

Coxen's fig parrot by actively seeking media attention to increase public awareness.

ACKNOWLEDGEMENTS

Thanks go to all the Currumbin Sanctuary staff who have participated in this programme over the years, Des Spittall for his comments and editing, as well as Bruce Pascoe for his comments and assistance.

PRODUCTS MENTIONED IN THE TEXT

Aviclens: avian water cleanser, manufactured by Vetafarm, 3 Bye Street, Wagga Wagga, NSW, Australia 2650.

Avione Dry Lory: commercial dry lorikeet food, manufactured by Avione Pet Products, Unit 1/3a, Hallstrom Place, Wetherhill Park, NSW, Australia.

Avisafe: avian disinfectant cleanser, manufactured by Vetafarm, 3 Bye Street, Wagga Wagga, NSW, Australia 2650.

Calcivet: liquid calcium and vitamin D₃ supplement for birds, manufactured by Vetafarm 3 Bye Street, Wagga Wagga, NSW, Australia 2650.

Dextrose monohydrate: manufactured by Pharmachem, 163 Evans Road, Salisbury, Queensland, Australia 4107.

Farex: baby cereal, manufactured by Farex Australia Ltd, Progress Street, Dandenong, Victoria, Australia 3175.

Kaogulon vitamin K syrup: vitamin K supplement, manufactured by Parnell Laboratories Australia Pty Ltd, 6 Century Estate, 476 Gardners Road, Alexandria, NSW, Australia 2015.

Nekton Q: avian dietary supplement, manufactured by Nekton Products, 75177 Pforzheim, Germany.

REFERENCES

FORSHAW, J. M. (1981): *Australian parrots* (2nd edn). Sydney: Lansdowne Editions.

JUNIPER, T. & PARR, M. (1998): *Parrots: a guide to the parrots of the world*. Sussex: Pica Press.

LELI, U. (1991): Breeding the Salvadori's fig parrot. *AFA Watchbird* 18(4): 38–43.

REECE, R. L., BUTLER, R. & HOOPER, P. T. (1986): Cerebellar defects in parrots. *Australian Veterinary Journal* 63: 197–198.

ROMER, L. & GYNTHNER, I. (1997): Coxen's fig-parrot recovery programme. *Eclectus* 3: 40–43.

Manuscript submitted 5 June 1998

Int. Zoo Yb. (2000) 37: 158–165

© The Zoological Society of London

Breeding Pesquet's parrot

Psitttrichas fulgidus

at Jurong BirdPark

J. BUAY & R. THIRUNAVUKKARASU

Jurong BirdPark, 2 Jurong Hill, Singapore 628925

Pesquet's parrot *Psitttrichas fulgidus*, which is indigenous to New Guinea, is a threatened species that needs particular attention from aviculturists. The captive population in zoos and private collections is not well established and breeding of *P. fulgidus* in captivity is not common. Detailed observations of the breeding and rearing of *P. fulgidus* carried out at Los Angeles Zoo and Loro Parque, Puerto de la Cruz, have been invaluable for the development of a breeding programme at Jurong BirdPark and the key issues related to pair compatibility, nesting requirements, health and the rearing of chicks are presented. The breeding success and failures for

P. fulgidus at Jurong BirdPark are described to assist other aviculturists who are attempting to breed this species.

Key-words: aggression, captive-breeding, compatibility, diet, nest log, Pesquet's parrot

The export of wild-caught Pesquet's parrot *Psitttrichas fulgidus* from New Guinea is now illegal, helping to safeguard the wild population against the demands of the international bird trade.

However, pressures from hunting for food and the highly prized feathers in the thriving local black market, deforestation and the encroachment of development have led to uncertainty over the status of the wild population (Beehler *et al.*, 1986; Low, 1990; Juniper & Parr, 1998; see also Collar, this volume). *Psittrichas fulgidus* is classified as Vulnerable by IUCN (1996) and every effort should be made to facilitate the breeding of existing captive birds.

