

**HUSBANDRY MANUAL
FOR
YELLOW-TAILED BLACK COCKATOO
Calyptorhynchus funereus**

Aves: Cacatuidae



**COMPILER: LISA HARRIS
DATE OF PREPARATION: 26/11/2007
WESTERN SYDNEY INSTITUTE OF TAFE, RICHMOND
COURSE NAME AND NUMBER: CAPTIVE ANIMALS
CERTIFICATE III 1068
LECTURERS: GRAEME PHIPPS, JACKI SALKELD,
ANDREW TITMUSS, ELISSA SMITH**

TABLE OF CONTENTS

1	INTRODUCTION.....	5
2	TAXONOMY	6
2.1	NOMENCLATURE.....	6
2.2	SUBSPECIES	6
2.3	RECENT SYNONYMS.....	6
2.4	OTHER COMMON NAMES	6
3	NATURAL HISTORY	7
3.1	MORPHOMETRICS.....	7
3.1.1	<i>Mass and Basic Body Measurements.....</i>	<i>7</i>
3.1.2	<i>Sexual Dimorphism.....</i>	<i>7</i>
3.1.3	<i>Distinguishing Features.....</i>	<i>7</i>
3.2	DISTRIBUTION AND HABITAT	8
3.3	CONSERVATION STATUS	8
3.4	DIET IN THE WILD	8
3.5	LONGEVITY	9
3.5.1	<i>In the Wild.....</i>	<i>9</i>
3.5.2	<i>In Captivity.....</i>	<i>9</i>
3.5.3	<i>Techniques Used to Determine Age In Adults</i>	<i>9</i>
4	HOUSING REQUIREMENTS.....	10
4.1	EXHIBIT/ENCLOSURE DESIGN	10
4.2	HOLDING AREA DESIGN	12
4.3	SPATIAL REQUIREMENTS	12
4.4	POSITION OF ENCLOSURES	12
4.5	WEATHER PROTECTION.....	13
4.6	TEMPERATURE REQUIREMENTS	13
4.7	SUBSTRATE	13
4.8	ENCLOSURE FURNISHINGS	13
5	GENERAL HUSBANDRY.....	15
5.1	HYGIENE AND CLEANING.....	15
5.2	RECORD KEEPING	15
5.3	METHODS OF IDENTIFICATION	16
6	FEEDING REQUIREMENTS.....	17
6.1	CAPTIVE DIET	17
6.2	SUPPLEMENTS	18
6.3	PRESENTATION OF FOOD.....	18
7	HANDLING AND TRANSPORT	20
7.1	TIMING OF CAPTURE AND HANDLING	20
7.2	CATCHING BAGS	20
7.3	CAPTURE AND RESTRAINT TECHNIQUES	20
7.4	WEIGHING AND EXAMINATION	20
7.5	RELEASE	20
7.6	TRANSPORT REQUIREMENTS	21
7.6.1	<i>Box Design.....</i>	<i>21</i>
7.6.2	<i>Furnishings.....</i>	<i>22</i>
7.6.3	<i>Water and Food.....</i>	<i>22</i>
7.6.4	<i>Animals per Box.....</i>	<i>22</i>
7.6.5	<i>Timing of Transportation.....</i>	<i>22</i>
8	HEALTH REQUIREMENTS.....	23

8.1	DAILY HEALTH CHECKS	23
8.2	DETAILED PHYSICAL EXAMINATION	23
8.2.1	<i>Chemical Restraint</i>	23
8.2.2	<i>Physical Examination</i>	23
8.3	ROUTINE TREATMENTS	24
8.4	KNOWN HEALTH PROBLEMS	24
8.5	QUARANTINE REQUIREMENTS.....	25
9	BEHAVIOUR.....	26
9.1	ACTIVITY	26
9.2	SOCIAL BEHAVIOUR.....	26
9.3	REPRODUCTIVE BEHAVIOUR	26
9.4	BATHING.....	27
9.5	BEHAVIOURAL PROBLEMS	27
9.6	SIGNS OF STRESS.....	27
9.7	BEHAVIOURAL ENRICHMENT	27
9.8	INTRODUCTIONS AND REMOVALS	30
9.9	INTRASPECIFIC COMPATIBILITY	31
9.10	INTERSPECIFIC COMPATIBILITY.....	31
9.11	SUITABILITY TO CAPTIVITY	31
10	BREEDING	33
10.1	MATING SYSTEM.....	33
10.2	EASE OF BREEDING	33
10.3	REPRODUCTIVE CONDITION	33
10.3.1	<i>Females</i>	33
10.3.2	<i>Males</i>	33
10.4	TECHNIQUES USED TO CONTROL BREEDING	33
10.5	OCCURRENCE OF HYBRIDS.....	33
10.6	TIMING OF BREEDING.....	33
10.7	AGE AT FIRST BREEDING AND LAST BREEDING	34
10.8	ABILITY TO BREED EVERY YEAR	34
10.9	ABILITY TO BREED MORE THAN ONCE PER YEAR	34
10.10	NESTING, HOLLOW OR OTHER REQUIREMENTS.....	34
10.11	BREEDING DIET.....	36
10.12	INCUBATION PERIOD	36
10.13	CLUTCH SIZE.....	36
10.14	AGE AT FLEDGING.....	36
10.15	AGE OF REMOVAL FROM PARENTS.....	36
10.16	GROWTH AND DEVELOPMENT.....	37
11	ARTIFICIAL REARING.....	38
11.1	INCUBATOR TYPE.....	38
11.2	INCUBATION TEMPERATURES AND HUMIDITY	38
11.3	DESIRED % EGG MASS LOSS.....	38
11.4	HATCHING TEMPERATURE AND HUMIDITY	38
11.5	NORMAL PIP TO HATCH INTERVAL	38
11.6	BROODER TYPES/DESIGN.....	38
11.7	BROODER TEMPERATURES	39
11.8	DIET AND FEEDING ROUTINE	39
11.9	SPECIFIC REQUIREMENTS	40
11.10	PINIONING REQUIREMENTS	40
11.11	DATA RECORDING.....	40
11.12	IDENTIFICATION METHODS	41
11.13	HYGIENE	41
11.14	BEHAVIOURAL CONSIDERATIONS	41
11.15	USE OF FOSTER SPECIES	42
11.16	WEANING.....	42
11.17	REHABILITATION PROCEDURES.....	43
12	ACKNOWLEDGEMENTS.....	44

13	REFERENCES.....	45
14	BIBLIOGRAPHY	47
15	GLOSSARY	49
16	APPENDIX.....	50

1 Introduction

While Black Cockatoos are an impressive display species and have always been kept in Australian collections, Yellow-Tailed Black Cockatoos are a relatively uncommon species in zoos. Red-tailed Black Cockatoos have traditionally been the favored species from the genus in aviculture, being the easiest to breed and raise, however several attributes of the Yellow-Tailed, while providing additional challenges, also make it arguably a more impressive display species- significantly larger size, haunting, less harsh call and destructive chewing habits.

For institutions within its natural range, it may be preferable to display a species local to the area rather than a very similar one found elsewhere in the country. Taxon Advisory Group (TAG) notes for the 2007 ASMP Regional Census & Plan are as follows: ‘Institutions to focus on the nominate sub-species *C. f. funereus*. Species not commonly bred in captivity. All pairs should be encouraged to breed. An increase in regional spaces will be required long term.’ At the time of writing, one institution holds 2.0.0 specimens of unknown subspecies. TAG advises ‘Institutions to identify specimens to subspecies to assist in appropriately managing Yellow-tailed Black-cockatoos at a regional level,’ and in regards to *C.f. xanthanotus* ‘there has been a significant increase in the holdings of this ssp. on a regional basis. TAG to discuss the possibilities regional management of Yellow-tailed Black-cockatoos in 2007.’

While overall populations have declined, the species is not considered nationally threatened, although it is classed as vulnerable under National Parks and Wildlife South Australia (NPWSA). An isolated population on the Eyre Peninsula in South Australia has undergone dramatic decline and is now recognized as critically endangered. The population is currently thought to be 30-40 birds, with numbers dipping as low as 19-21 in 1998. Habitat loss is thought to be the principal cause of the decline, with other contributing factors include increased predation risks from aerial predators (eg Wedge-tailed Eagles) due to loss of cover, predation of eggs by brush-tail possums and competition for tree hollows from feral bees.

2 Taxonomy

2.1 Nomenclature

Class	<i>Aves</i>
Order	<i>Psittaciformes</i>
Family	<i>Cacatuidae</i>
Subfamily	<i>Cacatuidae</i>
Tribe	<i>Calyptorhynchini</i>
Genus	<u><i>Calyptorhynchus</i></u>
Species	<u><i>Calyptorhynchus funereus</i></u>

2.2 Subspecies

Calyptorhynchus funereus funereus (nominate subspecies)

Calyptorhynchus funereus xanthanotus

2.3 Recent Synonyms

None Found

2.4 Other Common Names

- Funereal Cockatoo
- Yellow-Tailed Cockatoo
- Wylah
- Yellow-Eared Cockatoo
- Yellow-Eared Black Cockatoo
- Black Cockatoo

3 Natural History

3.1 Morphometrics

3.1.1 Mass and Basic Body Measurements

Total Body length 55-65cm

Male weight 645-760g, Female weight 610-900g (HANZAB, 1999)

Wings measure between 399-445mm for males, 362-449mm for females.

Tail 320-371mm males, 304-358mm females. (Forshaw, 2004)

3.1.2 Sexual Dimorphism

Males have a bare pink periophel ring around the eye which intensifies in colour when the bird is excited. Females have a dark grey ring around the eye but it is much less predominant. Males have a dark grey bill, while the females' is much lighter horn-coloured. (See figures 3.1 and 3.2) Females also have brighter yellow ear coverts than males, more yellow on the margins of body feathers and more speckling in the yellow band of the tail. Females normally slightly larger than males but with some overlap.



3.1.3 Distinguishing Features

The Yellow-Tailed Black Cockatoo is easily distinguished by its large size, dark brown-black plumage and bright yellow markings on the ear coverts and underside of the tail. The feathers on the body are also margined in yellow. The average length is around 65cm (Forshaw, 2003) varying according to sex and region. Its loud drawn-out *wy-la* (Pizzey, 1980) contact call is one of its most distinctive characteristics. The flight is also quite distinctive, powerful and buoyant but with a lazy look. Probably the only species that it could be reasonably confused with are the White-Tailed Cockatoos *Calyptorhynchus baudinii* and *C. latirostris*, which are closely related but smaller in size and have creamy-white plumage in place of yellow. Both white-tailed species are found in the south-western corner of Australia only so the ranges do not overlap. In the wild, Glossy Black Cockatoos could be confused at a distance however they are much smaller and quieter with comparatively short tails and thicker bodies.

