

10. CAPTIVE BREEDING AND MANAGEMENT OF MALLEEFOWL (*Leipoa ocellata*) AT WESTERN PLAINS ZOO, 1989 TO PRESENT

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Abstract

The Zoological Parks Board of New South Wales has been breeding Malleefowl (*Leipoa ocellata*) in captivity at Western Plains Zoo for almost 20 years to assist the New South Wales Malleefowl Recovery program. Successful breeding can be achieved through appropriate aviary design and husbandry resourcing. The captive program provides a valuable process for developing husbandry skills and highlights the valuable role captive institutions offer as sites for insurance-populations in case of catastrophic declines of birds in the wild. Continuation of the breeding for release program at Western Plains Zoo provides the opportunity for maintaining husbandry skills as well as opportunities for research that can assist managing birds for release.

Introduction

Western Plains Zoo has been involved in the captive breeding and reintroduction of Malleefowl in New South Wales for close to 20 years. The program began in 1988 when the Zoological Parks Board of New South Wales partnered with the New South Wales National Parks and Wildlife Service (now Department of Environment and Climate Change) as part of the Malleefowl recovery effort in the state. The Zoological Parks Board's role in the program was to take eggs collected from the wild by Department of Environment and Climate Change and incubate and rear them at Taronga Zoo. The chicks were then returned to Department of Environment and Climate Change for wild release and some were also sent to Western Plains Zoo to set up the nucleus of a breeding program to produce offspring for ongoing annual release.

In 1991 Western Plains Zoo built a series of aviaries to accommodate the expanding program and since then over 500 chicks have been released in three Nature Reserves in the central far west of New South Wales, these being Yalgogrin, Yathong and most recently at Nombinnie/Round Hill.

Along the way much has been learned about caring for Malleefowl in the captive environment. The development of husbandry skills provides insurance for the species when in the event of a serious decline of birds in the wild, captive breeding can be used as recovery mechanism. As part of the aims of the Recovery Plan a husbandry manual is in production. At present further breeding of Malleefowl at Western Plains Zoo is on hold at the request of Department of the Environment and Climate Change and the zoo is maintaining a core captive breeding group.

Facility Design

In the right conditions Malleefowl have proven relatively easy to breed. At Western Plains Zoo the Malleefowl facilities are comprised of 16 off-display breeding aviaries as well as a Walkthrough Aviary on public display. The breeding aviary complexes, located in a remote corner of the zoo, are composed of seven separate units, these units being either paired aviaries or triplets of aviaries.

The main characteristics required of facilities are that they are spacious, dry and well drained. In managing aviaries, it is essential to provide good service access for keepers as each autumn they have to barrow in large quantities of leaf litter for the birds to commence preparing their mounds (Figures 1 and 2).

Breeding aviary dimensions and features are:

- Two aviary units – 10 m x 20 m x 2.5 m, joined length-wise with an external airlock
- Five aviary complexes - each 20 m x 20 x 2.5 m with an internal airlock that separates two 10 m x 10 m aviaries

- Mesh size used over the aviaries is 12.5 mm x 12.5 mm x 1.2 mm gauge and there is predator proof wire mesh (chain link) extending vertically below the ground and also horizontally out from the aviaries for half a metre. There is also a layer of coarse pebbles around the outside of the aviaries to deter digging
- Aviary perimeters have shade cloth over the lower portion to provide a visual barrier that assists the chicks to remain calm and prevent males from seeing each other
- The aviary complexes were renovated in 2003, being completely rewired, support cabling and posts replaced and new shade cloth erected, at cost of \$40,000. To minimise solid roof framework that can be hazardous to birds, staff came up with the idea of using plough discs welded to the top of posts to support roof cabling, to which the mesh is then attached
- Complexes are set up with a compatible pair in the large aviary, with an empty pen opposite to house chicks. Breeding pairs should not be housed in adjacent enclosures where males can see each other
- Chicks, once hatched, are moved to an adjoining aviary to form crèches and during this process are wing feather-clipped and micro-chipped. There are two further catch-ups, one at around six months for sexing, and at final release with health checks
- The Walkthrough Aviary is 40 m x 20 m with a sloping roof to a maximum height of 4 metres and a minimum height of 1.2 m, and it houses the most productive breeding Malleefowl pair. The mound overflows onto the public walkway providing the visitors with a wonderful opportunity to see the pair working the mound as well as a very intimate view of mound chamber when it is open

At Western Plains Zoo there is a full time keeper to care for eight Malleefowl pairs and their chicks as well as the other birds in the Walkthrough Aviary. There is also a back-up keeper to cover leave and there are two veterinarians on staff to undertake any medical care of the birds. Adequate staff resources are important to enable behavioural observations of individuals, for the labour intensive mound management during the breeding season and to enable conditioning activities with chicks.