CAPTIVE-BREEDING PROGRAMME

In 1989 the breeding programme for *P. fulgidus* was established at Jurong BirdPark. Four proven breeding pairs were maintained in the off-exhibit Breeding and Research Centre and within 6 years of arriving at the BirdPark, two of the pairs had produced five healthy offspring. The other two pairs also reproduced but one chick died during hand-rearing and the other, a parent-reared chick, had wing and toe deformities and was euthanized after 1 year. The ♂ of the pair which was first to breed died recently and the ♀ is now paired with a ♂ which was also acquired in 1989. Although this pair appears to be compatible it has not bred yet.

In November 1995, the oldest ♂ of the chicks hatched at the BirdPark was sent to Loro Parque, Puerto de la Cruz, and the remaining four offspring have been paired (♂:♀, 4.5 and 3.5 years old, and 3.0 and 1.5 years old) for future breeding. The pairing was relatively easy because inquisitiveness and playfulness dominate social interactions at *c.* 2–6 months of age. Although no aggressive behaviour has been observed to date, it is too early to tell if the pairs are really compatible and bonded and, if they do eventually breed, whether they will make good parents. Information obtained from the four breeding pairs has been limited because of difficulties in observing the birds: the aviaries are enclosed to give the birds privacy and therefore staff cannot carry out detailed observations. In the near future

surveillance cameras will be installed to facilitate better observation and documentation of the behaviour and breeding habits of *P. fulgidus*.

BREEDING REQUIREMENTS

The success or failure of a breeding programme is determined by many factors, including pair-compatibility, timing, aviary design, the type of nesting log, environmental influences, diet, health and husbandry.

Pair compatibility Two prerequisites for successful breeding are pair compatibility and strong bonding, which can only be determined by the birds. These parrots are unpredictable so when new birds are introduced to each other, they should be watched closely and prompt intervention is necessary if pair incompatibility is observed. Physical aggression calls for immediate separation of the birds. Loud and threatening vocalizations towards the partner may precede such aggression and alert the observer to probable physical aggression. Slight changes in the behaviour of both ♂ and ♀ birds should be carefully noted as mis-matching may result in fatalities.

The first fatality of *P. fulgidus* at Jurong BirdPark was when a ♂ bit off a ♀'s tongue and she eventually succumbed to severe oral candidiasis. This pair had been together for *c.* 5 months, had been observed for over 1 month and appeared to be compatible. The ♂ was later paired with another ♀ but he died 5 months later of unknown causes, although the generally aggressive behaviour of the ♀ was probably a significant contributory factor: the ♂ had a toe missing and had developed nervous symptoms and stiff limbs. This was an unusual case, however, because, in our experience, it is usually the ♂ who exhibits the aggressive behaviour, either towards the ♀ or the keeping staff.

This kind of unpredictability and aggressiveness has led to recommendations that *P. fulgidus* are housed in large

aviaries and not in suspended cages, where size is a limiting factor: it is important that victimized birds have enough flight space to escape from aggressors (Low, 1991). The recommended size for an aviary is at least 7.2 m × 2.4 m × 2.4 m high (Low, 1991).

Timing Compatibility and a large aviary do not necessarily guarantee the safety of the pair throughout the year. On the one hand, the ♂'s eagerness to breed sometimes manifests itself as aggression, either towards the staff or the ♀. On the other hand, the ♀ may not be ready to copulate. Just before breeding ♂♂ are consistently agitated and threatening vocalizations, strong wing-flapping actions and jerky, extremely rapid movements were made whenever staff entered the aviary (pers. obs). During breeding, however, when there were eggs or chicks in the nest, the ♂♂ were quieter although they maintained their intimidating stance, diligently guarded the nest log and remained cautious and alert.

