

Hand-rearing Techniques for **IBIS**

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The tremendous worldwide technological and social changes of the past one hundred years have placed unbearable pressures on our planet's wildlife. The growing list of extinct and vanishing species leaves the serious aviculturalist with no choice. Successful and sustainable captive reproduction seems undeniably necessary for the long-term survival of many animal forms. At Brookfield Zoo we regard hand-rearing as one of many tools to be utilized in the quest for successful captive propagation programs. Hand-rearing has been utilized to achieve two distinct and specific goals. First, among species known to be indeterminate layers, eggs may be removed from the nest inducing the female to produce greater than normal quantities of eggs. Successful hand-rearing techniques will thereby increase that species' reproductive success. Secondly, given instances of abandoned nests or high neo-natal mortality, successful hand-rearing techniques may be used to increase a species' reproductive success. Increased captive reproduction for the broadest possible spectrum of avian species must be the final goal. In that vein we would to communicate preliminary results from our hand-rearings of two related species.

The family *Threskiornithidae* — the ibises and spoonbills — has long captured the interest and imagination of man. Artistic renderings depicting the distinctive bill shapes characteristic of this avian family have been discovered decorating the walls of Neolithic caves. The very name Sacred Ibis is derivative of the veneration once bestowed upon an ibis species. Hieroglyphics adorning ancient Egyptian monuments and artifacts frequently depict the easily recognizable silhouette of an ibis. The Sacred Ibis, often associated with the Egyptian deity Thoth, was frequently mummified and placed in elaborate tombs and pyramids.

Yet this fascination, which has benefited the artistry and mythology of man, has held few benefits for its original stimulus. The affection of man has been selective and fickle. A small number of ibis species have appeared in avicultural or zoological collections. And an even smaller number have responded to attempts at captive propagation. But taxonomists recognize over twenty species of ibis representing many varied geographical and ecological adaptations. Despite the thousands of years of selective attention from man little is known of many of these animals. Like so much of the world's flora and fauna, ibises must be viewed as endangered and vanishing animals. It is perhaps a prime irony that the so-called "Sacred" ibis, associated in Egyptian

mythology with wisdom and fertility, is now extinct within Egypt — a victim of habitat destruction. In a paper presented before the Colonial Waterbird Group, Dr. George Archibald and Dr. Sharon Lantis of the International Crane Foundation report that, "Today the (Japanese) crested ibis is perhaps the world's most endangered avian species with but eight survivors remaining in the wild in Japan, two in South Korea, and an undetermined number (if any) in China, North Korea, and the USSR. The Japanese population has not reproduced since 1973." Clearly there is a need for effective captive propagation and avicultural expertise for this avian group.

Although the world of taxonomy is renowned for its disagreements and revolutions, it is generally held that the subfamily *Threskiornithidae*, the ibises, is comprised of twenty-six species with nearly global distribution. The ibis is a moderate-sized bird with long legs and unwebbed feet suitable for wading. The most characteristic feature of an ibis is its long, slender, decurved bill. The Chicago Zoological Society currently maintains two species of ibis at its Brookfield Zoo. The Sacred Ibis *Threskiornis aethiopicus* has long been a resident of the Aquatic Bird House, with our current flock containing some individuals approaching thirty years of age. The adult Sacred Ibis exhibits primarily a white plumage, although soiling may compromise the purity of the whiteness. The head and neck area are bare skin, a dull black in color. The tips of the primary and secondary feathers are also black. Additionally, blue-black decorative scapular plumes are evident on birds in breeding condition. The Sacred Ibis occupies tropical and sub-tropical habitats, occurring most frequently by inland lakes and rivers and in cultivated areas. Geographically the extent of its distribution is somewhat disputed. It is primarily associated with African fauna, but also occurs in western Asia and southwestern Pacific islands.