Out of the breeding season birds are provided with a basic seed mix (millets) with sorghum, wheat and cracked corn, supplemented with mealworms, fly pupae and fresh alfalfa sprouts. This diet is further supplemented in the breeding season by the addition of a small quantity of 'soft bill' diet, (blended boiled egg, insectivore dry mix, biscuit powder), and green lucerne.

Husbandry observations

The flighty nature of Malleefowl offers a challenge in captivity and several techniques have been employed to assist managing them in the confines of an aviary. Initially chicks were feathered clipped on one wing to reduce their ability to launch upwards into the netting. More recently keepers have instituted regular conditioning of birds to their presence, using mealworms as a positive reinforcement has proven an effective strategy for luring birds into the smaller airlock areas where they can be more effectively confined and restrained. This method significantly lowers the risk of injury to the birds.

One of the most time-consuming husbandry activities is the collection of large volumes of natural leaf litter, and sometimes soil, which needs to be provided on a regular basis to the breeding pairs between May and September. Each mound needs anywhere between 15 to 50 barrow loads of litter over this period, which provides the necessity for easy service access into the aviaries. This material is sourced from around the zoo's grounds.

While managing Malleefowl in captivity Western Plains Zoo keepers have observed some interesting behaviours in their birds.



Figure 1.. Malleefowl breeding aviary



Figure 2. Mesh support and suspension technique

- There's no guarantee that pairs set up together will be compatible. Some pairings have been unproductive and these birds have usually been repaired after two years if breeding has been unsuccessful
- Adults can be aggressive to their own chicks as well as to other bird species. One adult male has had a tendency to repeatedly attack chicks and this behaviour has been managed by building a 'creep' in which newly hatched chicks can shelter until they are safely removed to another aviary
- In the walkthrough aviary large ground birds such as Bush-stone Curlews and Banded Plovers were not tolerated around the mound and Apostlebirds were removed after being observed

harassing Malleefowl chicks. Quail, finch and softbill activity in the walkthrough does not appear to elicit any negative responses by the Malleefowl

- Contrary to the general observation that the male undertakes the initial mound building there has been one female that was one of the earliest mounders
- Malleefowl have proven to be very determined in temperament, in that no matter how inconveniently they may locate a mound, they will not relocate even after keepers have prepared an alternative site
- A four month old Malleefowl chick was observed 'surrendering' to ants. The chick was found sitting in a group with other chicks with eyes closed and covered in ants. This individual had been seen two hours prior, walking around the aviary. On becoming aware of the keeper's presence the chick arose and shook off the ants (H. Findlay *pers.comm.*)
- Malleefowl have been observed flying around their aviaries (apparently free of external motivating stimuli) (H. Findlay *pers.comm.*)

Breeding and Development Results

Breeding results have been variable between individual pairs and from year to year. As with wild Malleefowl, the natural climatic conditions influence the breeding activity in captivity with little or no mounding in extreme drought periods.

At Western Plains Zoo females have commenced laying at a range of ages, starting as early as two years old and as late as 10 years old. Males are generally recorded to commence mound building activity around three to four years of age and occasionally as early as two years.