At Jurong BirdPark the nesting log is installed in the aviary as soon as physically aggressive behaviour, as opposed to aggressive vocalizations, is observed. However, the log is not kept in the aviary throughout the year because the incubation and rearing process is strenuous, particularly for the ♀, which devotes a considerable amount of time to these activities. When breeding is not considered desirable but the ♂ continues to exhibit strong mating urges and aggressive behaviour, he is moved to a separate enclosure until the aggressive behaviour has subsided.

Aviary design At Jurong BirdPark the aviaries used for breeding *P. fulgidus*, c. 4.5 m × 1.8 m × 2.2 m high, are adjoining and, although not specifically designed for Pesquet's parrots, have been accepted by the birds. The floor and lower portion of the walls are concrete and the upper part of the aviary is welded mesh.

Part of the roof is exposed to the elements. The door, c. 2 m high, is made of steel and divided into two sections which open independently, similar to a stable door. If both doors are opened at the same time, the birds may attempt to escape therefore the lower door section is used for access to the aviary without compromising the physical security of the birds. To facilitate the placement of food without having to enter the aviary, a small door is cut in the lower door, providing easy access to a nearby feeding platform which is anchored to the wall.

Nest requirements Pesquet's parrots will most readily breed in palm logs (Thursland & Paul, 1987; Low, 1990). At Jurong BirdPark either the royal palm *Roystonea regia* or the cabbage palm *Roystonea oleracea* is used, depending upon availability. Logs from the royal palm are preferred by *P. fulgidus* and appear to be more durable than those from the cabbage palm. The logs used are at least 1.5 m high and 45 cm in diameter. The base of the log is reinforced with a piece of 1.25 cm-thick marine plywood, wrapped in an aluminium sheet and elevated on a slab of cement to prevent it from becoming wet when the aviary is cleaned (Fig. 1). The log is situated away from rain and direct sunlight. It is important to use a firm, durable palm log that does not break up after the ♂ has excavated the log to a thickness of c. 2.5 cm all round.

A new and inexperienced breeding pair should be provided with a solid new log so that the excavating potential of the ♂ can be realized. It is possible that a new breeding ♂ excavates the nesting log to impress the ♀. If a new log is not available, a log which has already been used for nesting can be recycled but it should be disinfected before it is placed in the aviary. The inner walls of the log can be sprayed with a dilute solution of chlorine bleach and left in the sun for a few weeks. Stuffing the log cavity with wood shavings or coconut-husk fibres provides the neces-

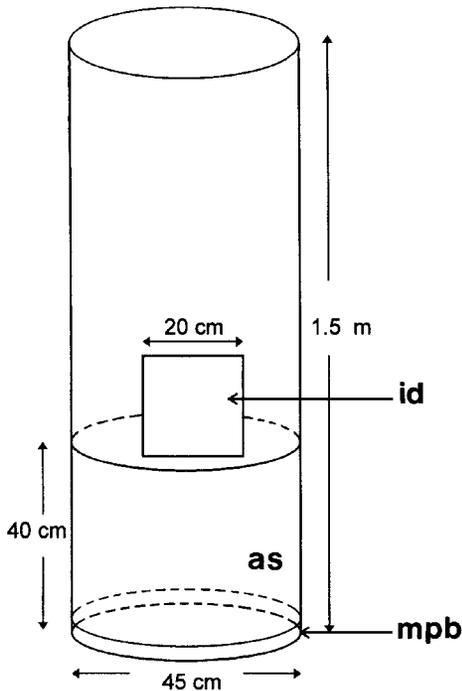


Fig. 1. Nest log (1.5 m tall and 0.45 m diameter) for Pesquet's parrots *Psitttrichas fulgidus* at Jurong BirdPark: as, aluminium sheet which wraps the bottom 40 cm of the nest log; id, inspection door 20 cm \times 20 cm positioned 0.4 m up from the base of the log; mpb, marine plywood base.

sary semblance of a solid log and satisfies the δ 's excavating instinct. If the log has been excavated right down to the bottom it may be necessary to reinforce the base of the log with plywood before re-wrapping it with an aluminium sheet to provide support for the nesting substrate. An advantage of using a hollowed-out log is that an inspection door can be made near the base for checking the eggs and chicks with minimal disturbance to the birds. If a new solid log is used, nest inspection needs to be carried out from the top, which is intrusive and places unnecessary stress on the breeding pair.

