

Development of Hand-rearing Techniques for Roseate Spoonbills, *Ajaia ajaja*, at the Fort Worth Zoo

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The Fort Worth Zoo has held a breeding flock of roseate spoonbills (*Ajaia ajaja*), since the 1960's and has had more success breeding and parent-rearing roseate spoonbills (*Ajaia ajaja*), than any other institution worldwide. To infuse new genetic material into the North American population, Fort Worth began collecting hatchlings and eggs from free-ranging birds for hand-rearing. Fledglings were first collected in 1982 and eggs in 1993. Since 1982 Fort Worth has hand-reared thirty-two birds including those fledglings and eggs collected off site and those in the zoo flock. Over time techniques, diet, and amounts fed have been adjusted. Documentation of the first bird hand-reared from hatch in 1987 indicates it attained 73 % of the body weight of parent-reared birds by day 14. The following birds raised from hatch beginning in 1993 only reached 30 % of the body weight of parent-reared birds by day 14. Growth rate has since increased to 60% of parent-reared weight by day 14 in 1997. Differences in diets and amounts fed may account for differences in growth rates.

Key words: roseate spoonbills (*Ajaia ajaja*), hand-rearing

INTRODUCTION

Roseate spoonbills (*Ajaia ajaja*) range from the Gulf coast of North America, through Central America and as far south as Argentina. These pink birds stand 32" tall and are easily distinguished by their long, spatulate bills (Allen, R.P, 1966). The Fort Worth Zoo has maintained a flock of roseate spoonbills since the 1960's, and has been successfully hand-rearing them.

In the late 1980's, zoo aviculturists realized that the roseate spoonbill's captive North American population had not had regular infusions of new genetic material. Before the situation became critical, the Fort Worth Zoo set out to collect new birds from various locations along the Texas coast to augment the population. Originally, the plan was to capture fledgling birds. The United States Fish and Wildlife Service (USFWS) suggested that there would be less disturbance to the nesting populations, not only spoonbills, but all the other colonial wading birds that nest in close proximity, if eggs, instead of birds, were collected early in the nesting season. As chicks grow, they begin to explore their surroundings before they are developed enough to be on their own. If there is disturbance in the nest area, there is a risk that the less well coordinated birds might fall from the nest.

MATERIALS AND METHODS

Collection

Several birds and eggs have been collected up to 1996. In addition, many fledglings and chicks from hatch eggs have been hand-reared from the zoo's flock.

Incubation and Brooding

Roseate spoonbill eggs were incubated at 37.5° C and 84-86% humidity. Incubation was 27-28 days. The chicks are blind and have only wispy bits of down when they hatch. They are kept in "nests," usually a margarine tub or pint fruit basket with a towel lining at a temperature close to 37.6° C for the first few days. Initially, it was found that small brooders, 12" x 12" worked well for one or two chicks. Three or four chicks required a larger space. The temperature in the brooder is gradually decreased until the chicks are fully feathered. Once the need for additional heat is gone, the chicks "nests" can be put in 20 gallon aquaria.

Nest sanitation

For newly hatched chicks, a pint fruit basket lined with a washcloth or piece of towel worked well. The towel was changed following each feeding. Chicks soiled with feces were gently cleaned with a Q- Tip dipped in Warm water, as the top layer of skin can be easily removed. Routine swabbing of the inside of the bill prevented build up of food and fecal material which can lead to bacterial growth and bill deformities..

As the chicks grew, increasingly larger plastic bowls or sweater boxes lined with towels made sturdy, easy to disinfect nests. Fresh, leafy twigs were added to the nests as the chicks became more active, to develop foot and leg muscles. Additionally, feces fell through the leaves leaving less to stick to the chicks. By this time, chicks no longer needed towels under them for warmth, and cleaning time was further decreased, by lining the box with newspaper, so that excrement and plant material could be rolled up and tossed out. The best results were obtained with bamboo and Texas privet as the nest substrate.

