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KEEPING AND BREEDING THE GREATER BIRD OF PARADISE *Paradisaea apoda* AT AL WABRA WILDLIFE PRESERVATION, QATAR AND WALSRÖDE BIRDPARK, GERMANY

by Simon Bruslund Jensen

The Greater Bird of Paradise was bred in captivity for the first time at Walsrode in Germany in 2001, unfortunately the female was later lost and the breeding success was not repeated. However, methods first developed at Walsrode were implemented at Al Wabra Wildlife Preservation (AWWP) in 2002 and resulted in successful breeding that same year and to date 22 chicks have been hatched at AWWP in Qatar.

At Walsrode initially massive problems were encountered in the effort to breed birds of paradise. Eggs were destroyed and/or were infertile. However, much experience was gained over a period of three years and it was learned that the males, when kept together with the females, would consistently destroy the nests and eggs. When the males were separated from the females, the females would lay eggs and incubate them, but these often proved infertile due to the difficulty of judging the right time to place the pairs together and quite frequently the female would destroy the nest and eggs herself. Important lessons were learned on timing and in particular the birds' sensitivity to disturbance. In June 2001 a single chick hatched in an off-exhibit breeding aviary. It was successfully reared by the female and proved to be a male. Unfortunately, the death of the female the following winter ended any further hope of breeding the Greater Bird of Paradise at Walsrode.

After working for three years as a keeper at Walsrode I took up the position as Curator of Birds at Al Wabra Wildlife Preservation early in 2002. The Greater Bird of Paradise is also maintained at AWWP and similar problems had been encountered when trying to breed this species. Implementation of the methods developed at Walsrode quickly led to the first breeding success, when in May 2002 as a precaution an egg was removed for artificial incubation and the chick was hand-reared. This was followed shortly afterwards by another chick from a different pair. Our husbandry methods were further developed and improved, not least by incorporating what had been learned breeding other species of birds of paradise at the Bronx Zoo (Hundgen, 1988, 1991) and at San Diego Zoo (Rimlinger, 1984) in the USA. Extensive health monitoring and documentation allowed for experimental diet modifications that have effectively reduced the problems caused by iron storage disease that almost completely depleted the population of Greater Birds of Paradise at Walsrode (Marcordes pers. comment). Iron storage

disease was also the biggest health problem with captive birds of paradise in other collections (Hundgen, 1988).

At AWWP a total of 22 chicks have hatched to date in a managed internal breeding programme that seeks to represent as many founders as possible in the population, with the aim of developing a long-term viable captive population. This is achieved by interchanging breeding males and even by restricting breeding by highly productive individuals and instead encouraging non-breeding birds, so that all female founders are equally represented. So far nine founder birds have reproduced and the first generation female showed the first signs of breeding behaviour in 2006.



Simon Bruslund Jensen/AWWP

Lek of displaying male Aru Island Greater Birds of Paradise at AWWP.

Ongoing studies have produced some initial results from data collected on the age at which young birds of paradise become mature: both when they are able to reproduce and also when they develop full plumage. These seem not to be entirely related to each other, for males are sexually mature before they develop full plumage which may take up to seven years. We have also undertaken research on DNA-sexing and endoparasites. The latter have proved to be a particular problem especially amongst parent-reared young, which may suffer infections if they are not prevented in time (Schulz & Hammer et al. 2004).

A size variation was detected among the birds of the founder population. Our birds were all purchased years ago in south-east Asia. Their exact origin

is unknown but it is likely that they are all wild-caught birds. Not knowing the locations they came from made it difficult to determine which of the two recognised subspecies they might belong to. However, all of our birds were measured and by comparing their measurements with those given by Frith & Beehler (1998), it was obvious that we have two distinct groupings within the population and these match the sizes of the two recognised subspecies. In addition to the measurements we were also able to determine that there are marked differences in their weights, with no overlap whatsoever between the adult birds of the two groupings.

As a result, the birds at AWWP are now managed as two separate populations: the larger birds as the Aru Island Bird of Paradise *P. a. apoda* group and the smaller birds as the Mainland Greater Bird of Paradise *P. a. novaeguineae* group. Before the two groups were identified and separated, a few hybrids were produced, but these were subsequently taken out of the breeding programme. Interestingly the hybrid forms present intermediate values both with regard to size and weight and have proved to be much more vulnerable than the other offspring.

