.11 Data Recording

Priam uses a Data recording sheet for all incubating eggs. Initial information recorded is the species, flight, egg number, fresh weight, egg volume, length, breadth, lay date, collection date and egg condition at collection. Also recorded is the incubator model and serial number, the incubation parameters (RH, temp etc) and any notes.

Ongoing information collected and recorded includes day (age), date, notes, actual weight, density, vein growth and time as required to monitor weight loss progress. See appendix on Egg Incubation Record Sheet and Key Egg Incubating Formulas. (next few pages) (Priam)

Data recording continues through piping (internal and external) and through hatching. Dates, times weights, brooding parameters (temperature and RH), general condition and observations that may be relevant to the chicks wellbeing etc. (Priam)

![Figure 54: Weighing of the young chick, before feeding is the most accurate time for this and also establishes how much food needs to be given eg 10% of body weight. Priam Psittaculture Centre (F Oosthoek)](image)

Feeding data must also be recorded and kept for future reference: Date, time, weight before feeding (and sometimes the weight after feeding if required to verify how much food has been taken), % of solids, food type, crop status (E=empty, NE=not empty) any relevant notes eg condition and observations, dehydrated etc and the person who administered the feed, if more than one person is caring for the chick. (Priam)

Any data relevant to the health, welfare, growth and development of the chick also needs to be documented on a regular basis.
11.12 Identification Methods

Eggs are identified by a pencil number written on the outside of the shell. At Priam their id system for their eggs works as follows: for example=**DYHA-M8-08-7=**

**DYHA** stands for Double yellow headed Amazon. **M8** is the flight number the parents came from, **08** is the year (season) the egg was laid and **7** means it is the 7th egg from those parents for that season. This number follows the egg right through until hatching and until another form of id eg leg tagging and micro chipping can be performed. (Priam)

A 10mm leg band can be fitted at 12-14 days of age. (Digney)

11.13 Hygiene

Eggs are very porous and must be handled not only with extreme care (cradled and fully supported, horizontally by the palm of the hand at all times - Priam), but with exceptionally clean hands. Fresh eggs should be washed in warm water (not too hot or cold) in a solution of Avi-safe (water steriliser) before putting into an incubator to remove any materials that may cause bacteria to harm the egg during incubation (Lakeland).

For neonates, hygiene must be maintained at the highest standards, I recommend the following:

- All water used to make formula must be pre boiled to sterilise.
- All feeding equipment must be cleaned and sterilised before use with a steriliser like Avi-safe, Enviroclens or Milton. And rinsed thoroughly before feeding commences. If possible air dry before use and keep in a clean sealed container to prevent contamination from crawling insects.
- Any old equipment showing wear eg cannulas and syringes should be replaced regularly. Rubber will perish if exposed to boiling water and sterilisers and will harbour bacteria.
- Formula must be made up new for each feed to prevent harmful bacteria.
- Always wear gloves when handling neonates and young chicks. Wash your hands in between feeding chicks that are not housed in the same environment to prevent the spread of disease.
- Food and formulas must be correctly stored to prevent spoil or contamination. Eg fridge or air tight lidded containers.
- Ensure all spilt formula is wiped off chicks after feeding to ensure germs and bacteria cannot multiply and harm the chick, as this is a real problem in the warm, humid environment (brooder) that the chick is housed in.
As the chick progresses out of the brooder and becomes fully covered in down and its eyes open, it is recommended that hygiene standards are allowed to relax gradually as this helps to build up the chicks immune system which assists in the resistance of the germs and bacteria it will encounter as it ages and progresses towards weaning time. It also helps to build up good gut flora, which would usually be from the parents. (Priam) Priam does this once a chick reaches flight school. They no longer use boiled water for mixing formula (but still to achieve the correct temperature, or a microwave) and start to relax their sterilisation of equipment; washing equipment normally. They also relax on wiping all traces of food off the chicks after feeding (except large quantities of spilt food). (Priam)

Food storage, hand washing, the use of gloves and the feeding of fresh formula are all maintained for the welfare of the chick. (Priam)

11.14 Behavioural Considerations

In my opinion it is always very important to consider the end result that is desired when hand raising chicks. **Imprinting** is a natural process that describes the bond that a chick forms with its carer. In a parent raised situation this would be the parent birds that feed the chick. However in a hand raised situation this can mean the carer. To what extent the chick is imprinted on humans very much depends on the amount of deliberate interaction the carer encourages with the chick and over what period of time – talking in particular. For chicks that are required to be released into the wild, I can’t stress enough how harmful too much human imprinting can be to the young bird’s chances of survival on release.

**For a captive breeding birds**, (particularly a cock) it may mean reduced breeding interest in female birds and a lacklustre breeding record over time. For a captive pet, it is obviously a desirable process as owners would prefer a tame and friendly companion. So imprinting can be both negative and positive depending on the circumstances.

**Raising chicks with companions** – other chicks of a similar age and even soft toys etc can certainly help minimise imprinting. It produces better balanced birds more readily able to accept a mate for breeding purposes and other birds generally.

**Wild born rehab chicks** require as little human interaction as possible from day 1 eg, minimal talking and spending time with the chick to prevent negative imprinting. It’s always better to raise 2 or more together and be housed somewhere quiet away from noise, people and other pets.

At Priam they raise a significant number of hand raised chicks each year. This enables them to raise several together at every stage. After leaving the brooder room, the chicks are set up in open boxes in Flight School. The set up of the flight school provides the chicks with more freedom and company from other chicks of a similar age or stage of development. As the chicks start to flap their wings they can stand on the edge of the box or on top of the cardboard. This is a platform on which to commence attempting to fly during the late peak and early weaning phases. By this time the birds are gradually being weaned from their dependence on their human carers and are bonding more with the other chicks. (Priam)
Progression from flight school to J Block – this provides even less human interaction and more bird interaction. It also introduces a more realistic aviary environment in terms of numbers and routines. While younger birds are initially separated from the others, they all share the same busy and sometimes noisy, environment. Care is taken by staff to ensure that birds are moved frequently to prevent any bird becoming dominant, particularly with the younger birds. (Priam)

On their approach to sexual maturity, these young birds are placed in a large mixed species aviary where natural mate selection is allowed and preferred as this tends to ensure closer bonds in the breeding pair. (Priam)

11.15 Use of Foster species

Under some circumstances foster parents may be used to incubate the eggs of a pair that has been identified as being young or underperforming parents in the past (or one is an egg breaker) with their previous clutches. The foster parents may have had artificial eggs put into the nest to prepare them to incubate the eggs on arrival and the parents losing the eggs would have them replaced with artificial eggs to minimise stress and anxiety. The process would be to put the eggs into the foster nest about 2 days after they are laid.