3.2 Distribution and Habitat

Endemic to Australia. Distributed down South-Eastern Australia from Yeppon in northern Queensland, west to the Pilliga and Wagga Wagga region in New South Wales and extending through eastern and southern Victoria west to the Murray-Mallee region around Adelaide in South Australia. Also found throughout Tasmania, on Kangaroo Island and on Islands in Bass Strait including Flinders Island. (HANZAB, 1999)

Inhabits wooded country from coastal to subalpine zones, visiting the upper reaches of snowgum woodlands in alpine New South Wales, Victoria and Tasmania. Most commonly found in subtropical and temperate rainforests, wet and dry sclerophyll forests, coastal Banksia woodland and on introduced *pinus* plantations. Occasionally on riverine plains, open woodland in semi-arid regions and coastal heathland. Visits Urban parks, gardens, reserves and golf courses. Breeding requires areas with tall mature eucalypts with suitable hollows, usually in woodlands. Considered to be nomadic but no particular movement pattern has been reliably recorded.

3.3 Conservation Status

The Yellow-Tailed Black Cockatoo is listed on Appendix II of the Convention on International Trade in Endangered Species (CITES). It is listed on the IUCN Red List as Low risk/ Least concern as it does not approach the threshold for population size criteria (less than 10 000 mature individuals) or population decline (30% in 10 years or 3 generations).

Overall population has declined in recent years. Formerly, flocks much larger than at present were reported of many hundreds or thousands, (Dawson 1994) including 5000 in November (SA Bird Rep. 1964) and 'tens of thousands' in August (Harvey 1931). Appears to be less numerous than in the past as flocks numbering in the hundreds seem to be extremely rare in the present day.

An isolated population on the Eyre Peninsula in South Australia has undergone dramatic decline and is now recognized in the state as critically endangered. The population is currently thought to be 30-40 birds, with numbers dipping as low as 19-21 in 1998.

Major threats include

- Habitat clearing for farmland
- Competition for hollows with introduced bee species
- Predation of eggs by possums
- Increased predation risks from aerial predators (eg Wedge-tailed Eagles) due to loss of cover

3.4 Diet in the Wild

The Yellow-Tailed and White-tailed Black Cockatoos are unique in the Cockatoo family for their habit of feeding on the wood-boring larvae of insects such as Cossid

Moths and Cerambycid beetles (Forshaw, 2003). It is thought that the cockatoos search the forest in groups, looking for visible signs of infestation such as swelling in the trunk, silk and droppings or sawdust around entrance holes. They then sink their beaks into the wood to detect movement. On finding a suitable site, they strip large pieces of bark down from above the boring hole so that they are aligned perpendicular to the trunk of the tree. This is then used as a sort of springboard platform, providing extra leverage as it extracts the larva with its bill (Zborowski, Edwards 2007).

In forests with fairly sparse undergrowth, the birds may descend to the ground and dig out the soil from around tree roots for the same purpose. The major part of their diet, however, consists of the seeds of native and introduced plants, predominately *Eucalyptus*, *Acacia*, *Hakae*, *Banksia*, *Allocasuarina*, and introduced *pinus* trees, being one of the few animals to have benefited in some areas from large pine plantations. (Forshaw, 2004). They are most often observed tearing apart cones and seed pods, but also eat nuts, berries, fruit, blossoms and leaf buds.

3.5 Longevity

3.5.1 In the Wild

Very little is known about the lifespan of these birds in the wild. No significant population study has been undertaken to determine this so most estimates are based on observations of captive populations.

3.5.2 In Captivity

Even in captivity, longevity estimates are primarily based on anecdotal evidence. Because the species is not widely kept in aviculture, the level of care which would affect lifespan varies widely, and accurate records are few and far between. It is believed that with proper care Yellow-Tailed Black Cockatoos may reach an age of between 40-60 years, however average lifespan has been recorded to be as low as 25 years. There are reports of Black Cockatoos reaching 100 years of age, but these are unsubstantiated.

3.5.3 Techniques Used to Determine Age In Adults

Males develop pale eye ring by 3rd year and dark coloured bill at 4 years of age (HANZAB, 1999).

4 Housing Requirements

4.1 Exhibit/Enclosure Design

According to EAPA regulations:

- 1) The enclosure must be constructed in such a way as to minimise the entry of:
 - a) predators of animals in the enclosure
 - b) pests
 - c) wild animals of the same or similar species
- 2) All enclosures (display, treatment, holding, isolation and other) must be constructed of such materials and be maintained in sufficiently good repair so as to ensure that they will contain the animals at all times and are safe for the animals, for the staff attending them and for the public.
- 3) If the material used in the construction of the enclosure is not new it must be of good quality and not contain blemishes or corrosion.
- 4) An enclosure must be constructed so that:
 - a) The visiting public are safe if they comply with appropriately displayed warning signage, and that animal attendants are safe if they comply with such signage and instructions under these and any other standards appropriate to the exhibited animals concerned; and
 - b) An animal cannot escape except in circumstances that cannot be reasonably foreseen and guarded against; and
 - c) The risk of injury to an animal in the enclosure is minimized
- 5) Vegetation or other material in or near an enclosure must be removed or repositioned if it would otherwise assist an animal to escape

Enclosures shall be constructed of such materials and be maintained in sufficiently good repair to ensure that they will contain the animals at all times and are to be safe for the animals, for the staff attending them and for the public. Enclosures shall include a covered shelter, enclosed by weatherproof walls which provide roost security and protection from wind, rain and extremes in temperature and sunlight. Up to half of the aviary should be protected at one end by three solid walls and covered roof which may be accomplished with brick or colourbond sheeting.

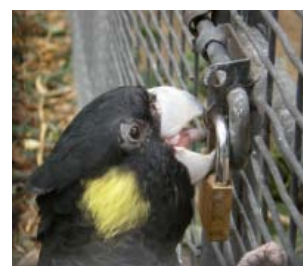
Roof should preferably be sloping so run off and debris falls away.

If the enclosure is in a bank of aviaries then doors to the access corridor should be kept shut while the exhibits are being serviced. Enclosures that back onto a corridor can have weldmesh walls on that end instead of solid for increased visibility as the corridor should provide sufficient protection from the elements.

Stand alone exhibits should be accessed via a double door system which creates an airlock preventing the birds escape should it breach the inner door. Obviously only one door should be open at any one time.

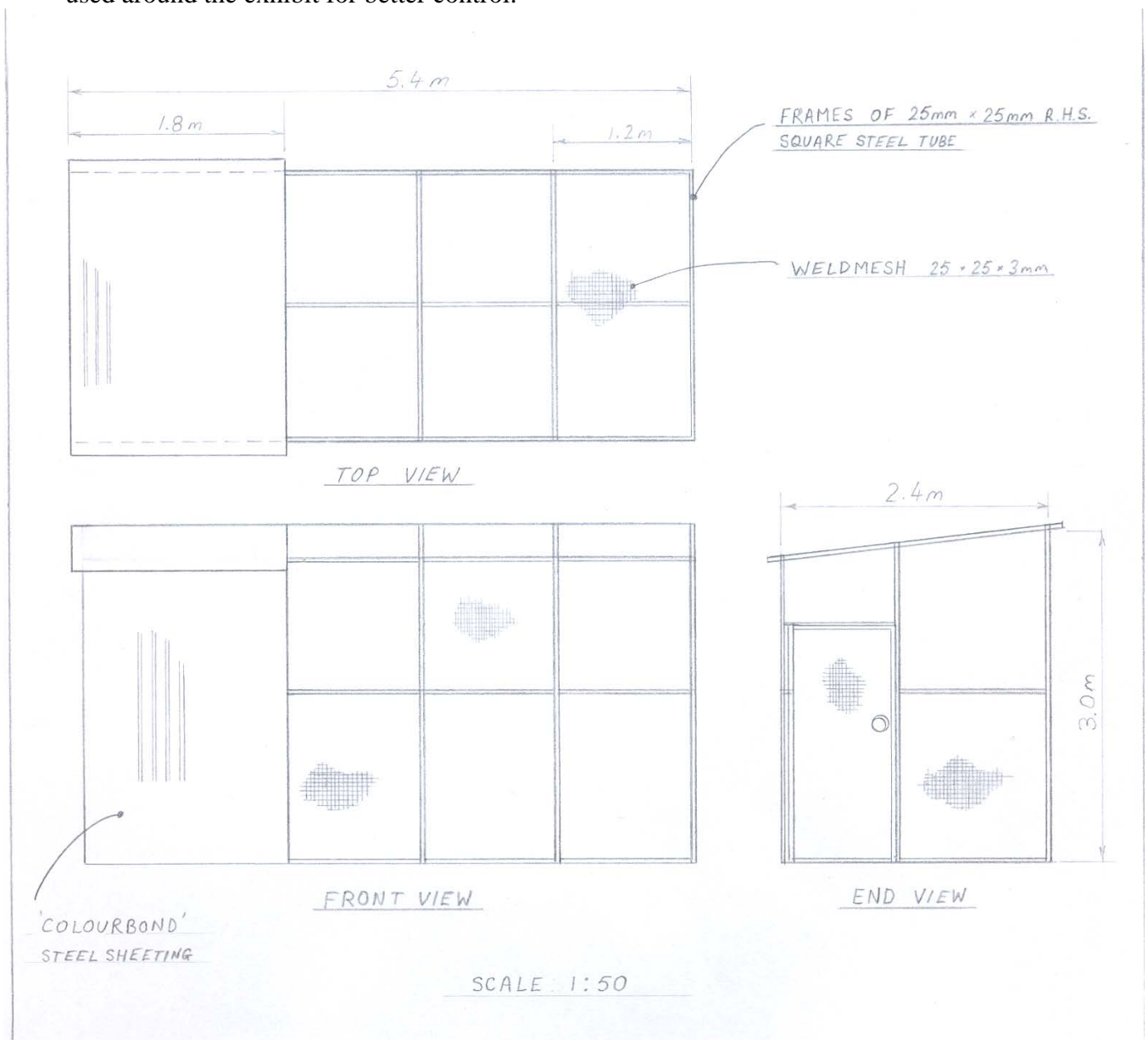
Weldmesh for Yellow-Tailed Black Cockatoos should be 25mm x 25mm and 3mm thick. New wire should be scrubbed with vinegar to neutralize the zinc oxide and avoid heavy metal poisoning if it is chewed. (Connors 2005, Pers. Comm. Gowland 2007)) Doors should be kept secured at all times with well-maintained bolt locks and padlocks.