Table 1. Average weights of adults based on 31 birds.

Aru Island Bird of Paradise	
Male	365g (range 330g-429g)
Female	220g (range 205g-232g)
Mainland Greater Bird of Paradise	
Male	229g (range 205g-255g)
Female	171g (range 154g-193g)

Husbandry

Feeding

The birds are fed twice a day, with the diet of the adult birds being relatively simple and mainly fruit based. Large amounts of fruit, especially papaya, are consumed, with mango, pear and apple also being offered daily. This is varied regularly with mulberries, oranges, grapes, bananas, watermelons and other fruits. Commercial pellets for fruit-eaters are also offered twice a day, the amount varying depending on the size of the particular bird. In the morning 7g-10g Ziegler® Bird of Paradise pellets are presented to each bird and in the afternoon each bird receives 2g-4g Wittemolen® Mynah Granulate. Both of these products, which we have tested on a regular basis in independent laboratories, have a steady iron content of less than 65ppm. Past experience with pellets containing higher measurable amounts of iron than 100ppm, resulted in birds quickly showing symptoms of iron storage disease. Livefood such as mealworms is fed once a week, when each bird receives five. They are of course also able to catch insects that

enter their flights. Feeding rations are tailored to suit each individual bird's consumption and there is very little waste. Vitamins and minerals are sprinkled over the food three times a week.

Housing

The birds are kept in large well-planted flights, each with access to a climate controlled inside enclosure in which the birds are fed. Male Greater Birds of Paradise become animated by observing each others' displays; in contrast the females can be aggressive towards each other. Therefore two males are often housed next to each other with the females in adjacent flights each side. Pairs are allowed access to each other as long as the female shows interest in entering the enclosure of the male, when this is not the case they are kept separated most of the time. If a female shows interest in a particular male and breeding behaviour such as mating or nest building is observed, the birds are monitored more closely. To achieve a successful breeding, timing is of the essence. It is important to allow the birds to remain together long enough to mate, but not long enough for the male to destroy the nest or egg. On some occasions females build their nests in very exposed positions or have been proven to destroy their eggs. In such cases the eggs are removed for artificial incubation. Due to the very hot summer climate in Qatar we also remove eggs laid in the outside flights during the hottest months. We do this not only to secure the eggs but also spare the female from the strain of having to sit on the nest all day in the blazing sun. Greater Birds of Paradise consistently lay single egg clutches and the egg is incubated exclusively by the female. She will abandon the nest and egg if she is convinced that the nest site has been compromised either by a keeper or by a male bird. Not infrequently the female will eat the egg and even a small youngster and will destroy the nest before it can be reached by an intruder.

We provide the birds with open baskets and nest material in the form of hay, fresh grasses, large dry leaves and thin sticks throughout the year. Only rarely is the same nest site used twice and it has proven beneficial to change the nest baskets or move them around when they are not in use. Most breeding occurs in the spring from late February until July. Mid-summer the birds normally start to moult and there is a halt in breeding activity until late autumn when some birds may start breeding again.

Artificial incubation

Greater Bird of Paradise and other bird of paradise artificial incubation records indicate that a comparatively high temperature and humidity produce the best results. An incubation temperature of 37.8°C-37.9°C (100°F-100.2°F) and a weight loss aim of 13.5% have been found to produce superior



Simon Bruslund Jensen/AWWP

Mainland Greater Bird of Paradise nest containing an infertile egg.

results. Eggs have been turned eight to 14 times a day with good results, whereas an egg that was turned more than 24 times a day failed to hatch, although the turning frequency could not be confirmed as the cause. The incubation period for the single egg clutch is 16-17 days, with the vast majority hatching on day 16. At internal pip the turning of the eggs is normally discontinued, although the time between internal pip and the first external pip is often exceedingly short and regularly the hatching process is not detected until the external pip has started. The eggs are subsequently transferred to the hatching unit and kept at a temperature of 37.5°C (99.5°F) and relative humidity of about 80%. During the hatching period and the first few days afterwards we have found it is very important to maintain the correct temperature. Hatching can take 12-46 hours (average 29 hours). If progress stalls we generally start assisting by chipping some of the shell away about 36 hours after external pipping.