11.16 Weaning

The weaning phase of the chicks’ life commences at the late peak stage which is between 40-50 days for this species. The actual completed weaning process is not likely to occur until 80-90 days. (Digney)

Normally the chick will begin to refuse food, its weight may plateau, or even drop as it begins to learn to fledge. There is likely to be limited growth and weight gains from this time, and until the young bird is self feeding a maintenance diet will be sufficient for their needs. Some may become very difficult to feed and some may regurgitate food (more likely in crop needle fed birds). However this is a good time to crop feed once a day to minimise weight loss and prevent dehydration until the chicks’ natural hunger returns and it begins to feed with more interest. (Digney)

Water should be introduced to a chick prior to peak as once they learn to drink they will cope with this phase much better. (Digney)

Weight loss levels of up to 20% are acceptable, losses higher than this need to be addressed. Also assess the chicks overall development, a well grown chick can afford to lose more than a poorly grown one. Monitor weight by weighing twice a week. (Digney)

Introduce a weaning cage at this time to encourage perching. Start with a log on the bottom of the perch that won’t move or roll and gradually move it up off the ground. A Neogle type cage is ideal. Provide enough space for wing movement and short flight without taking it too far from food. (Digney)

E Long Billed Corellas will generally be moved to a larger aviary before the weaning process has been completed. The general rule is, the bigger the bird species, the longer it will take to wean. (Digney)

The following fresh foods can be offered to weaning cockatoos, prior to peak: corn on the cob, peas, apple, carrot, passionfruit halves, orange, wholegrain bread, Nutrigrain,
and silverbeet. Sprouted sunflower seeds and lupins are also good, however care needs to be taken with the sprouting process – always use a solution like Miltons solution or Avi clens to prevent the growth of bacteria (yeast). (Digney)

Each day present a variety of different foods to maintain the chicks’ interest. These foods may be taken during the strong curiosity phase that cockatoos often go through. This will make weaning easier and sometimes quicker. Variety and colour are important as without them the chick will become bored and lose interest in food and extend the weaning process. (Digney)

**Provide a bowl of dry seed** with whole peanuts and almonds. Once the chick has been observed playing with food and cracking seed, begin checking the crop before each feed. If food is present in the crop, cut back the formula accordingly. If the crop is at least half full, a feed may not be necessary at all. (Digney)

Weaning is a delicate time as over feeding leads to continued dependence and under feeding may stress the chick back to complete dependence through, weight loss and dehydration and even ill health. (Digney)

When dropping from 2 feeds a day to one feed, drop the morning feed as this gives the bird the opportunity to pick during the day and begin to source its own food. It pays to monitor the bird’s weight by weighing it 2-3 days a week for up to 3 weeks after the last feed to ensure that the bird is finding enough food on its own to at least maintain its body weight. (Digney)

Below is a product specially formulated for weaning cockatoos.

**Pretty Bird: Weaning Food**

See appendix for further information
11.17 Rehabilitation Procedures

The Eastern Long-billed Corella is coming into rehabilitation care more often in the Sydney area now that the feral populations have increased. The following points will assist in the rescue, rehabilitation and release of this bird back to the wild. All birds are to be rehabilitated as per the Code of Practice for Injured, Sick and Orphaned Protected Fauna; issued by National Parks and Wildlife Service, Department of Environment, Climate Change and Water, NSW.

Rescue:

- Always record all information about the rescue including where it was found, date, by whom and their contact details etc. Record weight of the bird on receiving into care, all medical treatments, ongoing behaviour and eating habits etc to pick up any changes in its general health and wellbeing.

- Ensure all birds receive appropriate medical care as soon as possible - when a bird is injured, particularly a wing or broken leg, it needs immediate vet attention to increase the chances of a successful release later. Birds not requiring initial medical attention that show no improvement in the first few days, should be seen by a vet to ensure there are no subtle problems that may have gone unnoticed. Uninjured or stunned birds may only require food (including natural and browse), water and somewhere warm and quiet away from domestic pets for a day or two to regain their strength.

- Find a good bird and/or wildlife vet and be guided by their knowledge and judgment. Set a plan for recuperation and additional treatments and check ups required. Assess the bird’s condition and be realistic about its chances of being successfully released before commencing rehabilitation.

- Only rescue a young bird if you are completely confident that it has no parents caring for it and cannot possibly fend for itself. Fledging young often look venerable but often aren’t really. Observe for a period if you are unsure. Remove any obvious dangers if possible eg domestic dogs and cats, until the bird is able to get into, or be placed into a tree.

Rehabilitation:

- Any bird not able to be successfully rehabilitated and released eg unable to fly or fend for itself, requires euthanasing by an approved and humane method eg lethal injection administered by a vet. Carbon dioxide gasing is not considered humane for birds.

- Handraised young need to be raised in such a way that negative imprinting on humans is kept to a minimal level eg, raise it with its own kind, no human talking while handling, playing, housed with domestic pets or other negative interaction
that will cause the bird to gravitate to humans or inanimate objects that it associates with humans. Imprinted birds cannot be released as their ability to fend and forage for themselves is minimal.

- Rehabilitating birds require lots of natural foods, flying exercise (if appropriate for their ability level in the recuperation), a quiet location away from feral and domestic animals and housed with others of their own or similar species (other white cockatoos and galahs; not pet birds) Stress and stressors must be minimised at all times.