If the aviary is to be planted, be aware that these birds are powerful chewers. Select plants which are safe but not attractive to the birds. Frequent sacrificial browse is essential for diverting the birds' attentions away from aesthetic plants.



Large plants should also be positioned to maximize the flight path and conceal keeper service points.

Rodents are attracted to bird seed and can be a huge problem in bird aviaries. They can transmit disease and harbour parasites. Rats may injure young in the nest and also attract snakes which may kill birds. Rodents can also damage the exhibit, compromising security and will consume any food which is not properly contained. It is of vital importance that aviaries are rodent proof from the beginning. All food should be stored in sealed containers and spillage cleaned up immediately. Feed stations should be located so rodents do not have easy access and the area around feed stations should be cleaned up every afternoon to avoid attracting vermin overnight. Places to harbour rodents should be minimised and sealed rodent bait stations can be used around the exhibit for better control.



An example of a basic aviary design.

4.2 Holding Area Design

A Nogel cage serves as suitable off-exhibit temporary housing for Yellow-tailed Black Cockatoos. It can be used for a range of purposes including as temporary holding while a permanent exhibit is repaired or maintained, as a hospital or quarantine cage, or for young animals. It may can be constructed as the same type of weldmesh as the main aviary but need have only one perch. It should have the same mesh on the floor to allow food and faeces to fall through onto a pull-out tray which can be easily cleaned. Alternatively, a mat of Astroturf can be used over the wire flooring and hosed or gurnied off when dirty.



Pair of Nogel cages used for Black Cockatoos at Taronga Zoo

4.3 Spatial Requirements

Minimum standards for a Yellow-tailed Black Cockatoo aviary are 5 metres long x 2 metres wide x 2.4 metres high. (Connors, 2005) This however should be considered as an absolute minimum.

Yellow-tails are large birds with very deep wing beats and should be allowed as much flight room as possible. For example, an 11 metre aviary allows only 3 complete wingbeat in flight. (McNaughton, 2002) Length should be seen as a priority over width to maximize possible flight distance.

4.4 Position of Enclosures

Front of exhibit should face south. (Smith 2006) Position aviary away from potential predators such as birds of prey, carnivorous mammals and large monitors to avoid overstressing animals.



4.5 Weather Protection

Sufficient shelter must be provided to allow protection from wind, rain and extremes in temperature and allow sufficient access to shade during the hot periods of the day. (EAPA) To accomplish this, the aviary should be enclosed at one with solid walls on three sides for protection from the elements. The open end should allow the birds access to rain.

4.6 Temperature Requirements

Cockatoos can suffer from extremes of both heat and cold. A sprinkler system should preferably be installed in the aviaries to simulate rain and cool the birds in hot weather. Alternatively, in tropical climates where it rains regularly and the birds can shower themselves, a light spray with a handheld hose kept on hand may suffice for use in extreme temperatures. It should not be pointed directly at the animal. As Yellow-Tailed Black Cockatoos are found as far south as Tasmania and in alpine regions, adult birds should tolerate most cold extremes in Australia. If in doubt, heat lamps may be provided through winter in feed stations or holding area.

4.7 Substrate



To avoid the accumulation of faeces, urates, fungi and mould, a readily cleanable or replaceable substrate must be provided, particularly around feeding and watering points. Substrate must not be abrasive or irritating to the animals kept in the enclosure. (EAPA) Concrete flooring is a popular choice for Yellow-tailed Black Cockatoos as it is extremely easy to clean and drain. Hardwood mulch or coarse sand is easily raked and replaced and has a more naturalistic look.

4.8 Enclosure Furnishings

Perches are one of the most important aspects of aviary design. Perches should be constructed from uncontaminated natural branches and vary in diameter and cross-section so that at least some shall have circumferences not less than the foot span of the species to be housed. (EAPA)

Suitable species for harvesting include melaleuca, acacia, banksia, casuarina, grevillea (Connors, 2005), bloodwood and eucalypt. (Biggs, 2006) The bark provides enrichment as the birds will strip and chew it. The rough texture also helps keep the feet healthy and nails trim.

How frequently these will need to be replaced will depend on the number of animals kept and the activity of individual birds. For this species, vertical perches are often preferable to horizontal perches. Horizontal perches tend to be destroyed more quickly as the birds chew through the middle and force their replacement. Vertical perching is longer lasting, allowing more chewing time as it tends to be attacked more

evenly. It also allows more climbing area for the birds and looks more naturalistic, particularly in small exhibits. Ideally, at least 1 horizontal perch should be provided as well to allow pairs to perch together. (Harris 2007)

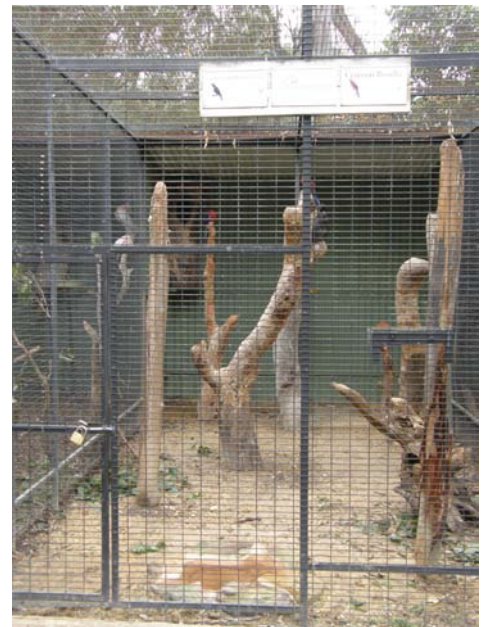
The total number of perches should outnumber the number of birds in the enclosure. Competition for the highest vantage point shall be avoided by providing a number of perches at that height. Perches in breeding enclosures should be positioned so that there is sufficient overhead clearance for copulation. (EAPA)

Care should be taken that perches are no closer to the roof of the enclosure than that distance which is needed for the bird's wing to go through its natural arc during take-off and landing. All perches should be placed so that birds can perch comfortably without their plumage coming into contact with walls or fixtures. Positioning of the perches should encourage the animals to make maximum use of the flight possibilities within the enclosure. At least one perch should be no less than two(2) metres from the ground. (EAPA)

If there are adjoining enclosures, perches in the covered shelter shall be placed so that a cockatoo resting on one of these may avoid visual contact with animals in adjoining enclosures. All perches should be placed so that animals in adjoining enclosures cannot perch within reach of each other through cage wire. (EAPA)

If the aviary is to contain a bathing pond or container it should have a diameter sufficient to allow normal bathing behaviour and a depth not greater than 15cm and not less than 5cm. The pond/container shall have a non-slip, cleanable surface and no sharp edges. It should be kept filled with clean fresh water or where the length of the legs of the shortest bird is less than 15cm to a depth equal to the length of that bird's legs. (EAPA) Preferably the pond should blend in with the substrate and maintain a naturalistic look.

If the enclosure is to contain a bird incapable of normal flight, rough-barked branches should be placed to permit the birds to climb to perches from the substrate. (EAPA) Perches are normally attached by bolting both ends to the weldmesh or by attaching triangular perch brackets which support the ends of a perch once it has been cut to size. Either of these methods allows easy removal and replacing of the branches.



Natural perch bolted to aviary wall



Perches resting in triangular perch bracket

5 General Husbandry

5.1 Hygiene and Cleaning

Aviaries should be hosed out every morning, preferably using a gurney. Birds can remain in the aviary while this procedure is carried out. Water bowls should be emptied and either cleaned or replaced and filled. For the most part, physical methods of cleaning are sufficient to maintain a cockatoo aviary and chemical disinfecting is unnecessary. Diluted bleach or F10 can be used in small quantities in a well-ventilated aviary to clear up algae or heavily soiled areas. If more than a small localized area needs to be treated however the birds will need to be removed as they are very sensitive to fumes. Browse should normally be replaced at least once a week with perches being replaced when sufficiently worn.

Rodents are attracted to bird seed and can be a huge problem in bird aviaries. They can transmit disease and harbour parasites. Rats may injure young in the nest and also attract snakes which may kill birds. Rodents can also damage the exhibit, compromising security and will consume any food which is not properly contained. It is of vital importance that aviaries are rodent proof from the beginning. All food should be stored in sealed containers and spillage cleaned up immediately. Feed stations should be located so rodents do not have easy access and the area around feed stations should be cleaned up every afternoon to avoid attracting vermin overnight. Places to harbour rodents should be minimised and sealed rodent bait stations can be used around the exhibit for better control.

5.2 Record Keeping

Significant events regarding individual Animals should be recorded using the International Species Information System (ISIS) / Animal Records Keeping System (ARKS). This information should be stored according to institutional policy but remain accessible in case a history is needed for veterinary investigation or disposition. Important Information should also be noted in a daily diary which is read by all keepers every morning.

Data collection for this species is primarily the same as for any other species.

Routine Data collection for individuals may include:

- Weight
- Feather/Beak/Feet Condition
- Physical Body Condition
- Behaviour
- Any Breeding Activity
- Veterinary Attention or Treatment
- Identifications or Tagging
- Deaths
- Acquisitions or Dispositions
- Hatchings or Fledgings
- Measurements

- Dietary changes or supplements
- Any other information deemed important to the care and management of the animals

Depending on the type and size of collection, some of this data may be collected daily, weekly, or only as needed eg. for veterinary examination, medication or breeding. Obviously, if there are any health problems present or suspected, or if the bird is being worked or being used for breeding purposes, more frequent, preferably daily data collection is preferable. In smaller, easily accessed collections it may prove advantageous to condition the birds to easily accept weighing and examination procedures. This allows data to be obtained more easily and with minimum stress to the birds.

5.3 *Methods of Identification*

Leg Banding is by far the most widely used method for individually identifying birds. Traditionally, males are banded on the right leg and females on the left. Bands can be closed or open, metal or plastic. Combinations of colours and multiples of bands can give hundreds of different ids that are clearly visible and do not fade. There is a small risk of them becoming caught on aviary wire or branches but it is minimal in a well-maintained enclosure with properly fitted bands. Normally a band size of between 18-20 is appropriate.

Microchipping provides good piece of mind in case the cockatoo becomes lost as it does not in any way interfere with the bird, cannot be lost or removed in the case of theft, and allows ownership to traced back to you from anywhere in the country. Leg banding for local identification paired with Microchipping for permanency is recommended as the best solution.

Primary feather clipping or feather tattooing with ink on the underside of the primaries can be used as a temporary id method but it is unsuitable for birds on display as it is aesthetically detracting and is too impractical to bother with if it needs to be applied more than once.