Nest-excavation does not always begin as soon as the log is placed in the aviary, depending upon the urge of individual birds to breed. It may be days or months

before excavation starts and subsequent egg-laying takes place. At Jurong BirdPark birds usually breed within 6 months of being provided with a log but fertility is not always 100%.

Once the δ has appraised and accepted the log, he can complete the entire c. 1.5 m excavation in just under 1 month. The longest period taken for a δ to excavate a solid log at Jurong BirdPark was 3 months but a pair at Loro Parque took c. 7 months to complete the excavation (Low, 1990). Recycled logs take 1–2 weeks to excavate fully. The f adds final touches, such as scraping the cavity walls to prepare the nest before she lays her eggs.

A clutch usually contains two eggs, although three eggs have been observed, with an interval of 5 days between the first and second egg, and 8 days between the second and third egg. However, in the three-egg clutch, only the second egg was fertile. Incubation is carried out primarily by the f but once the chicks hatch the δ spends more time in the nest. It is not clear, however, whether the δ just clings to the inner sides of the log or if he actually contributes to incubation and brooding. Nevertheless, during the entire period of incubation and rearing, the δ is protective and alert and usually stands guard near the nest log or at the entrance.

The height of the log is of paramount importance because security is derived from the depth at which the nest is located. At Jurong BirdPark breeding was never successful if the f laid her eggs before the log was fully excavated. If the eggs were fertile and hatched, the chicks would be killed by the parents soon after hatching. The adults may have been insecure because the base of the cavity, and hence the nest, was simply too near the entrance at the top of the log. Subsequent breeding efforts of the same pair were successful when the log was excavated out all the way to the bottom.

At Los Angeles Zoo (Thursland & Paul, 1987) and Loro Parque (Low, 1990)

the entrance to the log is at the side and the top is in its original, covered state. The position of the entrance may limit the inflow of light and noise, giving the breeding pair a sense of security. At Jurong BirdPark all four breeding pairs excavate and enter the log from the top. The fact that successful breeding was achieved only when the logs were excavated all the way to the bottom, suggests that the open-top design may contribute to insecurity in breeding pairs. If the base of the nesting cavity is too close to the entrance at the top, the pair would need to guard the 45 cm-diameter space directly above their heads constantly. In contrast, an entrance hole at the side would be c. 15–20 cm diameter. Open-top logs are still being used at the BirdPark, however, because the ventilation is better. This feature is particularly important in a warm and humid climate where fungi flourish in poorly ventilated areas.

Environmental influences The environment within and around an aviary plays an important role in breeding success; for example, Pesquet's parrots generally need privacy during breeding. Any amount and type of noise or interference can stress the birds and affect the outcome of breeding. Neighbouring birds which are too noisy or inquisitive may also agitate the breeding pair and noisy neighbours should be moved or the side of the aviary should be boarded up with plywood to give *P. fulgidus* the necessary privacy. The four breeding pairs of Pesquet's parrot at Jurong BirdPark are out of sight of each other and although their loud, raucous calls can still be heard, this has not appeared to affect breeding success. Parrot species which are not too noisy, such as Palm cockatoo *Probosciger aterrimus*, are housed in adjoining aviaries. The daily routine husbandry of hosing down the aviaries and feeding through the large main door may also disturb breeding Pesquet's parrots so once the nest logs are in place, staff avoid entering the aviaries

and washing and feeding are carried out through the small door cut in the lower main door. The nest logs are inspected only when the ♀ is observed spending a lot of time in the log which usually indicates that she has laid eggs and begun incubation. Once egg-laying has been confirmed, the hatching date is estimated based on an incubation period of c. 28 days. If there is a side inspection door on the log, eggs may be checked for fertility after 2 weeks incubation. If this is not possible hatching is confirmed when food consumption increases around the estimated hatching date.