Hand-rearing

Soon after hatching chicks are weighed and the umbilicus area is disinfected with iodine, then they are moved into a brooder. The temperature in the brooder is maintained at 37.1°C (98.8°F). If the temperature is too low the chick is likely to remain unresponsive at feeding time. The feeding



Simon Bruslund Jensen/AWWP

Five days old Aru Island Greater Bird of Paradise being hand-fed at AWWP. Note the syringe holding a small amount of water which is given to the chicks after each feed.

response is stimulated by whistling softly or gently touching the chick. Immediately after hatching the humidity is lowered to 65%-70% and then gradually lowered to about 55% over the course of a few days. The temperature in the brooder is lowered by approximately 0.5°C each day and by the time the chick fledges the temperature is being maintained at about 29°C-31°C (84.2°F -87.8°F). After a further few days the chick can safely be kept at room temperature without the need of additional heat.

Fluids in the form of Lactated Ringers solution mixed 1:1 with water are given orally in very small amounts every hour after hatching. If the hatch was prolonged or the chick appears weak a small amount of glucose is added to the solution. Depending on the degree of absorption of the yolk sac the first solid food is fed to the chick 12-20 hours after hatching and is limited to one or two small pieces of high protein food such as cricket abdomen or rat organs. It is essential to restrict food intake during the first few days until the yolk sac has been fully absorbed and is no longer visible through the skin of the abdomen. After that the chick is fed as much food as it will accept in suitable bite sizes. We have used organs and muscle meat from newborn mice and rats, soft white mealworms and pupae, cricket abdomens, soft papaya, pear, banana, mango and grapes. During the first week mice, rats and insects make up the larger portion of the diet, after which the amount of fruit is gradually increased and by the time the chick leaves the nest, about half the amount of food fed to it is fruit. The amount of insects and meat is slowly decreased during the following months and by three to four

months it is offered the same diet as the adults.