Release:
- Birds need to be released where they were found unless the environment is unsuitable. All birds released need to be in top physical condition (including feathers), otherwise the birds chances of medium to long term survival will be compromised. A soft release may be suitable for this species under certain circumstances.
- Birds are required to be ‘flight’ fit before release to maximise their chances of survival. In rehabilitation this equates to large aviaries with good flight spaces within.
- A good release weight guide is the capture body weight plus 10%. This will give the bird a number of days ‘body condition’ to enable it to successfully survive while it forages, locates roosting sites, finds water and generally get familiar with the area again etc. Young or juvenile birds will require more weight gains than this for release. They must be fully weaned and eating natural foods, and cracking seed independently before releasing.
- Birds that are too overweight on release are unable to fly properly and won’t be fit enough to survive. Likewise underweight birds will likely be unable to sustain themselves long enough to regain complete self sufficiency to ensure survival.
- All birds need to be released as soon as possible as this will assist greatly with a successful reintegration back into its own territory.

Remember: you can’t save everything. Love what you do, ask lots of experienced and knowledgeable people lots of questions, learn from your mistakes and do your best!
10 Acknowledgements

To my family, thanks for your support, my commitment would have been impossible without it. Family time was lost with mum ‘doing assessments’ on days off, a lot! I appreciate it.

To my teachers, Charlie Marashian, Brad Walker, Graeme Phipps and Jacki Salkeld, thanks for your knowledge and guidance, I have enjoyed the personal growth you have inspired, its been quite a journey!

To Peter Chapman, private aviculturalist, industry consultant and successful breeder of E long-billed Corellas, thank you so much for taking the time to review this manual and providing feedback – your contributions and advice have added another dimension to my work. I really appreciate your enthusiasm and kind words of support.

To Gonzo, the Eastern long-billed Corella from the Wildlife Care Centre. Thanks for the inspiration, I started out thinking I had chosen an ‘ordinary bird’, how wrong I was; my researched journey has definitely created an appreciation for this unique native Australian.
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Phipps G and Salkeld J. *Behavioural and physical needs of species.* Powerpoint Priam:
Rose, K. *Common Diseases of Urban wildlife; BIRDS.* The Australian Registry of Wildlife, Zoological Parks Board of New South Wales. June 2005-
Salkeld, J. *Animal enrichment/behaviour* doc. Educampus October 2010
Accessed 10/6/10

**Images:**
Image OH&S pg 4: http://en.wikipedia.org/wiki/Long-billed_Corella
12 Glossary

altricial — young that are born naked and with eyes closed, unable to leave the nest (compare with precocial, below)

asynchronous hatching — hatching that does not occur at the same time but that may take place over two to three calendar days

breeding cycle — the time period beginning at nest building through egg laying and raising young to the point of independence

brood (n) — the young of a bird that are hatched or cared for at one time

brood (v) — to sit on and keep warm (chicks)

caching — the storage of berries, seeds, and other food items in the crevices of bark, under leaves, in cavities, and the like. Retrieval of cached food items is not accidental, as in scatterhoarding.

cloaca — posterior-most chamber of the digestive tract in birds

clutch — total number of eggs laid by a female bird in one nest attempt

crepuscular — active at twilight, dawn, and dusk

dimorphism — existing in two forms, two colour forms, two sexes, and the like

dispersal — the movement of a young bird from the site where it hatches to the site where it breeds (juvenile dispersal); the year-to-year movement of an adult bird from one nest site to another (breeding dispersal)

diurnal — of, relating to, occurring, or active in the day

ectoparasite — a parasite that lives on the exterior of its host

fledge — the act of leaving the nest or nest cavity after reaching a certain stage of maturity

habitat — the place or environment where an animal (or plant) naturally or normally lives and raises young

incubation — the act of rearing and hatching eggs by the warmth of the body

nestling — a young bird that has not left, or abandoned, the nest
pair bond — the association between two birds who have come together for reproduction; can be short-term (lasting only through egg-laying or the rearing of young) or lifelong

parasite — organism that lives in or on an organism of another species (host) and derives its nutriment therefrom; usually a parasite causes some degree of damage to the host

precocial — young that are capable of a high degree of independent activity from birth (compare with altricial, above)

replacement clutch — the eggs laid to replace a clutch in which none of the eggs hatched

riparian — along banks of rivers and streams

roost (n) — a support on which birds rest; a place where birds customarily rest; also a group of birds resting together

roost (v) — to settle down for rest of sleep: perch

species — related organisms or populations having common attributes and potentially capable of interbreeding

taxonomy — scientific naming of organisms and their classification with reference to their precise position in the animal or plant kingdom

thermoregulate(ion) — the act of maintaining a constant body temperature

http://www.birds.cornell.edu/education/educators/glossary/
13 Appendix

Cleaners and Disinfectants (MSDS and first aid information)

Chlorine (Bleach)
Classified as hazardous according to the criteria of Worksafe Australia Section 01
Use: Bleaching Agent, Disinfectant

First Aid
Swallowed: Wash out mouth with water and give water to drink. Do not induce vomiting.
Eye: Irrigate immediately with water for 15 minutes and seek medical attention.
Skin: Wash with large amounts of water. Remove affected clothing and wash underlying skin.
Inhaled: Remove from exposure. Keep warm and at rest.

Avicare
Use: Avian Disinfectant/Cleanser is used for the disinfection of all companion animal environment including cages, pens, equipment and food containers.

PPE: Will damage eyes and will irritate the skin. Repeated exposure may cause allergic disorders. Avoid contact with eyes and skin when opening the container, preparing the solution and wear cotton overalls, buttoned to the neck and wrist and a washable hat, elbow length PVC gloves and goggles. When using the spray wear elbow-length PVC gloves and goggles. If product in eyes, wash it out immediately with water. After each day’s use, wash gloves, goggles and contaminated clothing.