Diet The diet offered to each pair of Pesquet's parrot is half or a third of a papaya (390–590 g) which is spiked onto nails on a perch, and a quarter of an apple (c. 26 g) and four small, peeled bananas (c. 120 g) in a bowl with a heaped tablespoon of lory powder. The birds are fed twice daily. Although papaya is the staple diet, *P. fulgidus* also relish bananas and the dry lory powder. Apples are the least favoured food. When brooding, the adults consume the banana first, probably because banana has more bulk and can sustain the chicks for longer periods of time than papaya, which tends to pass quickly through the digestive system. Faeces excreted when the parrots eat mostly banana tend to be firmer and smell less than when papaya is consumed and, in a confined log, this would probably be advantageous. Feeding hard and raw items of food, such as yam and carrot, to brooding parents is not recommended because they are difficult for the chicks to digest and can contribute to death associated with poor assimilation of the parent-fed foods (Thursland & Paul, 1987).

Health and husbandry Perhaps the most important factors determining the long-term success of any breeding programme are good health management and husbandry. It is well known that fungi and mould flourish in the humid tropics and

one of the most likely places would be the internal walls of an excavated log. Pesquet's parrot has a predisposition to the fungal infection candidiasis (Low, 1991) and at Jurong BirdPark prophylactic treatment is given to breeding birds as soon as chicks hatch: a 14 day course of Nystatin powder, at a daily dose (split between the two feeds) of one-and-a-half ground tablets (500 000 units per 1 g tablet), sprinkled onto papaya. Although this treatment has not actually prevented the onset of fungal infection in the chicks, no significant or fatal fungal infections have occurred. The concrete floor of the aviary is hosed down daily to reduce potential problems associated with bacterial and fungal growth: concrete helps to minimize worm infestations. Faecal screening for parasites and yeast is carried out frequently.

PROBLEMS ASSOCIATED WITH PARENT-REARING

At Jurong BirdPark two pairs of birds have reared three chicks but only the first pair was successful in rearing one chick to weaning. The second chick from this pair was diagnosed with renal failure at 2 months of age and the possibility of bacterial infection could not be ruled out. The chick from the second pair was parent-reared until weaning but had serious wing and leg deformities, not discovered earlier because of the difficulty in inspecting the nest from above, and it was euthanized.

At the BirdPark some chicks from each of the four breeding pairs were mutilated in the nest. Mutilation-associated deaths occurred in a total of six chicks between one and 2 days of age, although whether the mutilations occurred post-mortem or were the actual cause of death could not be determined because the chicks were too small for necropsy to produce conclusive results. Chicks may have been weak at hatching and died soon afterwards. The bruises on the body and, occasionally, the amputation of limbs, could have been the

result of overzealous attempts on the part of the adults to prod a weak and dying chick into responding (Voren, 1995). If the adults did kill the chicks, and the ♂ is usually the suspect, this may have occurred as a result of insecurity, stemming from half-excavated logs (three cases), or the incapacity of the adults to rear two chicks at one time (three cases). Infanticide could therefore be a result of misplaced or misdirected aggression. In all cases, the adults may have perceived some form of territorial intrusion and, uncertain about the ability to provide protection, killed the chicks (Voren, 1995). One possible way to combat this problem would be to accustom the birds to more frequent observation and some degree of disturbance or noise which they could not avoid. If the behaviour recurred when chicks next hatched then other probable causes would need to be identified.