In 1977 Brookfield Zoo expanding its collection by acquiring a group of six Hadada Ibis, *Hagedashia hagedash*. In appearance the Hadada is a medium-sized ibis with grey-brown body plumage. The wing coverts are an iridescent green and it bears a white streak on each cheek. The Hadada is primarily a bird of open forest and savannah. Its range seems to be limited particularly to wooded streams and watercourses, although it has been observed in coastal mangrove swamps. Geographically its prime occurrence is along the southeastern portion of Africa, but it crosses the continent equatorially to the west coast. Despite the fact that the Hadada occurs commonly throughout its range, it has seldom been kept or exhibited in zoological gardens. In 1978 Brookfield Zoo became the first institution to have this species successfully reproduce.

It has been our experience that captive ibis reproduction is prone to the same prime nestling mortality factors attributed to wild populations. Skead (1951) and Raseroka (1975) report that Hadada Ibis young apparently often fall to their death from rudely constructed nests. Urban (1974) attributes nest falls as a mortality factor in selected Sacred Ibis populations, with nest abandonment playing a prime role in populations not nesting in high trees. Predation was not reported as a significant nestling mortality factor. Ibises are indeterminate layers and therefore we have attempted to maximize the reproductive rate and success of our ibis collection by supplementing the natural parent rearing process with artificial incubation and hand-rearing. In that vein, we have developed the procedures recounted below.

All ibis eggs removed for artificial incubation are placed in forced air incubators and maintained at 97.5°F. with wet bulb reading of 80.0°F. The eggs are automatically rotated 90 degrees every hour. After pipping eggs are transferred to a glass-fronted hatcher which allows closer observation. Contrary to figures in current literature (Urban, 1974, reports 28-29 days; Skead, 1951, reports approximately 26 days; Raseroka, 1975, reports 25-28 days) all our eggs have hatched following a 22 day incubation period. All eggs have hatched unassisted, with most chicks completing the hatch within 24 hours of pipping. Hatching weights have generally ranged between 40 and 50 grams. Immediately after hatching the abdominal areas of the chicks are swabbed with an iodine solution to prevent the possibility of infection originating in the umbilical area. Ibis chicks are best described as semi-altricial. That is, although ptilopaedic, they are

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nidicolous with the eyes remaining effectively closed for about five days. The chicks are provided with a substrate of small twigs arranged to simulate a nest cup within a stainless steel bowl. Although the use of the twigs poses minor hindrance to the maintenance of optimum hygienic conditions it is felt that the provision of a natural substrate is a critical factor to proper development. Ibis chicks have, in the past, displayed considerable difficulty in keeping their legs positioned beneath themselves on smooth surfaces. Upon hatching the chicks are not capable of standing, but are capable of grasping lightly with the feet. The body weight of the chicks rests on the intratarsal or heel joint, which develops a characteristic protective pad. The chicks are almost immediately capable of limited locomotion, which is achieved by shuffling along the heel joints. The young ibis quickly express this limited mobility by moving toward a food source and by backing to the edge of the nest to defecate. It is the latter inclination which apparently contributes to the high nestling mortality rate.

Ibis feed their young by regurgitation. We attempted to replicate the physical consistency of regurgitated material in our hand-rearing diet. The diet is based upon the three basic ingredients fed the adult birds. Dry dog food (Gaines Dog Meal: General Foods Corporation), a commercially prepared bird of prey diet (Zu/Preem Bird of Prey Diet: Hills Division, Rivana Foods, Inc.), and smelt *Osmerus* sp. (deboned, skinned, and eviscerated) are placed in a blender with sufficient water to produce a thick paste upon blending. This mixture is further supplemented with a powdered multivitamin additive (Vionate: E.R. Squibb & Sons, Inc.), thiamine hydrochloride, and powdered bone ash. Ibis chicks exhibit a rapid rate of growth. (Please see Figure 1.) Associated with this rapid growth is a

dramatic extension of the tibiotarsal and tarsometatarsal bones. Particular care must be given to calcium supplementation to meet these extraordinary growth demands. The mixture is not chemically predigested.