Feeding

Adult spoonbills feed their chicks by regurgitation. To duplicate this, a liquid diet was fed with a syringe and catheter tube. The size of the syringe was determined by the amount the chicks were consuming. For the first few feedings, a 3 cc syringe was used. Syringe size was gradually increased to 6cc, 12 cc and 20 cc syringe capacity .

The catheter tubing diameter was determined by the size of the syringe, not by the size of the chick. The tube was no more than 1 1/2 inches in length. Once a feeding routine was established, the chick would readily open its mouth to take the tube. Care was taken to avoid putting the formula in the trachea rather than the esophagus. The chicks moved away from the tube when they were full.

Formula

Detailed records were not available on hand-rearing prior to 1993. In, 1993 available formula information was further developed by the bird department staff (Tale 1). At this time detailed records began to be kept. For the first two to three days, the formula was diluted 1: 1

with Pedialyte (Ross Laboratories, Division of Abbott Laboratories, P.O. Box 1317, Columbus, OH 43216): and warmed to 38.9 to 40.6°C. During the first feeding chicks took no more than 1.5 cc. Five feedings (one every four hours) beginning at 8:00 am and ending between 11 pm and midnight were initially offered. The commissary prepared the formula in large hatches and froze it in smaller packages. Formula was thawed fresh for each feeding. Feeding tools were stored in a disinfectant between feedings.

By day four, the volume was up to 4 ccs per feeding and was diluted with distilled water at a ratio of 2:1. The chicks have developed a good feeding response by day 4, sitting up on the hocks, head and neck extended up, head bobbing and vocalizations of a high shrill trill.

Days 7-9, the formula was diluted 3:1 with water and by day 10, full strength formula was fed.

At approximately day 18, chicks were receiving four formula feedings of 60 cc daily. Additionally, small pieces of Birds of Prey diet (Animal Spectrum Inc., P.O. Box 721, North Platte, NE 69103-0721) mixed with Mazuri flamingo pellets (Purina Mills, Inc., 1401 Hanley Road, St Louis, MO 63144) were given. Around Day 30, the amount of formula fed was decreased to encourage consumption of solid food. Balls of the meat mixture were offered after each formula feeding. By Day 35 only solid food was offered.

In 1995, parent-reared chicks were weighed to quantify differences in growth rates. Four chicks were selected, based on nest site. Nest sites on the periphery of the colony were preferable as there would be less disturbance to the flock to have a keeper climbing up and removing chick each day. As with the hand-reared chicks, weights were taken first thing in the morning.

RESULTS

Incubation and Brooding

Hatch weights range from 37 to 47 grams. Behavior was the best guide for temperature reduction. When over-heated, chicks would pant, drop their wings, and droop their heads over the sides of the nest. Cold chicks would huddle together and their skin color would become paler. Humidity and air flow are important considerations since chicks dehydrate quickly if humidity is too low (below 82-86%) or if the "nest" is in the path of moving air from the brooder fan. It was determined that the combination of a baffle and a tray of water kept the chicks well hydrated.

Nest sanitation

Cleanliness is important for feather growth as well as for warmth. It was difficult to , and maintain sanitary conditions. Chicks defecated over the side of the nest quickly developing quite a range. Initially, however, all the waste ends up in the nest and it was necessary to change the nest towel following each feeding.

Feeding

At even the first feeding, the chick will actively swallow formula. Care must be taken not to over feed the chick. Although they may continue to call and bob their heads, it will not be easy to insert the feeding tube. After feeding, the youngest chicks went straight to sleep, while older

chicks will stay up for a while and were at their noisiest. Each chick generally defecated at feeding time.

Growth

Based on available data, hand-reared birds never reached weights comparable to parent-reared birds at 7 and 14 days of age (Figure 1). Data points include the average of all birds hand-reared during that year. The first fledgling collected in 1982 was approximately 14 days old. The first chick hand-reared from day one of the 1987 hatch achieved the highest weight comparable to adult-reared chicks or 73 % of their weight. A chick hand-reared from approximately 6 days of age in 1988 did equally well, achieving 76% of adult-reared chick weight by day 14.