PROBLEMS ASSOCIATED WITH HAND-REARING

The original hand-rearing formula used at Jurong BirdPark, which comprised one part papaya puree to two parts powdered dog pellets (Cher, 1994), caused few crop or systemic problems and three out of four chicks were successfully reared on this diet. In 1995 the use of dog food in the hand-rearing diet of all our parrots was discontinued and a fourth chick was successfully hand-reared on a diet containing one part papaya puree to two parts regular parrot formula. Two chicks, which were being hand-reared, died recently after further modification of the hand-rearing diet to parrot formula without the papaya. Both chicks suffered from crop stasis and died. Anti-fungal treatment had not worked and necropsy showed that both chicks had a congested, enlarged liver with multifocal hepatocellular necrosis (severe damage to the liver and intestines). A Gram-stained smear taken from the crop of one chick also showed the presence of numerous budding yeast forms. Although diet may not have

been the direct cause of death, it is implicated because the chicks came into the nursery with no apparent problems. The 21% protein content in the parrot formula could have been excessive for this species, stressing the digestive system, predisposing them to fungal and bacterial infection which led to crop stasis and, eventually, liver necrosis and necrotizing enteritis. Excessive protein may also have caused the death of one hand-reared chick at Loro Parque, although a viral condition was not ruled out (Low, 1990). It is strongly recommended that juicy fruit is added to all hand-rearing formulas for the Pesquet's parrot. (See also, Witman & Lewins, this volume.)

Weaned Pesquet's parrots are extremely messy eaters and a sticky residue always remained around the face and the sides of the beak after eating. Damp cotton swabs were used regularly to clean the birds' faces. When transferred to holding aviaries, which are partially exposed to the elements, the chicks were able to go out in the rain and clean themselves: spraying the chicks with water was an ineffective alternative. This finding highlights the importance of access to aviaries that are partially exposed to the elements because a sticky paste around the beak could lead to fungal infection around and inside the oral cavity.

An important advantage of hand-rearing Pesquet's parrots may be that the birds are calmer and less stressed by human presence than parent-reared birds. However, aviculturists currently encourage parent-rearing in order to prevent imprinting and to increase the likelihood of successful second-generation breeding. We support this view because the inquisitive and playful nature of hand-reared birds could compromise successful breeding.

CONCLUSION

The first breeding pairs of *P. fulgidus* acquired by Jurong BirdPark, presumed to be wild-caught, adjusted well to cap-

tivity. This is not always the case as most wild-caught birds are easily stressed and some die only a few days after moving to a new location (Low, 1991). The experience gained in breeding *P. fulgidus* at Jurong BirdPark has allowed us to develop general guidelines for breeding the species in captivity. However, aviculturists must remember that there are few fixed rules in captive-breeding which can be faithfully adhered to. At the BirdPark, we have observed that each breeding pair exhibits different behaviours and temperament, and even birds we are familiar with exhibit seemingly inexplicable behaviours. Therefore, although it is important to be consistent in the practice of avicultural protocol, it is also necessary to be aware of subtle changes in the birds in order to perpetuate a well-managed breeding population of *P. fulgidus* in captivity which may, one day, be essential for preservation of this species in the wild.

PRODUCTS MENTIONED IN THE TEXT

Kaytee regular hand-rearing formula: hand-rearing formula for parrots, manufactured by Kaytee Products Inc., WI 53014, USA.

Nystatin powder: Mycostatin, Nystatin B.P. 500 000 units, manufactured by Bristol-Myers Squibb Pharmaceuticals Pty Ltd, Victoria 3174, Australia.

Science diet canine maintenance: dog pellets, manufactured by Hills Pet Products, Division of Colgate-Palmolive Company, KS 66601, USA.

Shep's Lori-Dry Powder: lory powder, manufactured by Shephard Enterprise Pty Ltd, Grafton, NSW 2460, Australia.