First Aid: If poisoning occurs, contact a doctor or Poisons Information Centre. Phone Australia 131 126, New Zealand 0800 764 766.
If swallowed, do NOT induce vomiting. Give a glass of water.
If skin contact occurs, remove contaminated clothing and wash skin thoroughly.
If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.

Coopex TM (Insecticidal spray for aviary shelters and nesting boxes)
A ready-to-use insecticidal dusting powder. Follow packet directions to use as a spray.

Inhalation:
If inhaled, remove to fresh air and keep at rest. Obtain medical advice if at all worried.

Skin contact:
Wash off skin immediately with soap and plenty of water. Seek medical advice if irritation persists. Launder contaminated clothing before re-use.

Eye contact:
Immediately rinse eyes thoroughly, including under eyelids, with running water for at least 15 minutes. Seek medical advice.

Ingestion:
Seek medical advice.

First Aid Facilities:
Provide an eyewash station in the production workplace.

Symptoms:
No specific symptoms to be expected. This product contains the synthetic pyrethroid permethrin.
F10 SUPER CONCENTRATE DISINFECTANT TM
HAZARDOUS ACCORDING TO CRITERIA OF WORKSAFE AUSTRALIA IN THE PACK
CONCENTRATE ONLY (eyes and skin irritant)
USE: Biodegradable multi purpose Disinfectant for all hard surfaces, equipment and airspaces.
Footbaths in quarantine areas.
First aid:
IF SWALLOWED: DO NOT induce vomiting. Give milk or water to drink. Seek medical advice
where necessary.
EYE: Rinse eyes with water. Seek medical advice where necessary.
SKIN: Wash affected area with soap and water.
INHALED: Non-toxic. Avoid long term inhalation of neat liquid. Remove to fresh air.
FIRST AID FACILITIES: Contact a doctor or Poison Information Centre (phone 131126)
ADVICE TO DOCTOR: Treat symptomatically

Virkon – S TM (Disinfectant – PB&FD)
FIRST AID
INHALATION
Symptom: - Inhalation of this powder in sufficient quantities may cause
irritation of the upper respiratory passages, nose & throat. Gross over
exposure may cause ulceration of mucous membranes.
Treatment: - Remove to fresh air. If not breathing, give artificial respiration. If
breathing is difficult, give oxygen. Call a physician.
SKIN CONTACT
Symptom: - If allowed to become moist the dry powder may cause severe
irritation and in cases of prolonged contact may cause burns or ulceration.
Contact with the dry powder may cause skin irritation with discomfort or rash,
or allergic skin reactions in sensitive individuals.
Treatment: - Flush skin with plenty of water. Remove contaminated clothing
& shoes after use. Call a physician. Wash contaminated clothing before
reuse.
EYE CONTACT
Symptom: - Eye contact with the powder may cause eye corrosion or ulceration;
eye irritation with discomfort, tearing or blurring of vision. Severe eye damage may
result if not treated immediately.
Treatment: - In case of contact, immediately flush eyes with plenty of water for at
least 15 minutes. Call a physician.
INGESTION
Symptom: - Ingestion of this product in sufficient quantities may cause
gastritis, with stomach pain, nausea, vomiting, diarrhoea, headache or
weakness; possibly progressing to necrosis or haemorrhage with gross
overexposure.
Treatment: - If swallowed, do not induce vomiting. Give 2 glasses of water
immediately. Never give anything by mouth to an unconscious person. Call a
physician.
**Milton solution (Steriliser for handraising equipment) Aviclens may also be used.**
Disinfection of infant feeding and other utensils, when diluted with water.

**SWALLOWED**
- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

**EYE**
If this product comes in contact with eyes:
- Wash out immediately with water.
- If irritation continues, seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**SKIN**
If skin or hair contact occurs:
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

**INHALED**
- If fumes or combustion products are inhaled remove from contaminated area.
- Other measures are usually unnecessary.

http://www.futures-supplies.co.uk/downloads/007.058.pdf

**Avi-safe**
Vetafarm's Avi Safe disinfectant cleanser is non-irritant, non-toxic, non-staining and biodegradable. Avi Safe deals with all aspects of hygiene control and the combating of cross infection in animals. It is safe and suitable for use in both human and animal environments. Avi Safe is suitable for hospital cages, food and water containers, incubators, brooders, perches, nest boxes and general use. Hand rearing implements and other instruments may be left in Avi Safe solution. Extensive skin tests have shown that Avi Safe caused no reddening of the skin or irritation to users. Avi Safe therefore offers its users a safe alternative to potentially hazardous and irritant products, whilst retaining its ability to destroy dangerous micro-organisms. Avi Safe has a pH of approximately 4 when neat and 5.5 to 6.0 at working solution.

Aviclens: Use for sprouting seeds or for water treatment/containers. Add 5mls per 10 litres of drinking water.
http://www.vetafarm.com.au/categories/BIRDS/DISINFECTANT%7B47%7DCLEANER/

**Nutritional Supplements**
Ornithon (multivitamin and mineral powder) Greyhorse Veterinary NZ Ltd
http://greyhorse.co.nz/ornithon.php

Calcivet Vetafarm

Poly Aid Plus Vetafarm
Commercial Formulas and weaning food

**VETAFARM: NEOCARE:** 
**Ingredients:** Isolated Soy Protein, Oats, Corn, Vegetable oil, Calcium Carbonate, Vitamins and minerals, Probiotic® & Predigestives. (Vetafarm)  
**Contains** Crude Protein 21%, Crude Fat 17% (Vetafarm)  