6 Feeding Requirements

6.1 Captive Diet

Cairns Tropical Zoo feeds the following diet to their Yellow-tailed Black Cockatoos Per Bird –

Approx 1 cup or less of soaked/semi-sprouted Large Parrot seed and small parrot seed
2/3 of a cup combination of three of the following:

- broccoli (chopped to small florets);
- beetroot (chopped to 1-2cm cubes);
- carrot (chopped to 1-2cm cubes);
- sweet potato (chopped to 1-2cm cubes);
- fresh corn (cut into thin wheels);
- snow peas (roughly chopped);
- beans (roughly chopped);
- frozen peas (defrosted);
- mung beans;
- snow pea sprouts;
- frozen corn (defrosted);
- silverbeet (chopped);
- celery (chopped);
- apple (chopped to 1-2cm cubes);
- English spinach (chopped);
- Pears (chopped to 1-2cm cubes)

Parrot Maintenance pellets are also fed to the birds. Additions to the diet include dog kibble, boiled eggs (half per bird), and shell grit all once weekly.

Eucalyptus, acacia, casuarina and bloodwood are used for browse. Paperbark strips, native flowers and seed pods collected onsite are also placed around the enclosure. Birds are fed once daily (between approx 8am-9am) from three large bowls (on trays under feed huts) located in different areas of the enclosure. These bowls are removed and cleaned between 2:30-3pm. All food scraps are removed and the trays are cleaned and stacked so that no rodents are attracted during the evening. Three large water bowls are scrubbed and refilled with fresh water every morning, and these will remain full overnight (not to be removed). (Biggs 2006)

Taronga Zoo's diet for Yellow-tailed Black Cockatoos consists of a psittacine mix made up of sprouted parrot seed, pear diced in 1cm cubes and very finely chopped greens- endive, spinach, kale, parsley, broccoli, and beetroot greens when available. The entire mix is sprinkled with Calcium Carbonate. This is fed out in the morning along with fruits spiked on branches such as apple, kiwi fruit, corn, paw paw, banana, orange, and sweet potato.

In afternoon rounds this is followed by mixed nuts including hazelnuts, walnuts, and almonds, and mealworms are scattered throughout exhibit. Casuarina seed pods are also provided sporadically. (Alexander 20007)



Many Aviculturalists consider additional protein an essential part of a breeding diet. This may be provided in the form of mealworms or small quantities of mincemeat or cooked bones. (McNaughton, 2002)

6.2 Supplements

Commonly used supplements include Calivet, a calcium and D3 syrup supplement added to food and Soluvet, which provides 13 essential vitamins in a soluble palatable form also added to food. Cairns Tropical Zoo recommends both of these be added to soaked seed mix once per week. Taronga Zoo uses Calcium Carbonate daily and D Nutrical weekly. Other supplements available include:

Breeding Aid - blend of essential oils, fatty acids and vitamins for breeding birds

D'Nutrical - Calcium, multivitamins and minerals in powder form

Moulting Aid - Vitamin, Amino Acid and Trace Mineral Supplement

Natures Essential Mix - essential vitamins, minerals, and active probiotics

Poly-Aid Plus - a sustained release carbohydrate and protein supplement with multivitamins and electrolytes and nine strain Probiotic™

Probiotic - Re-establishes natural gut flora

Soluvet Plus – 13 vitamins + salts and energy

Soluvet Liquid Vitamins - High potency liquid supplement 13 vitamins with added iodine

Spark Electrovet - High Calorie Electrolyte for extra energy and body salts

Tracemin - Soluble Trace minerals and Amino acids

All of the above are available from Vetafarm Pty Ltd (See Appendix)

6.3 Presentation of Food



Everyday diet can be presented in galvanized or stainless steel cups or dishes placed at an accessible perch. It is preferable to provide at least one food dish for every animal kept. These should be removed, emptied and washed daily.

Browse can be presented in cut sections of PVC pipe screwed or cabled to the wire sides of the aviary that the branches slide into from the top. Alternatively, the

branches can be held in place against the wall with a strand of chain hooked onto the wire either side. These methods keep it off the ground and allow for easy installation and removal. Ideally, browse should be replaced weekly or more often in hot or dry weather.

Many facilities also use nails hammered into perches or permanent furniture to spike pieces of fruit. (see 6.1 Captive Diet for suitability) This encourages exploration and increases the time occupied with feeding activities but care needs to be taken with the placement of nails and they need to be checked daily for rust or wear. A safer idea may be to spear on sharp branch protrusions. Food may also be scattered along the floor to encourage foraging behaviour.

7 Handling and Transport

7.1 Timing of Capture and Handling

Capture of Yellow-tailed Black Cockatoos should, if possible, be performed first thing in the morning in the cool before the day heats up and before the facility opens to the public. Capture will be made easier by catching birds when they first wake and are less active.

7.2 Catching Bags

Catching bags are not normally used for capturing cockatoos. In an aviary, a bird net is normally used for initially capturing the bird and confining it for manual restraint. A towel is also a useful tool.

7.3 Capture and Restraint Techniques

Black cockatoos should be captured using a large bird net with padded edges. The best technique is to encourage the bird to fly to a specific perch by which the keeper with the net is waiting. The keeper should then swiftly, without hesitation scoop the birds up with the net while half-twisting the hoop in the same movement to prevent the bird flying back out. (Phipps, 2006)

If it is a small cage, relatively tame bird or unwell, it may simply be caught with the hands using a towel from behind. The towel should encircle the body, holding the wings firmly in place so they cannot be pulled free.

For examination, cockatoos should be restrained using two hands. One hand firmly grasps the nape behind the head, while the thumb may be placed under the lower mandible to prevent biting. The other hand holds the feet and wings against the body. Yellow-tailed Black cockatoos are very easily trained so another more attractive option to replace the use of a net is to condition the bird to freely enter a box or accept manual handling.

7.4 Weighing and Examination

Black Cockatoos are easily conditioned to weight voluntarily by perching on a branch mounted on a scale and this is the least stressful and preferable method. They can easily be examined whilst being physically restrained.

7.5 Release

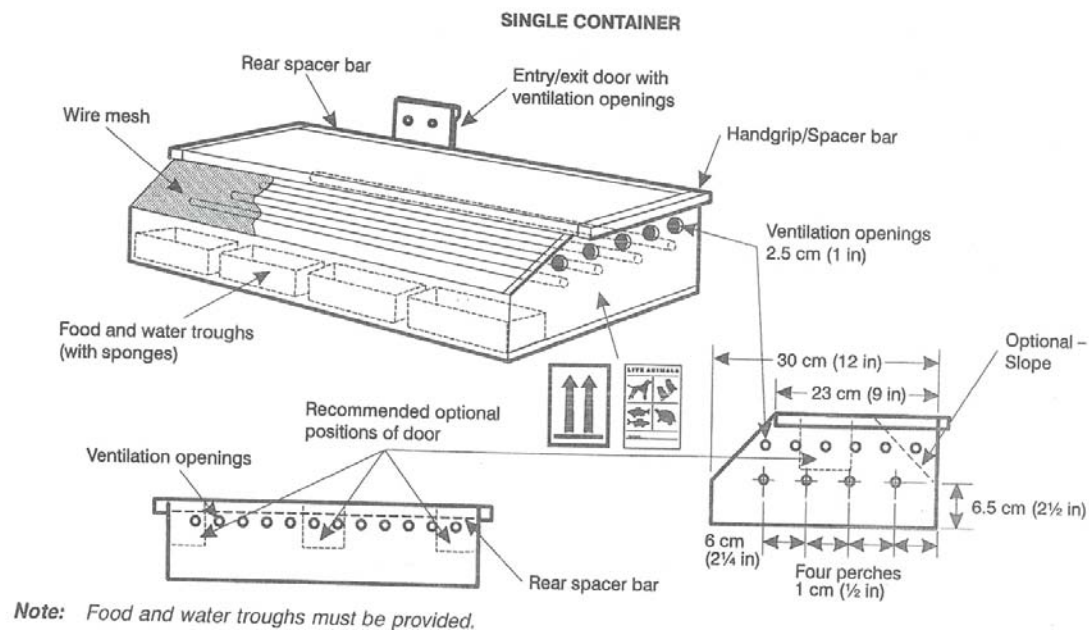
In most cases the box may be placed on the floor or at a perch and the door opened for the bird to exit by itself. If the animal needs to be released by hand it should be placed on the floor, checking first its feet and wings are not entangled. It should never be released mid-air as may be disorientated and should have a few moments to regain its balance and full movement.

The animal should be monitored for a short time after release to ensure it settles properly in to its surroundings and is not at risk of injuring itself.

7.6 Transport Requirements

7.6.1 Box Design

Boxes used for transporting animals should conform to IATA regulations. Sides should be constructed of plywood or solid wood with a thickness of 0.6cm or more or metal. Frame should be 2 x 4cm solid wood with roof and floor constructed of 1.2cm plywood. The container must be able to contain the bird at all times and prevent unauthorized access. The door must be constructed so that accidental opening cannot occur either from the inside or outside. Should also be clean and leak-proof. All inside edges must be smooth or rounded and there must be no sharp projections such as nails which could cause injury. Joints of wooden containers must be constructed so they cannot be damaged by a birds beak or claws from the inside.



7.6.2 Furnishings

Wooden perches must be provided with sufficient perch space inside the container for each bird to have its head upright and tail clear of the floor. Perch diameter must be large enough for birds to grip firmly and comfortably. Placement of perches must not allow droppings to fall into food or water troughs.

7.6.3 Water and Food

Separate food and water troughs must be provided. They must be made of non-toxic material and have rounded edges with a flange around the edges to prevent spillage. Precautions must be taken to avoid drowning by floating a sponge or similar on the surface of the water in the trough.

Shipper's instruction for feeding and watering must be given in writing at the time of acceptance. Feeding and watering instructions must be affixed to the container and a copy of the instruction must accompany the shipping documents. Any feed or water given must be recorded on the container instructions with the date and time of supply. Food must be provided by the shipper, but it must be checked that it does not contravene any regulations of the countries of transport or importation. In the case of sealed containers, feeding is not possible and the shipper must be aware of this fact. Likewise, products of animal origin, such as meat or food containing meat, must not be accepted inside the container for the same reason.

7.6.4 Animals per Box

Cockatoos may be transported in groups of up to 6, but aggressive birds must be transported individually. If possible, birds should always be transported singularly as even individuals normally housed together with good relationships may become aggressive when placed in a confined space, particularly in stressful situations such as transportation. (Phipps 2006)

7.6.5 Timing of Transportation

Transport should preferably be done during the cooler part of the day in calm weather if possible. Other factors to be taken into account will include length of journey, availability of transport equipment and personnel, preparedness of the receiving facility and disruption to normal activities.