Birds were not hand-reared again until 1993. These birds these chicks achieved only 30 % of the parent reared chick weights at 7 and 14 days of age. Growth rates improved over time with the birds hand-reared in 1997 reaching 60% of the parent reared weights at 7 and 14 days.

By 1997, hand-reared birds were consuming as much 100 % of their body weight per day in formula during these first 14 days. The 1993 birds had only been consuming 40 % of their body weight in formula daily during this same time. Solids including, lake smelt, Bird of Prey diet, and Flamingo pellets were not introduced to the 1997 birds until 18 days of age. At 30 days of age these birds were still consuming 30- 40 % of their body weight in formula daily. Solid food consumption at this time was approximately 6 % of body weight daily. It is possible the quicker incorporation of a solid diet into the rearing of the 1982, 1987, and 1988 birds accounts for the differences in body weights. The solid food items are higher in energy content than the liquid diet (Table 3.)

Two of the four chicks died, one on day 3 and one on day 4. Cause of death was not clear. The two that survived were weighed until day 15 (Figure 1).

DISCUSSION

Collection

Spoonbills typically lay 3-4 eggs. No more than 50% of eggs or chicks from anyone nest were taken during the collection process and usually only one was taken per nest regardless of the total number. Each year, in conjunction with the USFWS, the zoo collected from a different area along the Texas coast in hopes of getting specimens from distinctly different gene pools. A genetics study in progress with the University of North Texas will eventually determine if this method was successful.

Feeding

It is easier to feed using several 20 cc syringes than to struggle with a 60 cc syringe when the chicks are able to consume 60 ccs or more per feeding. It requires one hand to steady the chick. The chicks have developed a good feeding response by day 4, sitting up on the hocks, head and neck extended up, head bobbing and vocalizations of a high shrill triill.

The plunger may be difficult to work on the 60 cc syringe depending on the size of the feeder's hands. It is important to closely monitor the rate at which the formula is fed. If formula goes in too quickly, it will come right back out. The chick will let the feeder know when it is full. The neck can be observed swelling as the formula goes down.

Sanitation

It is important to clean the bill. Because the chicks often sleep with the bill on the edge of the nest, feces can adhere to the bill and actually cause abnormal growth. A period as short as overnight is enough to cause a problem build-up.

Growth

During the first year of hand-rearing, growth of the chicks was limited to 10% of the total body weight daily (Figure 1). The first year chicks rarely seemed satisfied at the end of a feeding. Based on observations of parent-reared chicks in the collection, the hand-reared chicks were nearly half the size of those parent-reared. Hand-reared chicks were weaned at the proper age (approximately 40 days) but took a couple of months to catch up in terms of size. The second year, chicks were fed until they indicated they had enough. The weight gains were much more rapid, although they were still not at the rate of the parent-reared birds (Figure 1). During the following years, amount of formula offered continued to be increased.

While a more concentrated formula may facilitate greater weight gains, increasing the concentration of the current formula to full strength in less than 10 days resulted in difficulties in keeping the birds hydrated. An African spoonbill (*Platalea alba*), hand-reared at the North Carolina Zoological Park, was introduced to solid food (Bird of Prey diet and Flamingo Fancier) at 10 days of age and achieved weight gains similar to parent-reared birds through 28 days of age (Reininger, 1997). The African spoonbill was fed chopped pink rats at 70 %, of body weight daily up until the adult diet began to be incorporated at day 10. This bird was completely on the adult diet by day 15 consuming 50 % of its body weight per day. The hand-reared roseate spoonbill did not begin consuming the adult diet until days 18 to 21. At 14 days of age the 1997 hand-reared roseate spoonbills were 60 % of the body weight of the parent-reared bird; and were still consuming formula at a rate of 80 % of body weight per day. The hand-reared birds did not begin consuming the adult diet until days 18 to 21.