**PRETTY BIRD: 19-8 HANDRAISING FORMULA:** A good general purpose formula for cockatoos.  
**Ingredients:** Corn, Oat Groats, Wheat, Soy Concentrate, Soya Oil, Coconut Oil, Wheat Isolate, Potato Protein, DL Methionine, Calcium Carbonate, L-Lysine, Oat Bran Fibre, L-Isoleucine, L-Threonine, L-Tryptophan, Salt, Dicalcium Phosphate, Dried (Lactobacillus Acidophilus, Bifidobacterium Thermophilum, Bifidobacterium Longum and Streptococcus Faecium) Fermentation Products, Dried Aspergillus Oryzae Fermentation Extract Product, Choline Chloride, Vitamin E Supplement, Ascorbic Acid (Vitamin C), Ferrous Sulfate, D-Biotin, Yucca Schidigera Extract, Zinc Oxide, Manganese Oxide, Niacinamide, Vitamin B12 Supplement, Rosemary Extract, Mixed Tocopherols, Copper Sulfate, Calcium Iodate, Citric Acid, Beta Carotene, Vitamin A Supplement, Calcium Pantothenate, Sodium Selenite, Folic Acid, Riboflavin, Natural and Artificial Flavours, Pyridoxine Hydrochloride, Thiamine Mononitrate, Menadione Dimethylpyrimidinol Bisulfite (source of Vitamin K3), Vitamin D3 Supplement, Cobalt Sulfate.  
Contains: 19% protein, 8% fat (Pretty Bird)  
Commercial Formula and weaning food:  

**HARRISONS: JUVENILE HAND-FEEDING FORMULA:**  
*CERTIFIED ORGANIC INGREDIENT  
**Guaranteed Analysis:** Crude protein (min.) 18%, crude fat (min.) 11%. (Harrisons)  
http://www.harrisonsbirdfoods.com/products/juv.html

Pretty bird weaning food

This product has the same nutrition as the breeder food but is extruded in a corn curl shape that is easier for young birds to hold while they are learning to eat. Weaning can be fed either dry or moistened.  
**INGREDIENTS:**  
Corn, Oat Groats, Corn Gluten Meal, Soya Oil, Coconut Oil, Potato Protein, Oat Bran Fiber, Calcium Carbonate, Dicalcium Phosphate, DL Methionine, L-Lysine, Isoleucine, L-Threonine, L-
Tryptophan, Choline Chloride, Natural and Artificial Flavors, Vitamin E Supplement, Ascorbic
Acid (Vitamin C), Ferrous Sulfate, D-Biotin, Yucca Schidigera Extract, Zinc Oxide, Manganese
Oxide, Niacinamide, Magnesium Oxide, Vitamin B12 Supplement, Mixed Tocopherols, Copper
Sulfate, Calcium Iodate, Citric Acid, Calcium Pantothenate, Vitamin A Supplement, Sodium
Selenite, Folic Acid, Riboflavin, Pyridoxine Hydrochloride, Thiamine Mononitrate, Natural and
Artificial Colors, Menadione Dimethylpyrimidinol Bisulfite (source of Vitamin K3), Vitamin D3
Supplement, Cobalt Sulfate, Rosemary Extract.


Wormers
typeID=0&CompanyID=0&ProductID=6260019&Details=Y
Avitrol plus TM: http://www.vetnpedirect.com.au/Products/Worm-Insect-Lice-Control
Ivomec TM (Ivermectin)
6deb1a4b9

Drugs
Sporonox TM (Itraconazole) Antifungal (Aspergilliosis):
http://www.veterinarypartner.com/Content.plx?P=A&C=31&A=520&S=0
Nizoral TM (Ketoronazole) Antifungial (Candidiasis):
Flagyl TM (Metronidazole) Antibiotic:
Ronivet – S TM (Ronidazole) Antiprotozoal:

Medications
Betadine TM (for wounds)
http://web.grcc.edu/Pr/msds/health/Betadine.pdf
Psittavet TM (for Psitticosis)
Lectade (for rehydration)
40197207.htm
Glucose (dextrose – simple sugar/carbohydrate)
Hartmanns Fluid


Sprouted seed for parrots/livestock/birds: Priam Psittaculture Centre
AB Incubators: http://www.abincubators.co.uk/newlife75-mk3-hatch.htm
Brinsea Incubators: http://www.brinsea.com/products/20aecco.html

Appendix: 1

Double entry Nesting Log
(Peter Chapman)

1200 to 1500 (cm)

Inspection door

1500 (cm)

Upright Perch
(Peter Chapman)