Initially the diet was prepared every 48 hours and maintained in a refrigerated state. Dr. Frank Wright, formerly of the Brookfield Zoo veterinary staff, subsequently suggested that a more optimum level of diet sanitation could be maintained by quick freezing the diet preparation immediately after production. Our current procedure is to immediately transfer the blended paste to pre-sterilized (ethylene oxide process) and sealable plastic bags. The material is then quickly frozen and maintained in that state until needed. This procedure, in addition to providing a high level of hygiene, is much more flexible and easily adaptable to feeding various numbers of chicks. Immediately prior to a scheduled feeding a bag containing an appropriate amount of prepared diet is thawed in heated water. The warmed paste is then mixed with sufficient hot water to produce a semi-liquid consistency of about body temperature. It is believed that the temperature of the food material is a critical factor. In initial feeding procedures chicks were observed to reject food which had cooled. Additionally one must be aware that the feeding of chilled food could result in a fatal lowering of the body temperature of young birds not yet capable of homeostasis.

It is important to differentiate between hand-feeding and force-feeding. Although it would have been feasible to force-feed the ibis chicks, it was believed to be more desirable to elicit begging and feeding behavior in as normal a manner as possible. In the wild state the chicks feed by swallowing regurgitated food taken from the parents' mouths. Our feeding routine has been developed to reproduce

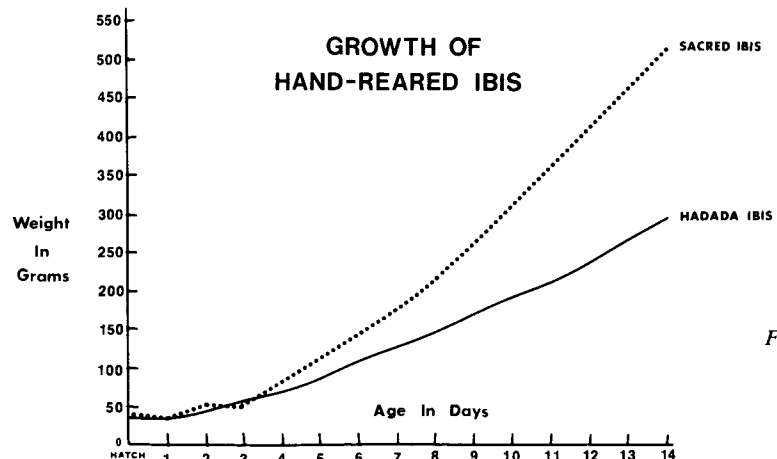


FIGURE 1

Mean weights are represented for limited samples of hand-reared Sacred ($n=5$) and Hadada ($n=2$) ibis. All weights were taken at 0800 prior to the day's first feeding.

the broadest spectrum of natural behavior possible under the abnormal circumstances. Toward that end the young birds have been fed in the following manner: A hand is held before the chick to tease or elicit begging behavior. Particularly during the first five days actual contact with the bill will be necessary to stimulate the still blind bird. The young ibis generally respond with tapping movements directed to a gap between the fingers. The chick then inserts the bill between the fingers, opens its mouth, and initiates swallowing movements. At this point, a feeding spoon, specially curved for this purpose, is introduced between the open mandibles and the chick is allowed to take food off the spoon. At no point is food forced on a healthy chick. Feeding ceases when begging behavior is still present, but has significantly weakened and the chick does not present the appearance of a full crop. A couple of minor choking episodes have been precipitated when food particles have lodged in the glottis. It is recommended that inspection of the glottis and oral cavity become a regular part of the feeding procedure. Feedings are scheduled at 0800, 1100, 1400 and 1700. During the first two weeks additional feedings are scheduled at 0200 and 2200. These additional

feedings are designed to prevent or minimize overnight weight loss. After roughly five days, the birds become more visually responsive and slowly begin to orient toward the spoon itself as a food source, gradually eliminating the need for hand teasing.

The young birds are maintained in the glass-fronted hatcher until they are between 15 and 20 days of age. During this period the temperature is gradually reduced from 95.0°F. to 80.0°F. At this point they are placed in larger brooder boxes equipped with heat lamps. They remain in these boxes until feather growth is complete and wing exercising and pre-flight attempts are evident. They are then transferred to a temporary introduction cage in the exhibit housing the adult birds and are prepared for release.