The 1997 birds were still partially hand fed at 80 days of age. Until this year, chicks were always feeding entirely on their own by day 40. In 1997, fish was simply not offered to the chicks during the weaning. Fish was eliminated from the diet of the adult spoonbills earlier in the year. Rather than accustom the chicks to fish and remove it from the diet, it was not offered. It is not clear how fish may play a role in the extended time taken for the 1997 birds to eat on their own compared to birds from previous years.

Regardless of growth rate during hand-rearing, all birds hand-reared at Fort Worth were able to attain adult weights though this process took longer than that in parent-reared birds.

Compared to the hand-reared chicks problems encountered with parent-reared chicks in the zoo flock were: 1) mortality was higher in the flock situation; and 2) the chicks were very mobile and

impossible to weigh after about day 15. It is not clear why mortality would be higher among chicks in the flock situation. Those chicks hand-reared we kept in a controlled environment thus avoiding weather changes or temperature extremes. It was much easier to observe the hand-reared chicks for signs of weakness.

CONCLUSIONS

The Fort Worth Zoo has successfully hand-reared 32 spoonbills over the past 15 years. Diet modification including feeding volumes up to 100 % of a chick's weight daily in formula has facilitated increased growth rates. Hand-reared chicks do not attain weight gains comparable to parent-reared chicks. However, growth rates over time have increased to 60 % of parent-reared weight by day 14. All hand-reared birds reach adult size though at a slower rate than parent-reared birds.

To facilitate increased genetic diversity in the captive collection of roseate spoonbills in North America, the zoo has collected eggs and fledglings from free-ranging birds over the past 15 years. A successful hand-rearing protocol has facilitated the incorporation of new individuals. A genetic study in progress will help determine if these collecting expeditions have been successful with regard to genetic background.

REFERENCES

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Table 1. Fort Worth Zoo spoonbill hand rearing formula, ingredients by percent weight on an as fed basis.

Ingredient	Percent of the diet
Lake smelt	11.10 %
Flamingo diet-1	11.10 %
Bird of Prey-2	11.10 %
Shrimpmeal	2.22 %
High protein dog chow-3	1.11 %
Vionate-4	0.30 %
Calcuim carbonate	0.15 %
Water	62.92 %

1-Flamingo diet- Mazuri flamingo diet, Purina Mills, Inc. 1401 Hanley Road, St. Louis, Mo 63144

2-Bird of Prey diet-Animal Spectrum, Inc., P.O. Box 721, North Platte, NE 69103-0721

3-High protein dog chow-Ralston Purina, Inc., St.Louis, MO 63164

Vionate-ARC Laborities, 4280 N.E. Expressway, Atlanta, GA 30340

Table 2. Nutrient content of Fort Worth Spoonbill formula on a fed basis.

<u>Nutrient</u>	<u>Level in the Diet</u>
Dry Matter	20.2 %
Gross energy	0.96 Kcals/g
Crude protein	8.28%
Fat	2.02 %
Calcium	0.77 %
Phosphorus	0.35 %

Table 3. The gross energy content of some foods fed to spoon bills on an as fed basis

<u>Food item</u>	<u>Dry Matter</u>	<u>Gross energy</u>
Fort Worth formula	20.2 %	0.96 Kcals/g
Lake smelt	20.1 %	0.98 Kcals/g
Bird of Prey diet-1	37.8 %	2.14 Kcals/g
Flamingo pellets-2	95.7 %	4.23 Kcals/g

1-Flamingo diet- Mazuri flamingo diet, Purina Mills, Inc. 1401 Hanley Road, St. Louis, Mo 63144

2-Bird of Prey diet-Animal Spectrum, Inc., P.O. Box 721, North Platte, NE 69103-0721

Fig.1 Growth of hand reared (HR) and parent reared roseate spoonbills (Ajaja Ajaja)