Main trunk diameter
125 - 150mm
## Appendix 2: Poisonous Plant lists

<table>
<thead>
<tr>
<th>Dangerous plants (source 1)</th>
<th>Dangerous plants (source 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amaryllis - bulbs</td>
<td>Alacia</td>
</tr>
<tr>
<td>American Yew</td>
<td>Apricot</td>
</tr>
<tr>
<td>Avocado</td>
<td>Autumn Crocus/Meadow Saffron</td>
</tr>
<tr>
<td>Azalea - leaves</td>
<td></td>
</tr>
<tr>
<td>Balsam Pear - seeds, outer rind of fruit</td>
<td>Beans - all types if uncooked</td>
</tr>
<tr>
<td>Baneberry - berries, root</td>
<td>Birch</td>
</tr>
<tr>
<td>Bird of Paradise - seeds</td>
<td>Bittersweet Nightshade</td>
</tr>
<tr>
<td>Black Locust - bark, sprouts, foliage</td>
<td>Bleeding Heart/Dutchman's Breeches</td>
</tr>
<tr>
<td>Blue-green Algae - some forms toxic</td>
<td>Bloodroot</td>
</tr>
<tr>
<td>Boxwood - leaves, stems</td>
<td>Bracken Fern</td>
</tr>
<tr>
<td>Buckthorn - fruit, bark</td>
<td>Broomcorn Grass</td>
</tr>
<tr>
<td>Buttercup - sap, bulbs</td>
<td></td>
</tr>
<tr>
<td>Caladium - leaves</td>
<td>Candelabra Tree</td>
</tr>
<tr>
<td>Calla Lily - leaves</td>
<td>Cardinal Flower</td>
</tr>
<tr>
<td>Castor Bean - also castor oil, leaves</td>
<td>Cherry Tree - bark, twigs, leaves, pits</td>
</tr>
<tr>
<td>Chalice Vine/Trumpet vine</td>
<td>Chinaberry Tree</td>
</tr>
<tr>
<td>Christmas Candle - sap</td>
<td>Coriander</td>
</tr>
<tr>
<td>Clematis/Virginia Bower</td>
<td>Crown of Thorns</td>
</tr>
<tr>
<td>Coral Plant - seeds</td>
<td>Croton</td>
</tr>
<tr>
<td>Cowslip/Marsh Marigold</td>
<td></td>
</tr>
<tr>
<td>Daffodil - bulbs</td>
<td>Elderberry</td>
</tr>
<tr>
<td>Daphne - berries</td>
<td>Euonymus/Spindle Tree</td>
</tr>
<tr>
<td>Datura - berries</td>
<td></td>
</tr>
<tr>
<td>Deadly Amanita</td>
<td></td>
</tr>
<tr>
<td>Death Camas</td>
<td></td>
</tr>
<tr>
<td>Delphinium</td>
<td></td>
</tr>
<tr>
<td>Deffenbachia/Dumb Cane - leaves</td>
<td></td>
</tr>
<tr>
<td>Eggplant - fruit okay</td>
<td></td>
</tr>
<tr>
<td>Elephants Ear/Taro - leaves, stem</td>
<td></td>
</tr>
<tr>
<td>English Ivy berries, leaves</td>
<td></td>
</tr>
<tr>
<td>English Yew</td>
<td></td>
</tr>
<tr>
<td>False Henbane</td>
<td>False Hellebore</td>
</tr>
<tr>
<td>Fly Agaric Mushroom - Deadly Amanita</td>
<td>Ficus (weeping)</td>
</tr>
<tr>
<td>Foxglove - leaves, seeds</td>
<td>Firethorn/Pyracantha</td>
</tr>
<tr>
<td>Golden Chain/Laburnum</td>
<td>Four O'Clock</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Glory Bean</td>
</tr>
<tr>
<td></td>
<td>Ground Cherry</td>
</tr>
<tr>
<td>Hemlock - also water the plant is in</td>
<td>Honey Locust</td>
</tr>
<tr>
<td>Henbane - seeds</td>
<td>Honeysuckle</td>
</tr>
<tr>
<td>Holly - berries</td>
<td>Horsetail</td>
</tr>
<tr>
<td>Horse Chestnut/Buckeye - nuts, twigs</td>
<td></td>
</tr>
<tr>
<td>Hyacinth - bulbs</td>
<td></td>
</tr>
<tr>
<td>Hydrangea - flower bud</td>
<td></td>
</tr>
<tr>
<td>Indian Turnip/Jack-in-Pulpit</td>
<td>Indian Licorice Bean</td>
</tr>
<tr>
<td>Iris/Blue Flag - bulbs</td>
<td>Ivy</td>
</tr>
<tr>
<td>Jack-in-the-Pulpit</td>
<td>Jasmine</td>
</tr>
<tr>
<td>Japanese Yew - needles, seeds</td>
<td>Jimsonweed/Thornapple</td>
</tr>
<tr>
<td>Java Bean - lima bean - uncooked</td>
<td>Jerusalem Cherry - berries</td>
</tr>
<tr>
<td>Juniper - needles, stems, berries</td>
<td>Johnson Grass</td>
</tr>
<tr>
<td>Kentucky Coffee Tree</td>
<td></td>
</tr>
<tr>
<td>Lantana - immature berries</td>
<td>Lupines/Bluebonnet</td>
</tr>
<tr>
<td>Larkspur</td>
<td></td>
</tr>
<tr>
<td>Laurel</td>
<td></td>
</tr>
<tr>
<td>Lily of the Valley - also water the in the plant</td>
<td></td>
</tr>
<tr>
<td>Lobelia</td>
<td></td>
</tr>
<tr>
<td>Locoweed</td>
<td></td>
</tr>
<tr>
<td>Lords and Ladies/Cuckoopint</td>
<td></td>
</tr>
<tr>
<td>Marijuana/Hemp - leaves</td>
<td>Mandrake</td>
</tr>
<tr>
<td>Mayapple - fruit is safe</td>
<td>Mango Tree - wood, leaves, rind - fruit safe</td>
</tr>
<tr>
<td>Mescal Beans - seeds</td>
<td>Moonseed</td>
</tr>
<tr>
<td>Mistletoe - berries</td>
<td>Mountain Laurel</td>
</tr>
<tr>
<td>Mock Orange - fruit</td>
<td>Mushrooms - several varieties</td>
</tr>
<tr>
<td>Monkshood/Aconite - leaves, root</td>
<td></td>
</tr>
<tr>
<td>Morning Glory</td>
<td></td>
</tr>
<tr>
<td>Narcissus - bulbs</td>
<td>Nectarine</td>
</tr>
<tr>
<td>Nightshade - all varieties</td>
<td>Nettles</td>
</tr>
<tr>
<td>Nutmeg</td>
<td></td>
</tr>
<tr>
<td>Oleander - leaves, branches, nectar</td>
<td>Oak - acorns, foliage</td>
</tr>
<tr>
<td>Philodendron - leaves and stem</td>
<td>Peach</td>
</tr>
<tr>
<td>Pointsetta - leaves, roots, immature</td>
<td>Peanuts - raw</td>
</tr>
<tr>
<td>Poison Ivy - sap</td>
<td>Pencil Tree</td>
</tr>
<tr>
<td>Poison Oak - sap</td>
<td>Periwinkle</td>
</tr>
<tr>
<td>Pokeweed/Inkberry - leaf, root, young berries</td>
<td>Pigweed</td>
</tr>
<tr>
<td>Potato - eyes, new shoots</td>
<td>Pikeweed</td>
</tr>
<tr>
<td>Privet</td>
<td>Pine needles - berries</td>
</tr>
<tr>
<td></td>
<td>Plum</td>
</tr>
<tr>
<td></td>
<td>Pothos</td>
</tr>
<tr>
<td>Prune</td>
<td>Rain Tree</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------------------------</td>
</tr>
<tr>
<td>Rhododendron</td>
<td>Ranunculus/Buttercup</td>
</tr>
<tr>
<td>Rhubarb - leaves</td>
<td>Red Maple</td>
</tr>
<tr>
<td>Rosary Peas/Indian Licorice - seeds</td>
<td></td>
</tr>
<tr>
<td><strong>Skunk Cabbage</strong></td>
<td>Sandbox Tree</td>
</tr>
<tr>
<td>Snowdrop</td>
<td>Scarlet Runner Beans</td>
</tr>
<tr>
<td>Snow on the Mountain/Ghostweed</td>
<td>Sorghum Grass</td>
</tr>
<tr>
<td>Sweet Pea - seeds, fruit</td>
<td>Sorrel</td>
</tr>
<tr>
<td><strong>Tobacco - leaves</strong></td>
<td>Sudan Grass</td>
</tr>
<tr>
<td><strong>Virginia Creeper - sap</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Water Hemlock</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Western Yew</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Wisteria</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Yam bean - roots, immature roots</strong></td>
<td><strong>Yellow Jasmine</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Yew (Amer, Engl, Japan) - needles, thistles</strong></td>
</tr>
</tbody>
</table>