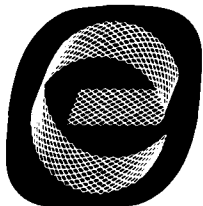
As might be expected, individual and specific differences have been noted. Each chick has exhibited individual idiosyncrasies and recognizable personality traits. As a general note, the Sacred Ibis has been the more aggressive and faster developing species. Our initial hand-raised Hadada (names Wobbles) required much individual attention and remains an imprinted bird in the classic sense of the word. A keeper entering the exhibit is often greeted



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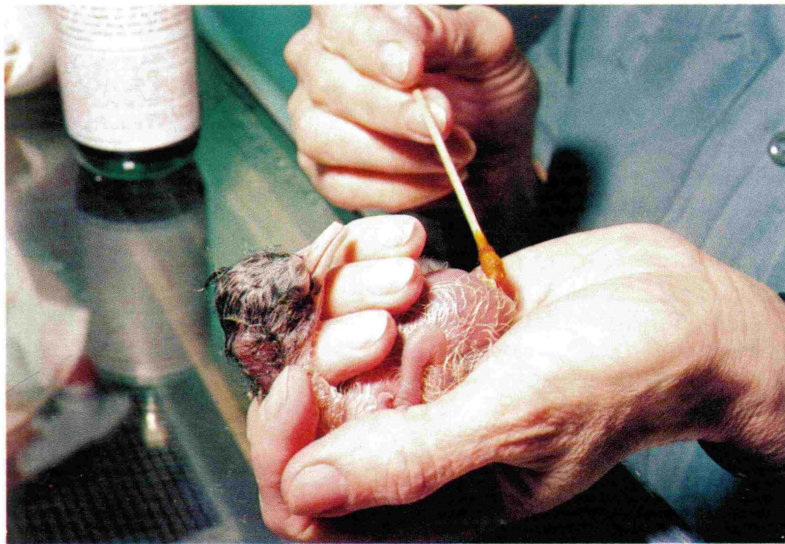
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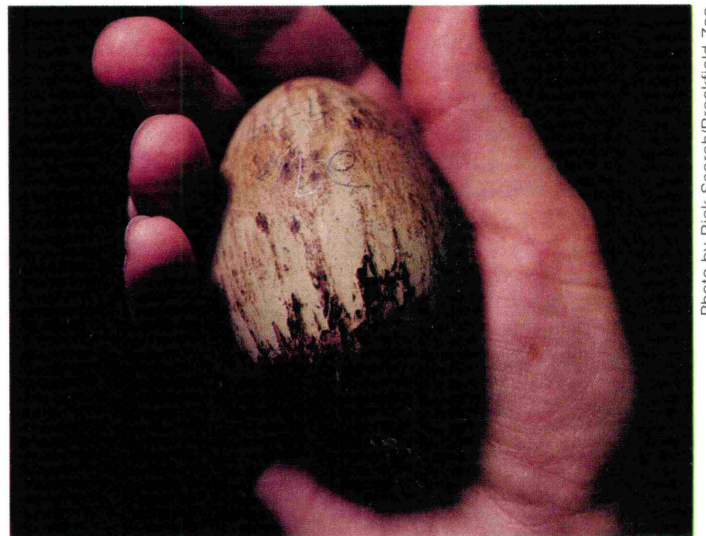


Photos by Rick Search/Brookfield Zoo

Adult Hadada Ibis in Aquatic Bird House, indoor flight cage.



Newly hatched Sacred ibis chick's umbilical area is swabbed with iodine solution.



Hadada ibis egg, weighed and numbered for artificial incubation.

Photo by Rick Search/Brookfield Zoo



Hadada ibis chicks.