8 Health Requirements

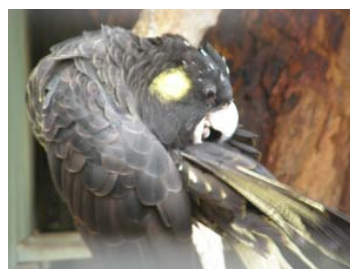
8.1 Daily Health Checks

Distance exam should begin with brief check of the environment. Look at-

- Climate conditions
- Abnormalities such as blood, diarrhoea, or regurgitated food
- Food and water consumed

Then move on to individual animals, looking at

- Body condition
- Alertness
- Abnormalities such as injuries or lesions
- Abnormal behaviour
- Movement and gait
- Feather condition (Titmuss 2007)



8.2 Detailed Physical Examination

8.2.1 Chemical Restraint

Nitrous oxide mixture with a minimum of 30 % oxygen is commonly used as a general anaesthetic for birds. Inhalant drugs used include Halothane and Isoflurane, (Gleed, Ludders 2001). Ketamine, Medetomidine or Thiopental sodium are suitable for use as injectable anaesthetics. (Gleed, Ludders 2001)

8.2.2 Physical Examination

A good idea is to start at the head and work down-

- Head should look symmetrical, held straight and upright.
- Eyes should look bright and clear
- The cere should be examined for damaged and the surrounding feathers checked for staining or discharge
- Examine beak for malformation, damage or bruising
- Check mouth and tongue for abnormal odour, presence of excessive mucous or cheesy plaque
- Run your fingers over the entire bird checking for any lumps or lesions
- In fledged birds the breast muscles should be convex and the keel bone should not be prominent
- The abdomen should be slightly concave and the bird should not demonstrate pain when given a gentle examination
- Examine the Powder down feathers over the hip - should be fluffy and full
- Pull out each wing individually. Feel the bones from the shoulder to the wing tip and check each joint for range of motion and signs of swelling
- The vent should be free of swelling, encrustation or soiling
- Run your fingers down each leg from the hip to the claw, paying particular attention to the joints
- Assess the gripping ability of both feet



- Examine the bottom of each foot – should be roughly textured not smooth
- Check for overgrown claws though their presence may only be a sign of poor perching material
- Observe the bird immediately after the examination to determine its levels of stress or discomfort (Cannon 2002)

8.3 Routine Treatments

Birds should be routinely treated with an intestinal wormer. This should be done at least every 3 months or more often if there is a high risk of infestation. Birds should particularly be wormed during periods of stress, prior to the breeding season, during high humidity and during quarantine (Cannon 2002).

This can be done using a number of methods. Panacur 25, Avitrol, Avitrol Plus, Ivomec, Cydectin, Nilverm and Wormout gel can be administered orally as drops into the beak or using a crop needle and syringe. With the exception of Avitrol and Avitrol Plus, the above can also be added to food and water. If this method is used, consumption of both should be closely monitored to ensure the birds do not stop eating and drinking due to the taste of the treatment. Ivermectin may also be injected or applied topically to the skin at the base of the neck. (Cannon 2002)

Taronga Zoo's preferred method is treatment of all seed with Piperazine powder every 3 months. (Pers. Comm Dockrill 2007)

If desired, birds may be given a 2 day course of Baycox or other coccidiostat in the drinking water every 2 months to control Coccidiosis (Pers. Comm., Twentymen 2007). Good husbandry procedures and not overcrowding exhibits, however, are normally control enough.

8.4 Known Health Problems

Infectious Diseases

Name	Organism	Signs	Treatment	Zoonotic
Mycoplasmosis	<i>Mycoplasma spp.</i>	Nasal Discharge, Sneezing, Eye swelling	Antibiotics	No
Chlamydophilosis	<i>Chlamydophilia psittaci</i>	Various	Doxycycline (Psittavet)	Yes
Candidiasis	<i>Candida albicans</i>	Regurgitation, Diarrhoea Plaque in mouth	nystatin, ketoconazole	No
Giardiasis	<i>Giardia lamblia</i>	Greasy feathers Excessive grooming, picking Enlarged stools	Emtryl, Ronivet-S Flagyl Suspension Torgyl solution	No
Coccidia	<i>Eimeria spp.</i> , <i>Isospora spp.</i>	Diarrhoea Weight loss Dehydration	Toltrazuril,, Amprolium, Sulfa drugs	No
Psittacine Beak and Feather Disease (Pbfd)	<i>Circovirus sp.</i>	Overgrown beak, Feather loss	Possible future vaccine	No
Tapeworm	<i>Choanotaenia spp.</i>	Condition loss, Colic, hiccuping	Niclosamide, Praziquantel	
Leucocytozoon		Infection in vital	Chloroquine,	No

	<i>Leucocytozoon</i>	organs and blood	primaquine	
	<i>spp.</i>	cells	anti-malaria drugs	
Aspergillosis	<i>Aspergillus fumigatus</i>	Lethargy, condition loss,	Amphotericin-B, Fluorocytosine	No
		Breathing		
		difficulties		

Non-Infectious Diseases

Name	Cause	Signs	Treatment
Egg binding	Obesity, infection calcium deficiency, chilling, lack of exercise	Straining to lay, swollen abdomen, Upright posture	Calcium supplement, increased heat and humidity
Gout	Kidney disease, Dehydration	Lameness, Joint swelling, depression	Fluid therapy
Calcium deficiency	Lack of calcium	Fractures, deformed beak, egg binding, poor egg production	Calcium supplement, improved diet
Metabolic Bone Disease	Calcium Phosphorus Imbalance	Spontaneous fractures or bending of joints	Improved diet, sunlight exposure, vitamin and calcium supplements
Heavy metal poisoning	Ingestion of heavy metal particles	Vomiting, convulsions, blindness, crop stasis, bloody faeces	Elimination and neutralization of poison
Feather picking	Allergies, trauma, Pbfd, behavioral abnormality, liver disease, poisoning, malnutrition	Excessive chewing of feathers and skin, Normal feathers on head and neck	Alteration of environment, tranquilizers, anti- histamine, treatment of secondary condition

(Cannon 2002, Connors 2005, Doneley 1999)

8.5 Quarantine Requirements

Quarantine should be for a minimum of 4 weeks, preferably six weeks, but length will depend on individual institutional requirements (Cannon 2002). During quarantine, birds should be wormed twice, and return 3 clean faecal floats before being released. If any faecal samples test positive for parasites, quarantine period should be begun again (Taronga Zoo policy 2006). If quarantine is to be for six weeks or more, it is advisable to administer a course of doxycycline (Psittavet) to protect against Psittacosis (Cannon 2002). In addition, a coccidiostat such as Baycox should be given in water for 48 hours on admission and again for 48 hours 7 days later (Pers. Comm. Twentymen 2007). Quarantine area should be dark and quiet to avoid undue stress (Cannon 2002).

9 Behaviour

9.1 Activity



Activity patterns are dependant on habitat and climate. Active when first awoken in early morning before sunrise. Normally rest in dense trees along watercourses during the heat of the day, resume feeding in afternoon and continue until just before dusk; then return to daytime roosting sites or fly into forest to roost. Often come to ground to drink first thing in the morning and late afternoon before going to roost.

Moving flocks feed in morning, fly during the middle of the day and move to roost in early afternoon, earlier in bad weather (Dawson 1994)

At roost, preen, feed young, perform aerobatic displays and call before settling (McLean 1987a; Dawson 1994)

9.2 Social Behaviour

The Yellow-Tailed Black Cockatoo is a gregarious species. It is most commonly seen in family groups or small flocks, though flock size varies considerably. Average flocks number between 2 and 8 birds, but up to 14 are regularly seen (Templeton 1992). During breeding season, they are usually found in pairs or pairs with young from previous season or in small groups of less than 10. Families keep together when part of a flock. (Hyem 1936; Lendon 1973; McInnes & Carne 1978; Low 1980; Sutton 1990; Mayo & Mayo 1992; Forshaw) The largest flocks can be seen in the middle of the non-breeding season when they may number 100-200 and up to 1000 animals, composed of pairs, dependant juveniles, and single birds. (McLean 1985, 1987a; Dawson 1994) It has been claimed that the nominate subspecies *funereus* rarely forms large flocks, unlike the subspecies *xanthanotus*. (Courtney 1986)

Possible that all or most birds in a region roost together, particularly in non-breeding season, but local or sedentary birds roost apart from moving flocks (Forshaw). The same roost site is rarely used for more than a few nights, probably chosen for proximity to current feeding site and according to prevailing weather (Forshaw). Moving flocks may break up during the day but return to roost together. When separated, keep in vocal contact, particularly if moving.

9.3 Reproductive Behaviour

Breeding pairs are monogamous and have a strong pair bond (Forshaw) Both parents prepare the nest hole and feed the young (Forshaw) but only the female incubates (Sindel & Lynn updated). Young usually remain with parents until the start of next breeding season when driven away or ignored, but can remain through the following season (Sindel & Lynn) or for up to 4 years (McLean 1985, 1987a; Dawson 1994;

ACT Atlas) Young from previous season have been observed joining female in nesting hollow (J.L. Nelson).

9.4 Bathing

A shallow pond or sprinklers should be provided to allow regular opportunities for bathing and encourage natural preening behaviours.

In the wild, flocks may bathe together during rain, with several hanging upside-down at one time flapping wings in tall eucalypts, then preen after rain has stopped (Dawson 1994). Similar behaviours may occur in captivity.

9.5 Behavioural Problems

Cockatoos are highly intelligent animals that need to be kept occupied. Under stimulation can result in a range of behavioural problems. The most common ones are:

- Feather picking
- Constant or abnormal vocalization
- Aggression

9.6 Signs of Stress

Common signs of stress include:

- Eye pinioning
- Pulling feathers tight against the body
- Panting
- Constant or abnormal vocalization
- Feather picking
- Aggression
- Hunched body posture and fluffed up feathers
- Rapid erratic circling flight

9.7 Behavioural Enrichment

Feeding Strategies

- Nail/Spiked Fruit – pieces of banana, apple, pear, kiwifruit, orange, grape, corn can be spiked on nails protruding from branches and trunks, or sharp protrusions on trees or perches. This encourages full use of the enclosure and locations and type of fruit should be varied. If nails are being used they need to be checked daily for wear and rust.
- Fruit Kebabs – fruit and vegetables as above can be skewered on a piece of thick wire and hung from the roof of the aviary
- Scattered nuts- Nuts can be scattered amongst leaf litter or similar sized pebbles to increase foraging time
- Natural browse foods with seed pods intact- *Casuarina spp.*, *Eucalyptus spp.*, *Acacia spp.*, *Hakae spp.*, *Banksia spp.*, *Allocasuarina spp.*, *Pinus spp.*

- Pine cones/Banksia seed pods filled with food items – These act as a good natural food dish. Nuts, seeds and fruit can be pushed into open pods and hung from the roof or branches.
- Mealworms can be placed inside a real or artificial log. An artificial feeder will mean random dispensing of the food, or if a real log is used the birds will be encouraged to chew and tear at the wood to reach the food items
- Allow daily portion of mealworms to burrow inside a bok choy and feed whole (Bearman 2007)
- Drill holes in a wooden board and insert various nuts. Then soak the board in warm water to swell it against the nuts and hang or mount in exhibit (Bearman 2007)
- In summer, nuts can be frozen in ice blocks of fruit juice and placed in water bowls (Bearman 1007)

Exhibit Furnishings

- Exhibit furnishings should be changed frequently and their placement in the exhibit varied as much as possible.