Columns 1 and 2: All of these plants are harmful. Some more than others.

**Disclaimer from Mytoos website:**
This information below has been compiled from various sources and is provided as a service.
Mytoos assumes no liabilities, implied or otherwise. Check with your vet if you're not sure.
Also be sure that no plant has pesticide sprayed on it! If so, it must be washed thoroughly.

**Safe plants and trees**

<table>
<thead>
<tr>
<th>Trees and Bushes</th>
<th>House and outdoor plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>Acacia Aloe</td>
</tr>
<tr>
<td>Arbutus</td>
<td>African Violet</td>
</tr>
<tr>
<td>Ash</td>
<td></td>
</tr>
<tr>
<td>Aspen</td>
<td></td>
</tr>
<tr>
<td>Beech</td>
<td>Baby's Tears</td>
</tr>
<tr>
<td>Birch</td>
<td>Bamboo</td>
</tr>
<tr>
<td></td>
<td>Begonia</td>
</tr>
<tr>
<td></td>
<td>Bougainvillea</td>
</tr>
<tr>
<td>Citrus (any)</td>
<td>Chickweed</td>
</tr>
<tr>
<td>Plant Type</td>
<td>Example Plants</td>
</tr>
<tr>
<td>------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Cottonwood Crabapple</td>
<td>Christmas Cactus, Cissus/Kangaroo Vine, Coffee, Coleus, Corn Plant, Crabapple</td>
</tr>
<tr>
<td>Dogwood</td>
<td>Dandelion, Dogwood, Donkey Tail, Dracena Varieties</td>
</tr>
<tr>
<td>Elm</td>
<td>Eucalyptus (all species)</td>
</tr>
<tr>
<td>Fir</td>
<td>Ferns, (asparagus, birdnest, boston, maidenhair), Figs (creeping, rubber, fiddle leaf), Figs (laurel leaf)</td>
</tr>
<tr>
<td>Guava</td>
<td>Gardenia, Grape Ivy</td>
</tr>
<tr>
<td>Hawthorn</td>
<td>Hen's and Chickens, Herbs (e.g. oregano, rosemary, thyme)</td>
</tr>
<tr>
<td>Jade Plant</td>
<td>Kalanchoe</td>
</tr>
<tr>
<td>Larch</td>
<td>Madrona, Magnolia, Manzanita</td>
</tr>
<tr>
<td>Norfolk Island Pine</td>
<td>Marigold, Monkey Plant, Mother-in-Law's Tongue</td>
</tr>
<tr>
<td>Nuts (except chestnut and oak)</td>
<td>Nasturtium, Natal Plum</td>
</tr>
<tr>
<td>Palms (areca, date, fan, lady, parlour)</td>
<td>Pepperomia, Petunia, Pittosporum, Prayer Plant, Purple Passion/Velvet Nettle</td>
</tr>
<tr>
<td>Palms (howeia, kentia, phoenix, sago)</td>
<td></td>
</tr>
<tr>
<td>Pear</td>
<td></td>
</tr>
<tr>
<td>Poplar</td>
<td></td>
</tr>
<tr>
<td>Sequoia (Redwood)</td>
<td>Schefflera (Umbrella), Sensitive Plant, Spider Plant, Swedish Ivy</td>
</tr>
<tr>
<td></td>
<td>Thistle</td>
</tr>
<tr>
<td></td>
<td>Wandering Jew, White Clover, Zebra Plant</td>
</tr>
</tbody>
</table>


Appendix 3: Next Page. Enrichment Calendar.
# Eastern Long Billed Corella Enrichment Calendar

**Any Special requirements**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Corn, apple, spinach, legume and sunflower sprouts etc)</td>
<td>SUBSTRATE PILE WITH MEALWORMS (VARY EG SAND, MULCH ETC)</td>
<td>PINEAPPLE TOP</td>
<td>GRASS CLODS ON GROUND (DIRT ATTACHED)</td>
<td>WHOLE NUT SCATTER</td>
<td>NATIVE BROWSE WITH FLOWERS AND NUTS</td>
<td>FRESH HERBS, FRUIT, LEAVES HANGING FROM A WIRE (NATIVE AND EXOTIC)</td>
<td>CARDBOARD BOX, EGGCARTON SAWDUST AND DOG KIBBLE</td>
<td>SUBSTRATE PILE WITH MEALWORMS</td>
<td>HANGING LOG WITH FRUIT BITS INSIDE</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
</tr>
<tr>
<td>CUT GRASSES WITH OR WITHOUT SEED HEADS</td>
<td>PINE CONES OPEN AND CLOSED, WITH OR WITHOUT FOOD</td>
<td>NATIVE BROWSE WITH NUTS AND FLOWERS</td>
<td>SUBSTRATE PILE AND NON TOXIC WEEDS OUT OF GARDEN</td>
<td>PINEAPPLE TOP</td>
<td>HANGING LOG</td>
<td>PINE CONES (Corn, apple, spinach, legume and sunflower sprouts etc)</td>
<td>EGGCARTON SAWDUST SPRAY WITH DILUTED EUCALYPTUS OR TEETREE ESSENCES ON SAWDUST</td>
<td>GRASS CLODS SOME MEALWORMS OR INSECTS UNDER</td>
<td>NATIVE BROWSE WITH FLOWERS AND NUTS</td>
</tr>
<tr>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
</tr>
<tr>
<td>GRASS CLODS AND PINECONES</td>
<td>FRESH HERBS, FRUIT, LEAVES HANGING FROM A WIRE (NATIVE AND EXOTIC)</td>
<td>BROWSE FROM OTHER ENCLOSURES EG INVERTEBRATES, POSSUMS (ensure no risk of disease transfer)</td>
<td>HANGING LOG WITH NATIVE FLOWERS</td>
<td>(Corn, apple, spinach, legume and sunflower sprouts etc)</td>
<td>SUBSTRATE PILE AND NON TOXIC WEEDS OUT OF GARDEN</td>
<td>WHOLE NUT SCATTER</td>
<td>NATIVE BROWSE WITH FLOWERS AND NUTS</td>
<td>EGGCARTON SAWDUST WITH SUNFLOWER SEEDS</td>
<td>GRASS CLODS</td>
</tr>
</tbody>
</table>
Appendix 4: Enrichment item drawing.