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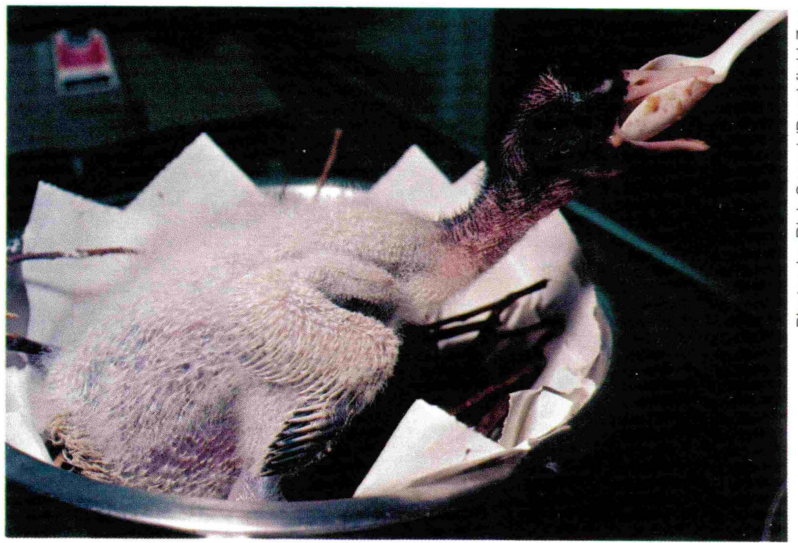
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"Wobbles" our first captive raised Hadada ibis at approximately 3 weeks of age.



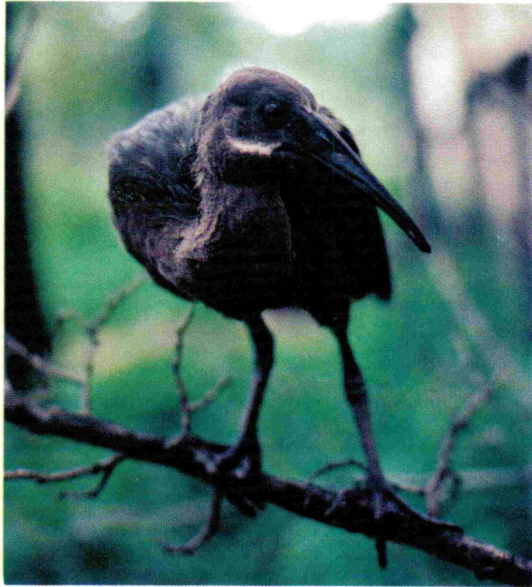
Photo by Mike Greer/Brookfield Zoo

Experimental feeding of a Hadada ibis chick using hand puppet.



Photos by Rick Search/Brookfield Zoo

Spoon feeding Sacred ibis chick.



Photos courtesy of Brookfield Zoo

Hadada ibis juvenile approximately 3 months of age, in Aquatic Bird House, outdoor flight cage.



Photo by Rick Search/Brookfield Zoo

Ralph Piland feeding Sacred ibis chick.



Photos courtesy of Brookfield Zoo

Adult Sacred ibis in Aquatic Bird House, outside flight cage.

by an ibis using an unnervingly direct flight path that avoids an interspecific collision only by a last minute swerve to nearby rockwork. A preoccupied keeper may be startled to find an unattended ear investigated by a long, and often wet, beak. During the twice daily feedings of crickets to the birds in the indoor flight cage, the public is often amused to see a long-billed bird tugging insistently and enthusiastically on the keeper's trouser leg. What is often misunderstood is that he is not seeking food, but rather companionship. We are now experimenting with the use of hand puppets during feeding periods in an attempt to reduce imprinting intensity.

Imprinting has not been a problem with the Sacred Ibis. Two factors possibly contribute to this situation. Birds hand-reared with siblings seem to develop more natural behavior patterns than individually raised birds. Additionally, the Sacred Ibis, as opposed to the more solitary Hadada, lives and breeds in colonial groupings. This loose social structure aids in the quick acceptance and social normalization of hand-reared birds. We have noted hand-reared birds becoming sexually mature at 18 months of age, constructing nests, and producing fertile eggs.

In conclusion, we feel that these artificial rearing techniques have contributed positively to short and long term management of our captive ibis flocks. We continue to feel that intense and coordinated husbandry techniques may be applied profitably to a broad diversity of avian species. It would indeed be tragic if one day only mythological stories and mummified remains were left to remind us of our avian interests.

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