- Perching is obviously a major feature in a cockatoo aviary and can provide a source of enrichment as well as being functional. Non-toxic natural perches of varying dimensions should be provided with the bark intact, which will be chewed and stripped by the birds. While sturdy hardwood branches may seem more

attractive in terms of longevity, softer woods encourage more activity and as they must be changed more regularly are more hygienic in the end.

Human Interaction

- With the possible exception of bonded pairs breeding or with young which may become stressed, Yellow-Tailed Black Cockatoos are normally quite tolerant of the presence of people.
- Should always have the freedom to retreat from people if desired.
- They are not a species known to seek out interaction with keepers or the public when on exhibit as some other cockatoo species do.
- Human interaction through conditioning may be very beneficial to the bird providing enrichment as well as the means to reduce potential stress. Whether or not conditioning for keeper interaction would also encourage interaction with the public is unclear.
- Human interaction may be more beneficial in situations where only a small number of animals are housed together eg. a pair, but less so where large flocks (intraspecific or interspecific) are kept as their social needs are more easily met.

Training and Conditioning

- Training and conditioning provide excellent opportunities for reducing the potential stress to an animal normally resulting from a routine procedure such as transport or veterinary checks. By pre-empting the need for such a procedure we may appropriately condition the animal so that it may be viewed as a positive experience. Training in such a way can also reduce husbandry times and be an excellent form of enrichment, particularly for Cockatoos and other animals with notably high levels of intelligence.
- Useful behaviours to condition may include:
 - Loading into a Petpac or transport crate
 - Hopping onto and remaining on a scale for weighing
 - Accepting restraint in a towel
 - Presenting feet, wings and tail for examination
 - Accepting medication orally from a syringe
 - Presenting for and accepting blood sample to be taken
 - Targeting
 - Stepping up onto a hand or perch
- If desired other natural behaviours may be placed on cue simply for the purpose of providing enrichment through training sessions, rather than for any specific purpose.
- Behaviours should always be trained using positive reinforcement techniques to avoid side effects such as escape/avoidance behaviour, generalised fear of the environment, apathy that often occur using traditional punishment and negative reinforcement techniques.

Sensory Stimulation

- Auditory stimulation can be provided by playing recordings of other birds of the same species, preferably from varying locations as vocalisations are area specific. Recordings of other parrot species as well as birds of prey and other natural co-inhabitants are also suitable.
- It is believed that Cockatoos do not have a well-developed sense of smell so apart from natural browse and normal food they would not greatly benefit from any attempt to offer scent-based enrichment.
- A good view of the surrounding environment is excellent enrichment for cockatoos. Having enclosures housing members of other or the same species in visual and auditory contact is beneficial. Parrots have also shown a preference for brightly coloured objects so adding colourful flowers or toys if appropriate may stimulate their interest. I have not heard of predatory silhouettes being used with any cockatoos but this may be effective.
- Should be offered a variety of foods in the diet, with fruit and browse varying seasonally as it would in the wild

Monthly Enrichment Calendar for Yellow-Tailed Black Cockatoos

1	2	3	4	5
Nail Fruit	Toilet Rolls or cardboard boxes	Pine cones filled with fruit and vegetables or seed mix	Rearrange Perching	Scatter nuts with similar sized rocks and pebbles
6	7	8	9	10
Overfill aviary with thick browse	Mealworms in hollow log with holes	Scatter food in leaf litter	Play audio calls of various wild birds	Water sprinklers on for 10 minutes every 2 hrs
11	12	13	14	15
Small amount of food in many dishes around aviary	Fruit juice ice blocks	Feed out fruit and veg whole	Bok choy with mealworms burrowed inside	Insert nuts into holes in timber board and swell in water
16	17	18	19	20
Play audio calls of various wild birds	Toilet Rolls or cardboard boxes	Feed out fruit and veg whole	Scatter nuts with similar sized rocks and pebbles	Fruit juice ice blocks
21	22	23	24	25
Rearrange Perching	Water sprinklers on for 10 minutes every 2 hrs	Overfill aviary with thick browse	Small amount of food in many dishes around aviary	Insert nuts into holes in timber board and swell in water
26	27	28	29	30
Water sprinklers on for 10 mins every 2 hrs	Mealworms in hollow log with holes	Scatter food in leaf litter	Nail Fruit	Pine cones filled with fruit and vegetables or seed mix

9.8 Introductions and Removals

If possible new animals should be placed in visual and auditory range of each other for a period of time before being allowed physical contact. The new individuals should then be placed in a smaller nozel cage within the larger aviary whilst the established birds become accustomed to it. If no signs of stress or aggression are evident after several days (a week is recommended), the door of the nozel cage may be opened and the bird allowed to enter the larger aviary as it chooses. During both this and the initial introduction period, it is vitally important that the birds be closely observed for any signs of aggression or stress.

9.9 Intraspecific Compatibility

Yellow-Tailed Black Cockatoos are a social species which should not be kept alone. Neither are they a species normally found in large numbers, which coupled with space constraints has lead most institutions to keep pairs.

9.10 Interspecific Compatibility

Interspecific housing is appropriate for this species as it is normally non-aggressive yet of a large enough size to prevent harassment by others. Yellow-Tailed Black Cockatoos have been successfully housed with the following conspecifics:

- Short-Billed Black Cockatoo (*Calyptorhynchus latirostris*)
- Red-Tailed Black Cockatoo (*Calyptorhynchus banksii*)
- Major Mitchell Cockatoo (*Cacatua leadbeateri*)
- Gang Gang Cockatoo (*Callocephalon fimbriatum*)
- Australian King Parrot (*Alisterus scapularis*)
- Superb Parrot (*Polytelis swainsonii*)
- Princess Parrot (*Polytelis alexandre*)
- Red-Capped Parrot (*Purpureicephalus spurius*)
- Red-Collared Lorikeet (*Trichoglossus haematodus*)
- Red-Rumped Parrot (*Psephotus haematonotus*)
- Cockatiel (*Nymphicus Hollandicus*) (Lynn 1989)
- Crimson Rosella (*Platycercus elegans*)
- Eastern Rosella (*Platycercus eximius*)
- Western Rosella (*Platycercus icterotis*)
- Bush Stone Curlew (*Burhinus grallarius*)
- Australian Bustard (*Ardeotis australis*)
- Laughing Kookaburra (*Dacelo novaeguineae*)
- Dollarbird (*Eurystomus orientalis*)
- Masked Lapwing (*Vanellus miles*)
- Buff-Banded Rail (*Gallirallus philippensis*)
- Chestnut Rail (*Eulabeornis castaneoventris*)



The species is regularly housed by private breeders with all the other *Calyptorhynchus* species. It should be kept in mind however, that once incidence of hybridisation has occurred with another *calyptorhynchus* species and this should be avoided at all costs.

9.11 Suitability to Captivity

Yellow-tailed Black Cockatoos have a fairly quiet temperament which lends itself to captive conditions. From a keepers point of view they are relatively straight forward to care for as long as they are provided with a suitable diet and plenty of material to chew. They are also easy to work with, being neither aggressive or overly nervous. Their intelligence means they can be easily conditioned to make husbandry practices even easier. Their placid nature means that problems with other flock members are likely to be minimal.

While they may be easy to provide the necessities for, providing a good quality of life for individuals poses more of a challenge. Yellow-tailed Black Cockatoos are a large bird which require larger housing than most parrot species to accommodate their long wing beats and tail. As with all parrots, the same intelligence that makes them so interesting also poses great difficulties for keeping them in captivity. Enrichment is an absolutely essential part of keeping any parrot in captivity. In denying the animals we care for their wild environment, we must provide a substitute which allows them the opportunities to perform the same natural behaviours they would in the wild. They are highly evolved for chewing and climbing and should be provided with plenty of stimulation to fill up their day with these activities. Every effort should be made to extend the duration of every day activities to closely resemble a wild activity budget. Lack of stimulation can led to behavioural problems as detailed above.

10 Breeding

10.1 Mating System

Yellow-tailed Black Cockatoos are a monogamous species, but will re-pair with a second compatible mate if the first dies or is removed.

10.2 Ease of Breeding

As with all cockatoos, the biggest issue with breeding is pair compatibility. Young birds housed together before sexually mature have a much better chance of proving compatible later than adults introduced for the first time.

Once pair bonding has occurred, this species can make a fairly reliable breeder provided the appropriate environment is provided and they are left relatively undisturbed. Are unlikely to breed on exhibit.

10.3 Reproductive Condition

10.3.1 Females

Females should be at least four years of age and in good condition.

10.3.2 Males

Males do not normally breed until four years of age but some have been known to demonstrate courtship behaviour earlier than this and would probably breed successfully (Connors 2005).

10.4 Techniques Used to Control Breeding

Normally if an appropriate nesting log is not provided, pairs will not breed. On occasion however, some birds will be very persistent and may even nest on the ground. In these cases it may be necessary to house the individuals separately. If the pair are allowed to breed but the eggs removed, it is a good idea to replace with fake eggs to prevent undue stress to the female.

10.5 Occurrence of Hybrids

Only one hybrid of this species has been recorded. A female Red-tailed Black Cockatoo (*Calyptorhynchus banksii*) and a male Yellow-tailed Black Cockatoo produced a single chick. It appeared similar to Red-tailed Black Cockatoo but had a longer tail and *funereus*-like head features including bill shape, crest length and yellow ear covert patches (Branston 1977). Hybridisation should be avoided.

10.6 Timing of Breeding

Breeding season is variable. In south-eastern Australia eggs are normally laid between November and February, but sometimes as late as May. In northern New South Wales and Queensland, breeding occurs from March to August (Forshaw 2000). It has also been reported that *C.f.funereus* may breed from December through to July, while *C.f.xanthanotus* will breed either during spring September – December, or else will begin in March April during autumn (Connors 2005).