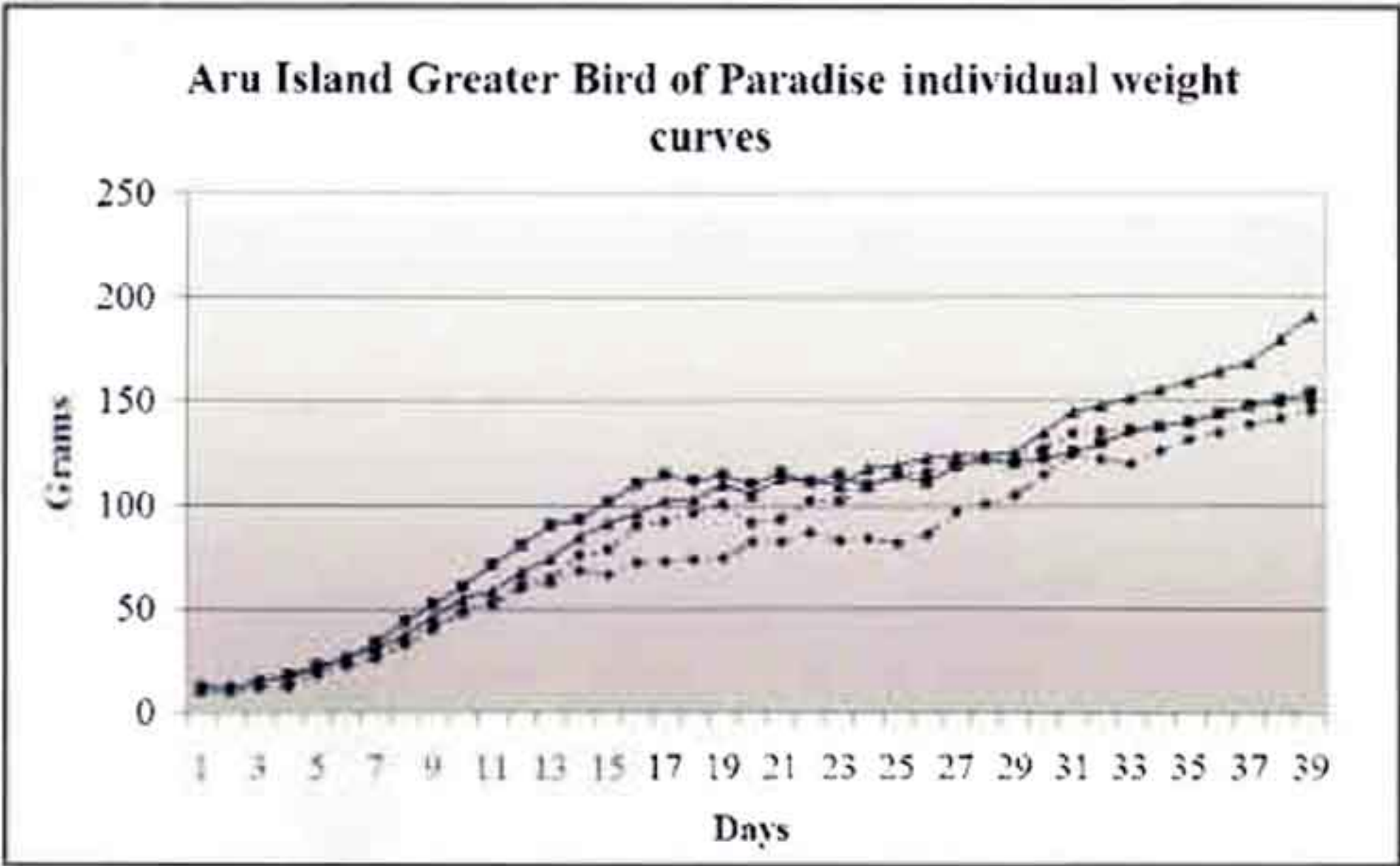
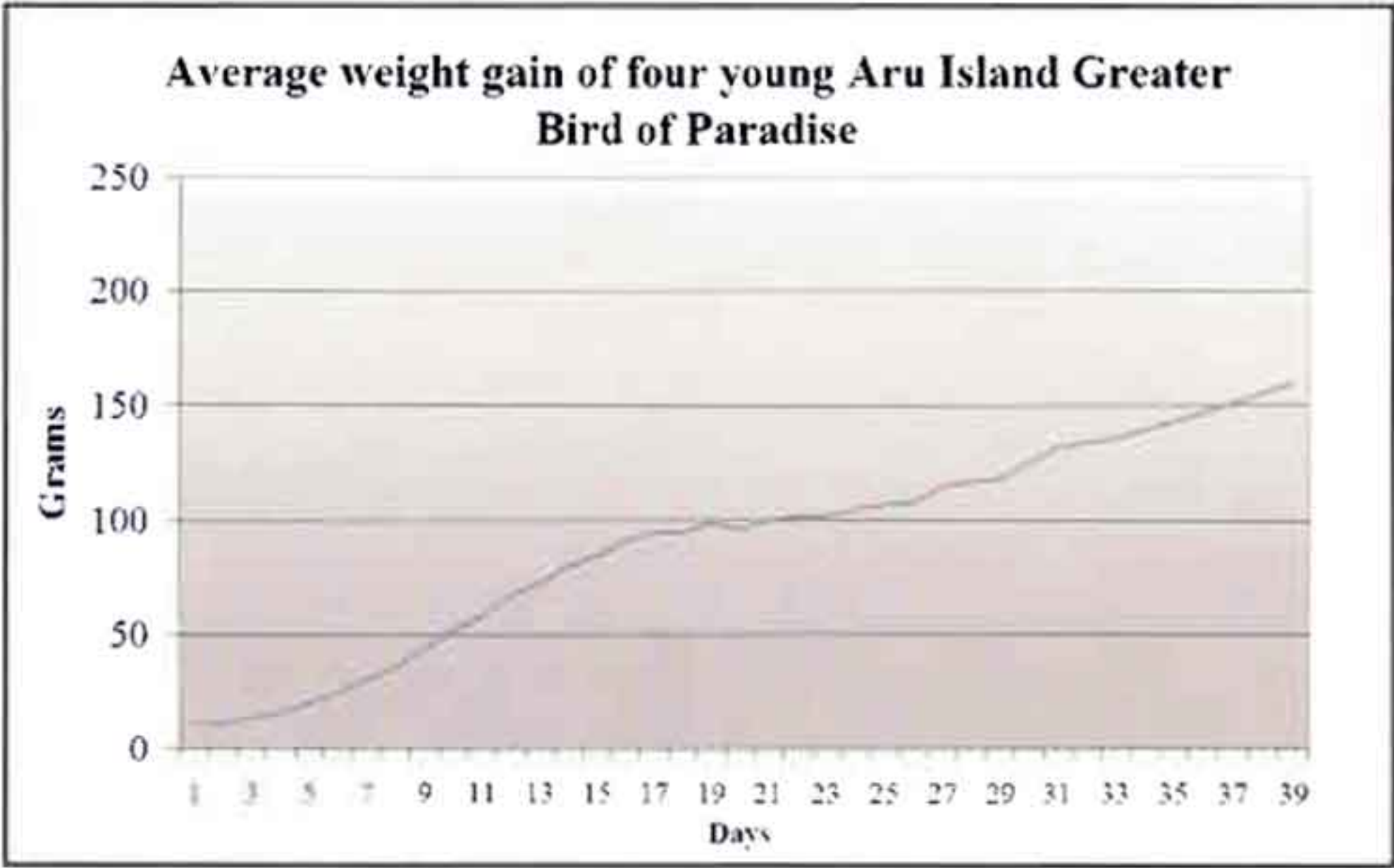
From the beginning the chicks are fed only during the daytime - in our case a 14 hour day. Care is taken not to disturb the chicks during the night, when it is essential they are allowed to conserve energy. Initially they receive 12-16 feeds a day at just under one hour intervals. When the chicks are about two weeks old, the intervals are increased to two hours. On reaching 30 days they are fed five times a day and are encouraged to feed themselves. By 50 days they should be fully weaned.