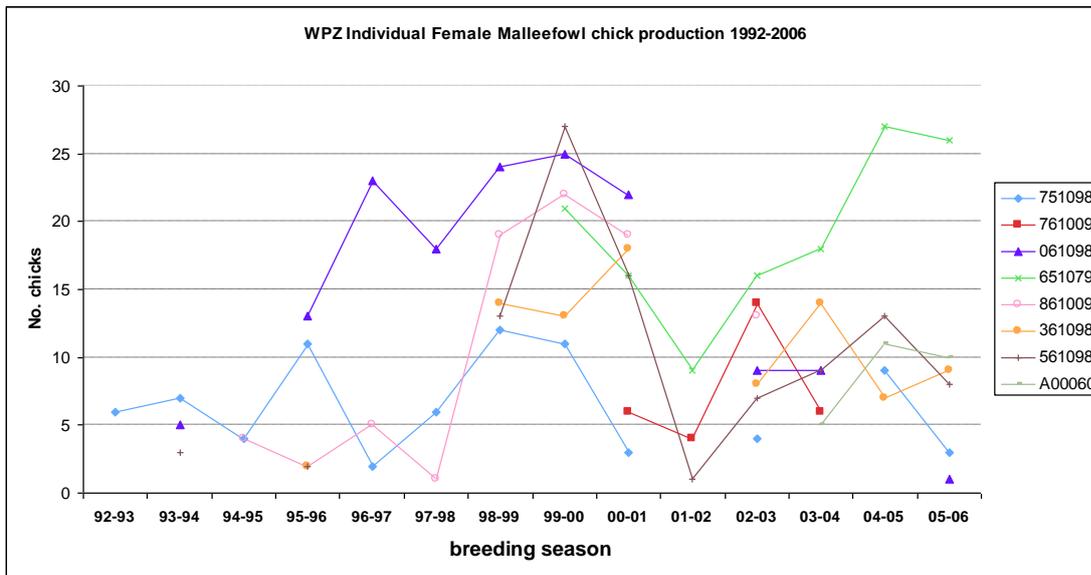


Figure 3. Seasonal chicks results for individual Malleefowl females

The sizes of clutches (based on total number of chicks hatched) have ranged from nought to 27 and the highest average clutch size (number of hatched chicks) for a pair was 19 and the lowest was six (Figure 3).

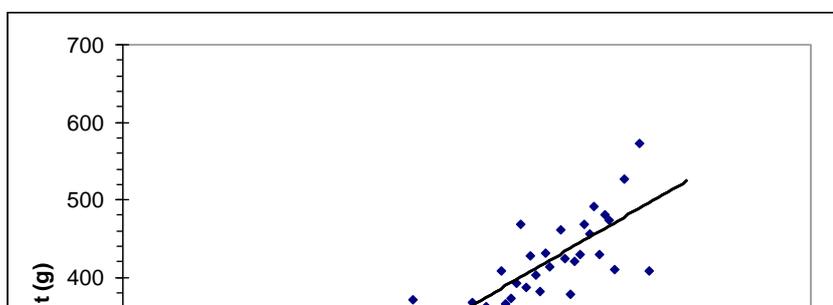


Figure 4. Chick weight after hatching

Chicks that were artificially incubated weighed on average 112 grams on hatching. Note that chicks were weighed regularly to develop growth data and this activity may have had a negative impact on development, based on their general flighty disposition and thus should be taken into account when considering the growth data. Chicks were observed to lose a couple of grams post hatching and then to gain approximately 2 -3 grams per day over the next two weeks (Figures 4 and 5). An average adult weight is two kilograms.

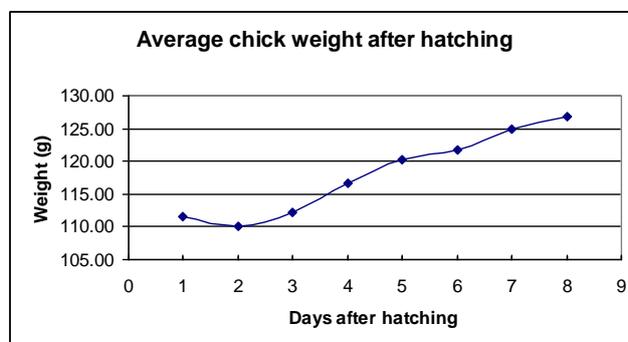


Figure 5. Chick weight after hatching

Overall 62% of chicks that hatched survived for eventual release. A peak in egg laying and chick production occurred in the summer of 1999 /2000. Losses of chicks can be attributed to a range of causes, with most losses recorded in the first month of life. These causes include:

- Limb and wing trauma sustained in the aviary
- Nutritional secondary hyperparathyroidism (metabolic bone disease), resulting in bone, foot or beak abnormalities that would impact chick survival on release. This condition arises when juvenile birds are raised on diets with an inappropriate calcium / phosphorous ratio
- Predation or trauma by eagles, goannas, adult conspecifics
- Fungal pneumonia - aspergillosis and mucormycosis respiratory infections. An outbreak of fungal pneumonia occurred following the use of steam-processed bulk *Melaleuca* leaf for nesting

material, combined with extremely dry environmental conditions that assisted the fungal spores to be dispersed in the air. Aspergillosis is normally a very rare condition in the arid environment of Dubbo, although occasional cases have occurred in individuals

- Coccidiosis – this occurs sporadically in malleefowl under four weeks of age
- Erysipelas – this is caused by *Erysipelothrix rhusiopathiae*, and the condition was observed in birds after periods of heavy rain. Vaccination has been used to treat birds; however the efficacy of the vaccination remains unknown (Blyde & Woods 1999)

Malleefowl Release Program With Department of Environment and Climate Change

Malleefowl chicks are generally released to the wild at between six months and 10 months of age. There have been several older individuals (between two and 10 years old) that have also been released. Birds are maintained in their enclosure crèches until a release is co-ordinated. The birds selected for release are usually caught up the evening before, given a veterinary examination and then individually boxed in large cardboard fruit boxes (540 mm x 340 mm x 300 mm high) that are then stored in the veterinary centre. Very early the next morning the birds are driven approximately four hours to the appointed release site. The release sites have been State Nature Reserves that are managed by the Department of Environment and Climate Change. Both Yathong and Nombinnie Reserves contain large areas of suitable mallee habitat that have undergone highly successful, extensive long term fox baiting programs and already contain existing Malleefowl populations that are aerially monitored by the Department of Environment and Climate Change.

The release program commenced in 1989 and built to a peak in 2000. In all, 98 chicks originally collected as wild eggs have been returned to both Yalgogrin and Yathong Nature Reserves. A further 368 captive bred chicks have been released at these two sites and 90 chicks have been released at Nombinnie/ Round Hill Nature Reserve. In the years that releases have not been planned to occur the breeding pairs have been retained and eggs removed from mounds as a means of controlling breeding.

In 2004 Western Plains Zoo was approached by Charles Sturt University, Wagga Wagga, to assist with a proposed study by Chris Coombes involving monitoring the survival and dispersal behaviour of chicks at a release site. An initial pilot study occurred at the zoo, investigating radio tracking attachment techniques and potential impact on Malleefowl behaviour. This study was followed by the actual chick release and monitoring.

Table 1. History of Malleefowl releases from Western Plains Zoo animal records

Year	# released from captive hatched (ie wild eggs)	# released from captive bred (ie captive bred birds)	Total # released	Site
1989	9 (TZ incubated)		9	Yalgogrin
1990	54		54	Yathong
1993	27	1	28	Yathong
1994		9	9	Yathong
1996	4	22	26	Yathong
1997		11	11	Yathong
1998		13	13	Yathong
1999	4	74	78	Yathong
2000		97	97	Yathong
2001		92	92	Yathong
2002		12	12	Yathong
2003		37	37	Yathong
2005		56	56	Nombinnie
2006		34	34	Nombinnie
		Total	556	

The Future

The Zoological Parks Board of New South Wales, along with Zoos South Australia, financially supported the development of the National Recovery Plan for Malleefowl and Western Plains Zoo will continue to support the recovery efforts in collaboration with the Department of Environment and Climate Change through maintaining a breeding group of Malleefowl. The current collection includes nine adults hatched in 1989 from eggs originally collected from the wild at Yalgogrin. With these birds in their 18th year, recruitment of F1 generation birds to maintain a breeding nucleus is a priority. Western Plains Zoo has made a major commitment in resources to Malleefowl conservation through the release program and recognises that managing their captive population and breeding program is important for maintaining husbandry skills and providing opportunities for research into Malleefowl that can inform the long term recovery of the species. A husbandry manual is expected to be available by the end of 2007 following circulation of a draft to the Recovery Team and captive holders.

Acknowledgements

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Reference

Blyde, R. & Woods, R. (1999), Erysipelas in malleefowl. *Australian Veterinary Journal* **77**:434-5.