10.7 Age at First Breeding and Last Breeding

Pairs commence breeding at four years of age, although some males display to their mates earlier than this. It is possible these individuals may be capable of successful fertilisation earlier if placed with a suitable mate (Connors 2005). Age of last breeding is unknown.

10.8 Ability to Breed Every Year

Under normal circumstances, provides adequate food and environment are provided this species should be capable of breeding every year. The young from last season should be removed just before breeding season to encourage the pair to nest again.

10.9 Ability to Breed More than Once Per Year

If the chicks are to be parent raised, and remain with the parents throughout the natural span of time, the young birds will continue to beg for food and often be fed intermittently by the male until the next breeding season. This means the pair will not lay again until the next year. It is unknown if removing the young earlier would cause the pair to breed again.

10.10 Nesting, Hollow or Other Requirements

Natural nesting logs are the preferable choice for breeding for aesthetic reasons but boxes can serve the same purpose. If natural hollows are being collected from the wild it should be appreciated that the average estimated age of hollows used by Yellow-tails in the wild is 221 years (Nelson & Morris CSIRO) so they should only be taken from already fallen trees not live specimens. The log or box should be open at the top and approximately 1 metre deep with an internal diameter of 35-50cm. (Connors, 2005) If the log is suspended from the roof it should allow plenty of clearance for entry and exit. The nest should only be slightly sheltered from the elements. Wild Yellow-tailed Black Cockatoos nest out in the open exposed to all weather conditions. Some aviary pairs will simply ignore an overly sheltered log. (Connors, 2005) If the nesting log is on the ground, filling the base with approximately 30cm of concrete will prevent rodent access from underneath and raise the nest floor to a more accessible level in tall logs. (Harris 2007) Pairs have been found to breed more readily when given a choice of hollows in which to nest. Featherdale Wildlife Park have found that, when provided with several options, pairs will repeatedly choose a metal bin hung from the side of the aviary over a log whether suspended, placed on a shelf or on the ground. This also tends to be a more keeper-friendly method as they are easily cleaned and the relative shallowness and broad width of the opening in comparison to a traditional natural hollow makes access to eggs and chicks much easier. This is in contradiction to preferences in regards to natural hollows, where birds seem to prefer a tightly fitting entrance hole and may abandon the log as unsuitable if the opening becomes too wide. (Harris 2007)



Attaching lumps of soft timber to the interior of the receptacle will help bring the birds into breeding condition. If a nestbox is constructed of wood then all edges will need to be adequately protected with metal angle to prevent destruction. (Connors, 2005) A base of fine hardwood mulch or sawdust should be provided in the nest to better protect the eggs from damage. Softwood mulch should not be used as it retains water. Eggs have been known to become stuck on small sticks or large pieces of mulch, disallowing proper turning and incubation and potentially leading to breakages by the parent birds trying to force movement. Sawdust also makes it much easier to detect vermin infestations so it is thought that this is the better option. (Harris 2007) A choice of nesting logs which vary in size, position and angle should be provided to increase chances of breeding, as pairs have been shown to have different preferences (Connors 2005).



Depth of successful nesting logs vary from 0.6 to 3m and pairs have bred in logs on the ground, mounted or suspended, vertical or almost horizontal. Natural hollow logs are preferred but should only be taken from fallen trees as a suitable hollow often takes over 100 years to develop and should not be denied to wild populations for the sake of captive breeding.

Artificial nestboxes can be constructed from planks of untreated or natural wood, plywood, plastic or aluminium. If nestboxes are made of wood, edging should be protected with metal angle to prevent destruction by the pair. Non-wooden nestboxes need to have a secure mesh ladder inside for entry and exit as well as lumps of timber attached to the interior for the pair to work for nesting material. Care should be taken when using non-wooden boxes that they are not adversely affected by climatic conditions ie. extreme cold or heating from exposure to direct sunlight. Suspended or mounted logs provide protection from vermin invasion but should be well clear of the roof, allowing plenty of room for landing and the escape of excess heat (Connors 2005).

10.11 Breeding Diet

Additional dietary protein is considered essential for the breeding of this species. This is most often provided in the form of mealworms, but dog kibble, half boiled eggs, and a small amount of meat mix are also used (Biggs 2006). A calcium supplement may be added to food during breeding to ensure healthy egg-laying. Consumption of food can increase up to fourfold, particularly after the chicks' first month of growth. Quantity should be provided as needed. With easy access to food, the female will often come down off the nest for short periods to feed in addition to being fed by the male.

10.12 Incubation Period

Female incubates for 29 or 30 days, usually commencing with the laying of the first egg (Sindel & Lynn 1989). Other captive females have been recorded as commencing incubation with the laying of the second egg (Low 1993). The newly-hatched chick is then brooded constantly by the female for the first seven to ten days (Forshaw 2000).

10.13 Clutch Size

Usual clutch size is two eggs, laid between 4 and 9 days apart, though occasionally only one egg may be laid. Normally, the second egg is visibly smaller than the first (Connors 2005).

10.14 Age at Fledging

The first chick fledges between 12 and 13 weeks after hatching (Forshaw 2000) or 80-90 days (Connors 2005), and will usually perch near the nest entrance for a couple of days prior to fledging (Connors 2005). While there have been occasions both in captivity and the wild when the second chick has fledged successfully, these are very rare occurrences and it will normally perish if left with the parents. For this reason, it is advisable that the second chick be removed for hand raising or fostering. (Connors 2005)

10.15 Age of Removal from Parents

The young continue to be fed by the parents for a further four months after fledging, after which time it is able to fend for itself but may continue to be fed intermittently. Young may be removed at this stage if required, however it is recommended that they be left with the parents until the next breeding season. When removed from the common enclosure, the young bird should be temporarily housed adjacent to the parent birds for an adjustment period to reduce the stress of separation.

10.16 Growth and Development

Growth rates averaged out over both parent and handreared chicks in grams (Connors 2005)

Day	Weight .	Day	Weight .
1	23.8	18	229
2	26.5	19	244.7
3	30.9	20	265
4	36.2	21	289
5	42.2	22	314.3
6	49	23	346
7	61.2	24	367
8	72.7	25	398
9	89	26	323
10	107.7	27	442
11	118	28	461
12	130.8	35	537
13	145.3	42	601
14	161	49	685
15	183.3	56	816
16	198.3	63	890 Peak
17	213		

11 Artificial Rearing

11.1 Incubator Type

Fan forced incubators are preferable for parrot eggs over still air incubators, as they provide an even temperature. Auto-turn models save labour time over manual-turn models, but they must be checked frequently to ensure they are still functioning correctly. Popular models for parrot egg incubation include the Brinsea Octagon 20 Mark III, Marsh Rolex and the AB Newlife 75 MK4 Incubator.



11.2 Incubation Temperatures and Humidity

Incubator dry temperature preferably should be set to 37.2 C, however extremes of 36.6-37.7 C are acceptable. Desirably humidity is directly dependant on egg shell thickness. Start at 40%, but egg weight loss trends should be monitored and relative humidity adjusted accordingly.

11.3 Desired % Egg Mass Loss

The ideal weight loss for the egg between day 1 and external pip is 15% to 17% of its original weight when laid. Subtracting 15-17% from the original weight will give the desired weight at external pip. This should then be divided by the number of days from hatch date until external pip (expected incubation period minus 2 days) which will give a desired daily weight loss. (Digney 1998)

11.4 Hatching Temperature and Humidity

The ideal egg weight loss from day 1 until external pip should be 15-17% of its original weight when laid. Subtracting 15-17% from the original weight will give the desired weight at external pip. This should then be divided by the number of days from hatch date until external pip (expected incubation period minus 2 days) which will give a desired daily weight loss. (Digney 1998)

11.5 Normal Pip to Hatch Interval

Internal Pip should occur 5 days prior to hatch date. 24-48 hours after internal pip, the first signs of external pip should appear (occasionally this may occur as soon as 12 hours after internal pip). The hatching process should then be completed after a further 24-72 hours. (Digney 1998)

11.6 Brooder Types/Design

Commercial Brooders include the Lyons Intensive Care Brooder, WAPE Parrot Brooder, AB Newlife Brooder and the Brinsea Octagon 20 Parrot Rearing Module. Brooder kit are also available, which contain a thermostatically controlled heater and

fan and but require the construction of a cabinet. Brooders are easy enough to construct. They should be made of a smooth, non-porous material which is easily cleaned and disinfected such as Perspex or laminated timber. Plastic storage tubs serve equally as well.

Non-toxic wood shavings or shredded paper can both serve as suitable substrates. Strands should be short enough not to tangle up the chicks but not short enough to inhale.

11.7 Brooder Temperatures

Black Cockatoo chicks are able to tolerate temperatures several degrees cooler than most other parrots due to their heavy down. Brooder temperatures should decrease as the chick becomes more feathered and able to regulate its own body temperature better. If chicks of varying ages are being raised, more than 1 brooder will be required to facilitate this. While a thermometer should be installed in the brooder, observation is often a better guide to whether the temperature is adequate- Shivering chicks or chicks pressing into a tightly packed group in the centre indicates the temperature is too cool, while overly warm chicks retreat to the extremities of the container. As a rough guide temperature should be as follows:-

Newly hatched	36.6
5-12 days	35-31.6
12 days-Pin feather	31-28
Feathers covering most of body	26.5



11.8 Diet and Feeding Routine

At the time of hatching, the chick may still have unabsorbed yolk sack at its abdomen. This is often sufficient enough to sustain the chick for the first day. Chicks may hatch out dehydrated so it is advisable to feed an electrolyte solution such as Ensure before introducing formula. If the hatching was a long and drawn-out process, the chick can be rehydrated immediately, otherwise many breeders leave the chicks to dry out in the brooder for 3-8 hours before the first feed. If the chick is given even a thin formula in the first 12 hours it could possibly overload the crop causing it to shut down altogether. It may also be beneficial to continue adding rehydration fluid along with the normal mixing water to the formula for the first week. (Digney 1998)

Feeding can be performed using a spoon, syringe or crop tube. There are advantages and disadvantages for each method, but each is effective. Formula used, number of chicks being raised, and time available will factor into which method is used but ideally the carer should be proficient with each.

It is important that chicks learn appropriate begging behaviour and should not be fed until they beg. Experiments with aviary-bred birds have shown that hand-reared birds not allowed to beg do not digest their food properly and do not rear their own young

effectively. (Parsons 2007) There are many commercially available formulas for rearing parrots. Homemade formulae arguably work just as well and may be considered for cost benefits, however if a number of chicks are being raised, it will probably be more convenient to use a commercial formula. Effective brands available in Australia include Lakes, Vetafarm, Roudybush, Wombaroo and Pretty Bird. As usual, opinions differ on which is the better brand, but Yellow-Tailed Black Cockatoo chicks may be successfully reared on any of these formulas. Priam recommends Harrison's Neonate at 20% solid solution for the first week, followed by a 50:50 Neonate/Juvenile formula mixed at 10%. As usual, daily weight gain should be monitored and the solution adjusted accordingly. Formulas should be mixed according to the manufacturers instructions, without using boiling water as this can diminish the value of the nutrients and make the formula gluggy.