REFERENCES

- BEEHLER, B. M., PRATT, T. K. & ZIMMERMAN D. A. (1986): *Birds of New Guinea*. Princeton, NJ: Princeton University Press.
- CHER, A. (1994): Breeding and hand-rearing Pesquet's parrot at Jurong BirdPark, Singapore. *International Zoo News* 41(7): 29-35.
- CUNNINGHAM, M. (1990): The Pesquet's parrot. *AFA Watchbird* 17(2): 56-57.
- IUCN (1996): *1996 IUCN red list of threatened animals*. Gland: IUCN.
- JUNIPER, T. & PARR, M. (1998): *Parrots: a guide to the parrots of the world*. Sussex: Pica Press.
- LOW, R. (1990): Rearing Pesquet's parrots at Loro Parque. *AFA Watchbird* 17(2): 58-62.
- LOW, R. (1991): Breeding Pesquet's parrot. *American Cage-bird Magazine* 63(3): 50-60.

THURSLAND, D. & PAUL, L. (1987): Parent-reared Pesquet's parrots *Psittrichas fulgidus* at the Los Angeles Zoo. *International Zoo Yearbook* **26**: 208–212.

VOREN, H. (1995): Infanticide. *Bird Breeder* **67**(1): 10–11.

Manuscript submitted 5 January 1998

Int. Zoo Yb. (2000) **37**: 165–171

© The Zoological Society of London

Breeding and hand-rearing Pesquet's parrot

Psittichas fulgidus

at the Zoological Society of San Diego

P. WITMAN & E. LEWINS

Zoological Society of San Diego, PO Box 551, San Diego, California 92112, USA

Pesquet's parrots *Psittichas fulgidus* are rare in avicultural collections and successful breeding is uncommon and usually off-exhibit. At San Diego Zoo, however, two pairs of *P. fulgidus* which were on-exhibit have bred successfully. In the 1980s a pair of wild-caught adults nested in a natural palm log in their enclosure and eight chicks hatched from 17 eggs which were artificially incubated. In 1997 two hand-reared adults nested in an artificial nestbox laying seven eggs all of which were removed for artificial incubation and two of which hatched. The chicks from both pairs were hand-reared owing to the lack of parent-rearing success in the past. A review of breeding history since 1988 at San Diego Zoo is given and the methods used for artificial incubation and hand-rearing are described.

Key-words: artificial incubation, growth rate, hand-rearing, nestbox, Pesquet's parrot

Pesquet's parrot *Psittichas fulgidus*, which is indigenous to New Guinea, has always been rare in avicultural collections and successful breeding in captivity is uncommon. At San Diego Zoo between 1984 and 1985 eight chicks hatched from 17 eggs which were artificially incubated. These eggs were laid by a pair of wild-caught birds which were on exhibit and nesting in a natural palm log *Phoenix canariensis*. These chicks were hand-reared (Low, 1987).

In 1986 a hand-reared ♂ was obtained from Bronx Zoo, New York, for pairing

with one of the hand-reared ♀♀ hatched in 1984 at San Diego Zoo. In 1988 this pair was introduced at the Avian Propagation Center (APC), an off-exhibit breeding area, and in 1994 they were moved to an on-exhibit aviary. Although in 1992 eggs were laid for the first time, successful breeding was not achieved until 1997 when two chicks hatched and were hand-reared.

HUSBANDRY AND REPRODUCTION

From 1988 to 1994 the hand-reared adult pair was maintained at the APC in enclosures measuring 4.27 m × 2.44 m × 2.13 m high. A 1.2 m section at one end of the aviary was enclosed to provide shelter. A natural palm log *P. canariensis* was provided but not used by the birds. By 1992 this log had deteriorated and was replaced with a nestbox measuring 91 cm × 76 cm × 91 cm deep. The pair was often maintained in separate enclosures because the ♂ was aggressive towards the ♀. In September 1992 two eggs were laid and, subsequently, three more two-egg clutches were laid, however, all the eggs were either infertile or broken (Table 1). An interval of 2–4 days between egg-laying was observed.