A faecal sac is normally produced after each feeding session. If one is not produced following two or more feeds or if the membrane is fragile, it is more often than not a sign of problems. The most frequently encountered problem is stress or dehydration. Greater Bird of Paradise chicks are particularly shy and easily become stressed when there is activity or noise in the room. Keeping more than one chick in the same brooder unit has consistently led to problems. Stressed chicks are very susceptible to secondary infections.

The chicks are kept in plastic cups lined with tissue and a plastic mesh. It is exceedingly important that the chicks can grip the lining of the cup with their large feet. If they are unable to do this, deformities such as bent toes and even twisted tarsus can quickly become irrevocable. Greater Bird of Paradise chicks are in general more sensitive and difficult to rear than those of other birds of paradise that have been hand-reared at AWWP. The chicks are weighed and the nest cups are changed daily, however, due to the chicks' nature and also the sensitivity of their legs it may be advisable to keep handling of the chicks to a minimum. Young Greater Birds of Paradise continue to grow long after they have become independent and males continue to gain weight for at least one year.

Table 2. Development stages of juvenile Greater Bird of Paradise.

Days	Development stage
1-3	Blind and naked.
4	First growth of pin-feathers on the wings.
5-8	Pin-feathers developing all over body.
6-8	Eyes start slitting.
12	Feathers start breaking out of sheaves on wings.
15-19	Standing in nest, stretching and flapping wings.
18-20	Fledges and does not return to nest.
20-25	Immobile on perch waiting to be fed.
25-30	Starting to become active; approaches to receive food.
28	Almost fully feathered.
29-32	Starts feeding itself.



All the above charted weights are for hand-reared chicks.



Simon Bruslund Jensen/AWWP

Aru Island Greater Bird of Paradise aged approximately 10 days old.



Simon Bruslund Jensen/AWWP

Young recently fledged parent-reared Mainland Greater Bird of Paradise at 18 days.



Simon Bruslund Jensen/AWWP

Young Aru Island Greater Bird of Paradise starting to become mobile at 25 days.

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