Appendix 5: Key egg incubation formulas (Priam) This page
Appendix 6: Egg incubation Data recording sheet. (Priam) Next page

### Key Egg Incubation Formulas

#### Units of Measurement: (all to 3 or 4 decimal places)
- **Length (L)** - Centimetres
- **Weight (W)** - Grams
- **Time (T)** - Days
- **Volume (V)** - Cubic Centimetres
- **Density (D)** - g/cm³/day

#### Calculation of an Incubation Time Period:

\[
= \left\{(\text{Time (mins)/60 + Time (hours))}/24\right\} + \text{days}
\]

E.g. If Initial Start Time \(T_1\) = 1350 Hrs 6/1/97
If Time of Period \(T_2\) = 0715 Hrs 13/1/97
Therefore \(T_1 - T_2\) = \((10/60 + 10)/24\) + 6 + \((15/60 + 7)/24\)
= 0.424 + 6 + 0.302
= 6.726 days

#### Estimated Egg Fresh Weight (when unknown):

\[
= \text{Length} \times \text{Breadth} \times \text{Breadth} \times 0.548
\]

#### Daily Weight Loss Target Aim:

\[
= \left(\text{Fresh Laid Weight} \times \text{Desired % Loss to Pip}\right) / \text{Number of Days to Pip}
\]

#### Estimated % Weight Loss Trend at Time \(T\) (t)

\[
= \left\{\left(\text{Fresh Weight} - \text{Actual Weight at } T(t)\right)/T(t) \times \text{Estimate Days to Pip}\right\} / \text{Fresh Weight}\times 100
\]

#### Egg Volume:

\[
= \text{Length} \times \text{Breadth} \times \text{Breadth} \times 0.51
\]

#### Egg Density:

\[
= \frac{\text{Egg Weight}}{\text{Egg Volume}}
\]

#### Estimated Daily Change in Egg Density:

\[
= \left(\text{Egg density at time } T(1) - \text{Egg Density at Time } T(2)\right) / T(2) - T(1)
\]

**NB:** Target Egg Daily Density Change should be a reduction of 0.006 g/cm³/day

**NB:** Normal Target Fresh Egg density = 1.075 g/cm³

**NB:** Target Hatch Weight = Approximately 65% of Fresh Egg Weight
**Egg Incubation Record Sheet**

Species: ____________________________  Length (cm): ____________________________  
Flight: ____________________________  Breadth (cm): ____________________________  
Egg Number: ____________________________  Lay Date: ____________________________  
Fresh Weight (g): ____________________________  Collection Date: ____________________________  
Egg Volume (cm³): ____________________________  Egg Condition at Collect: ____________________________  

Incubator Model: ____________________________  Serial No: ____________________________  
Incubation Parameters: DBT: ____________________________  RH: ____________________________  Turning Regime: ____________________________  
Notes: ____________________________

<table>
<thead>
<tr>
<th>Day #</th>
<th>Notes</th>
<th>Actual Weight (g)</th>
<th>Density (cm³)</th>
<th>Vein Growth (%)</th>
<th>Date</th>
<th>Time</th>
</tr>
</thead>
</table>

Initial Start Day Correction Time Fraction Decimal:

Expected Incubation Period: ____________________________
Expected Days to Pip: ____________________________
Appendix 7: Leg banding sheet.

Figure 1 Readable Bird Band. 
(a) silver gull, (b) booby, (c) penguin

Figure 2 Closing bands. The correct hole in the pilers should be used for both steps of closing a band. (a) & (b) for ‘C’ shaped bands. (c) & (d) for...
### Appendix 8: Reproduction calendar for long-billed Corella (based on wild population data)

<table>
<thead>
<tr>
<th>Event</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mating</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Eggs laid 1 month later</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Hatching</strong> (incubation 24 days)</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Chicks in nest</strong></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Fledging</strong> (after 7 weeks approx)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Moulting</strong> (complete 160-180 days)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
<td>yes (breeding females begin).</td>
<td>yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flocking numbers</strong></td>
<td>Low-high</td>
<td>High (food dependent transient)</td>
<td>High (food dependent)</td>
<td>High (food dependent)</td>
<td>high</td>
<td>high</td>
<td>Low (breeding season)</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td><strong>Food availability and preference</strong></td>
<td>Scarce Onion grass</td>
<td>Scarce Onion grass</td>
<td>Crop stubble sunflower seeds</td>
<td>New crops planted</td>
<td>High New crops on grain</td>
<td>High New crops on grain</td>
<td>New crops</td>
<td>High most types available onion grass</td>
<td>High onion grass</td>
<td>High onion grass</td>
<td>Crops maturing Onion grass and other food types</td>
<td>Crops maturing</td>
</tr>
</tbody>
</table>