Feed frequency should roughly be as follows: Day 1 □ 2 hour feeds □ 9-10 feeds a day □ □ By Day 8 □ 3.5-4 hour feeds □ 5-6 feeds per day □ □ By Day 14 □ 5 hour feeds □ 4 feeds per day □ □ By Day 30 □ 8 hour feeds □ 3 feeds per day □ □ At Peak □ □ 2 feeds per day □

11.9 Specific Requirements

At weaning, chicks should be moved to a weaning cage where they can learn to perch, flap and climb and build up their muscles. It is important that the chicks have the chance to improve their co-ordination and confidence before being moved to a full-sized flight cage to reduce the risk of injury. At least one case has been recorded of a fledgling dying as a result of trauma sustained in early flight attempts.

11.10 Pinioning Requirements

In Australia, pinioning may only be performed on the following primarily terrestrial bird orders held for public exhibition:-

- Ciconiiformes (Hérons, Ibises, Storks, Flamingos)
- Anseriformes (Ducks, Swans, Geese, Screamers)
- Galliformes (Megapodes, Quails, Pheasants, Guans)
- Gruiformes (Button-Quails, Rails, Cranes, Bustards)

As parrots are not included in the above, any parrot may not be pinioned for any purpose including exhibition. Doing so constitutes an act of cruelty under the Prevention of Cruelty to Animals Act 1979 and offenders may be prosecuted.

11.11 Data Recording

Data collection should be as detailed and complete as possible to allow early identification of problems and provide valuable information for future rearing attempts. Egg incubation records should include:-

- Lay Date
- Fresh weight
- Length
- Width
- Dam and Sire
- Egg number in clutch
- Date of removal from nest
- Egg condition at collection
- Enclosure No.
- Incubator model



- Incubator No.
- Incubation temperature
- Relative humidity
- Turning regime

The following data should be recorded daily where appropriate:-

- Weight
- % Vein coverage
- Density
- Time of data collection
- Any adjustments to temperature, humidity or turning regime
- Hatch progress

Post-hatch data should consist of

- Weight
- Gain
- Time of feeds
- Volume of feeds
- Crop Status
- Total daily feed volume
- Behavioural or environmental changes
- Formula thickness and additives
- Brooder temperature
- Physical Development
- Weaning progress

11.12 Identification Methods

Chicks should be permanently banded at 19-24 days. (Digney 1998) Prior to this, a temporary identification method such as plastic wrap-around leg bands, or washable coloured highlighter can be used. If chicks are brooded individually, then individual brooders may be labelled with the chicks information as the chick is normally not removed from the brooder.

11.13 Hygiene

Hands should be washed between handling each clutch of eggs or chicks or alternatively disposable gloves can be used. Separate feeding implements should also be used for each clutch or individual birds if housed alone. All equipment should be washed with normal detergent between uses. Any birds exhibiting signs of illness should be housed separately and serviced last.

11.14 Behavioural Considerations

Imprinting is a natural process, primarily by which the animal learns to recognise itself as an individual of its own species. Birds can also imprint to carers, food, siblings, sexual partner preference and specific behaviours. Imprinting is generally considered to be irreversible, and for the purposes of a raising a bird for addition to a

zoological collection, human imprinting is inappropriate and should be avoided. Chicks may become imprinted to hands, voices, television, cuddly toys, shoes, faces, dogs or cats, other species of birds, specific food, food containers, etc. (Parsons 2007) Coddling, talking to, housing a chick where it is in constant visual contact with people or failing to introduce it to conspecifics at an early age are all practices that encourage human imprinting. Contact with the chicks should be restricted to feeding or essential husbandry only. Birds which have imprinted on humans may not interact with others of its own species, recognise potential sexual partners, or recognise food sources, and may seek out human interaction or become stressed when removed from human company. One of the easiest ways of avoiding imprinting with parrots is to rear them in groups. The chicks will then normally imprint on each other rather than the carer. In the absence of other chicks of the same species being available, it is preferable to rear the chicks with a similar species than to rear a chick independently. (Hibbard 2003) If the chick cannot be reared with others, a rough puppet in the correct colouration of the parent birds, a barrier to prevent visual contact and taped vocalisations of parent birds feeding chicks may be used as a substitute.

11.15 Use of Foster Species

While the Yellow-Tail is the second largest species of the black cockatoos and the largest of the *Calyptorhynchus* genus, a chick could potentially be fostered by any of the genus. The chicks' appearance and behaviour should be sufficiently similar across the genus to allow any combination of cross-fostering. It is unknown whether fostering would be successful with Palm Cockatoos or species of white cockatoos, as the presence of down on the chicks may reduce the likelihood of acceptance by the foster parents. The chick should only remain with its foster parents for the minimum possible time to avoid inappropriate sexual imprinting, and all efforts should be made to have the chick imprint on its own species. Chick which are raised by another species and do not have the chance to socialise with or learn from conspecifics may not learn species-specific vocalisations and may not recognise potential mates.

11.16 Weaning

Feeds should be dropped back to 2 per day shortly after the bird has reached its peak. The morning feed should then be gradually reduced so at around 80-90 days the chick is only on one feed a day at night. It is at this time that Black Cockatoo chicks go through a strong curiosity phase, which provides an important window of opportunity for weaning. During this stage the natural curiosity of the chick should be exploited by varying the foods provided and the method of presentation. Weaning foods can include corn, peas, apple, carrot, lettuce, passionfruit halves, orange, wholegrain bread, Nutrigrain, silverbeet, canary seed, sprouted sunflower and lupins. Sunflower should not be offered as the sole weaning food as it is addictive and chicks may become totally dependant on it. Canary seed is often the first seed black cockatoos learn to eat, so ideally it should be provided in good quantities. Livefood can be introduced by breaking open mealworms to expose the juices and offering them to chicks before they learn to pierce them themselves.

Some Black Cockatoos may go very thin, losing up to 25% of their body weight and yet wean successfully. Such dramatic weight loss is however, undesirable and should be avoided if possible. Weaning with black cockatoos can be a long process, but they should be weaned totally between 120-150 days. However, black cockatoos have been known to wean completely and then for no apparent reason revert to total dependence.

Chicks may lose weight and resume begging anywhere up to 12 months of age. Extended periods of dependence increase the risk of imprinting.

11.17 Rehabilitation Procedures

The goal for rehabilitation animals should always be to give them the best possible chance to survive in their natural habitat. The majority of animals come into care as a result of human impacts such as collisions with vehicles, overhead power lines and windows, chicks becoming separated from their nest or parents, attacks from pets or feral animals or through malicious injuries. It should be kept in mind, however, that some animals are not meant to survive in the wild. Indeed with Yellow-Tailed Black Cockatoos, it is natural for the parents to raise only the strongest chick and allow the other to perish. Before taking on any rehab case intended for release, the implications of the survival of that individual on the wild population, as well as its prospects for reintroduction should be considered. If it is intended to rehabilitate the bird for addition to the collection, the bird should be assessed for suitability. Whilst young chicks will normally accept captivity quite readily if raised properly, adult birds may suffer from maladaptation syndrome and never be comfortable or healthy in a natural environment.

If the bird has no serious injuries that require immediate veterinary attention, it may be advisable to leave it in a warm dark box for up to 24 hours to allow it time to calm down and lessen the risk of shock leading to death. (Parsons 2007) Water with Glucodin should be provided during this time and the bird's condition monitored. An hour or two may be sufficient depending on the bird's stress levels.

Once it has been determined that the bird is a good rehabilitation candidate, its injuries or condition should be treated in a way which minimises human contact and stress to the animal. Food should be offered in as natural way as possible to prevent association with artificial food containers. After this has been accomplished, the focus should be on re-teaching the bird self-reliance. Natural foods should be provided and totally replace supplement foods before release. The pre-release aviary needs to allow enough flight room for the bird to build up as close as possible to 100% fitness before release.

12 Acknowledgements

I would like to thank all my teachers at TAFE- Graeme Phipps, Jackie Salkeld, Elissa Smith and Andrew Titmuss for all their encouragement and advice. Special thanks to Daniel Gowland at Priam's Silver Dawn Parrot Farm who patiently answered my stream of pestering questions. Thanks to all institutions and individuals who have contributed photographs and data- Everyone at Taronga Zoo's Bird Show and Bird Department, Currumbin Wildlife Sanctuary, Australia Zoo, Tim Brooks, Tobias Clark, Cindy Jackson, Kim Smith & Roy Harris. Thanks to Jason Biggs of Cairns Tropical Zoo for his prompt reply to one of my first appeals for information from the zoological community. Evan Harris at Featherdale Wildlife Park who freely shared knowledge and access without question. All the authors I have referenced for their excellent parrot and keeping literature.

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15 Glossary

Cere- fleshy area at bill base enclosing nostrils.

Cloaca- Terminal part of the gut into which the reproductive and urinary ducts open. This cloacal aperture is the only opening to the outside of the body, instead of separate anus and urinogenital opening. (Perrins 2003)

Endemic- native and confined to a certain region ie. Found nowhere else

Fledge- To grow feathers, or, refers to the moment of flying at the end of the nesting period when young birds are more or less completely feathered. (Perrins 2003)

Gait- Movement in locomotion ie. the way the animal walks or flies.

Hybrid- An offspring of parents from different species or sub-species.

Interspecific/Conspecific- Of a different species.

Intraspecific- Of the same species.

Mandible- one of the jaws of a bird which make up the bill (upper or lower) (Perrins 2003)

Monogamus- Each adult male mates with only one member of the opposite sex. The partners usually maintain some association even outside the breeding season.

Morphometrics- Study of forms of animals and their structure. (Fulton 2005)

Nape- Back of the neck.

Nomadic- wandering, as opposed to residential. Does not remain in any one area.

Nomenclature- The making of and assigning of distinguishing names to all groups of organisms.

Sedentary- not migratory; inhabiting a given locality throughout the year

Sexual dimorphism- Having two different distinct forms of individuals within the same [species](#). Males and females have marked morphological differences. Can refer to different coloring, sizes, features, etc.

Synonyms- Alternative scientific name or classification.

Target- A prop which pinpoints a location for an animal in training.

16 Appendix

Annual Cycle of Maintenance

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Substrate Change												
Vertical Perching												
Horizontal Perching												
Nest Box Clean												
Worming												
Breeding												



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