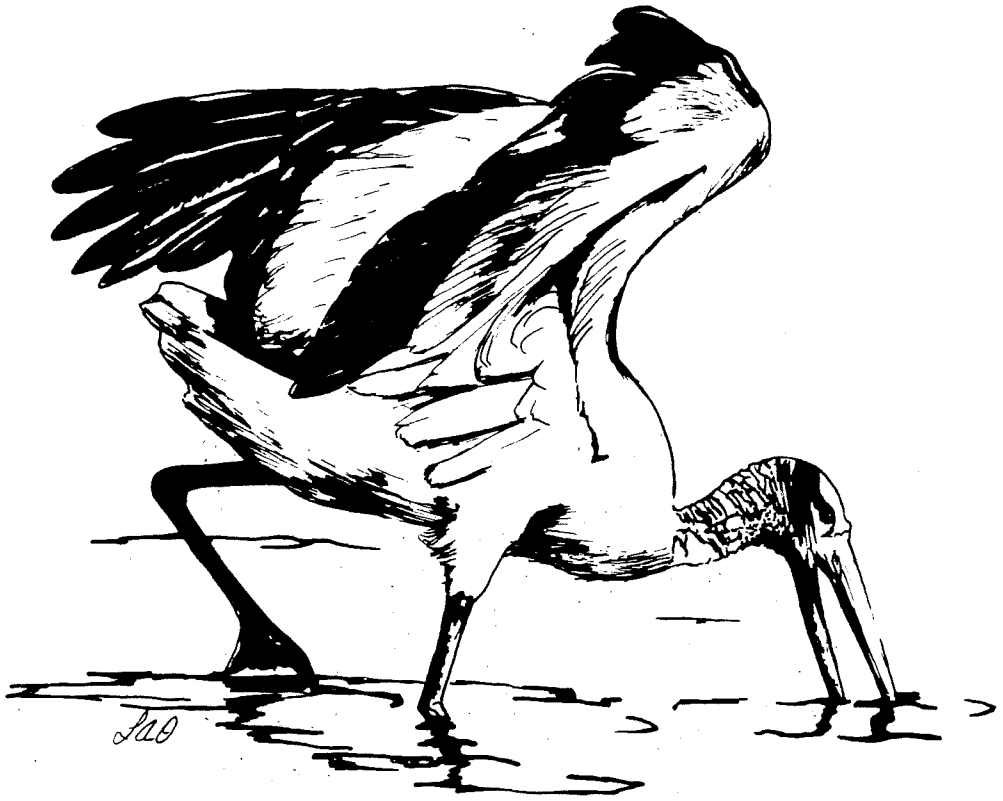
PARTICIPANTS AT THE WORKSHOP ON CONSERVATION AND CAPTIVE PROPAGATION OF STORKS



OCTOBER 26–29,1986

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"Conservation and Captive Management of Storks"

I. Introduction.

Summary of Workshop:
- Objectives
- Participants
- Spinoff - Stork Interest Group.

i. Title Page: Title
Sponsors,
Edited by: M.C. or
"Stork Interest Group"

ii. Endorsement by AAZPA.

iii. Table of Contents,

II. Stork Classification

- brief outline
- behavioral similarities (ref. to Kahl)
- ecological.

III. An Overview of Storks in Captivity.

- history, attitudes.
- general principles
  - colonial vs. solitary.
  - gregarious.
  - shy vs. tame.
  - interbreeding problem.
- reasoning for lumping spp. by genus for gen. mgmt.

IV. Species Accounts (by Genus)

A. Genus: Anastomus
B. Genus: Ciconia
C. Genus: Ephippiorhynchus & Jabiru
D. Genus: Leptoptilos
E. Genus: Mycteria
F. Special Case: Balaeniceps.

E. GENUS: Mycteria (example).

Species:	M. americana	Am. Wood Stork
	M. cinerea	Milky Stork
	M. ibis	Yellow-billed Stork
	M. leucocephalus	Painted Stork

1. Introduction to genus Mycteria
   a. general biology (behavior, ecology, habitat pref., etc.)
   b. general management recommendations.

M. americana
   a. distribution and status
   b. status in zoos (geographical breakdown by continent)
   c. history in zoos
   d. breeding in captivity.
   e. management considerations
      1. housing/nests
      2. diet
      3. breeding
      4. other mgmt. recommendations

V. Recommendations

* species which need attention.
* research.
*

VI. References -
~~Pertinent~~ Literature (pertinent).

Appendix A:
* copy of Questionaire.

Appendix B:
Results of Questionaire.

Stork Workshop - St. Catherines (Oct. 86)

Objective → document summarizing mgmt. techniques for Ciconiids in captivity, with reference to status in wild.

Conservation & Captive Mgmt. (Propagation) of Storks
Results of Workshop held Oct. 86, St. Cath. Island, GA.

FORMAT.

I. Introduction
- Summary of Workshop - who & what why?

Objectives.

1.) increase awareness & interest in this little-known group of birds.

2.) pool information on status in wild & captivity of all stork spp.

3) discuss known mgmt. techniques for storks based on experiences of various zoos.

4.) increase communication & coop. among stork researchers & zoos working with stork spp.

5.) to create a document to help zoos develop effective mgmt. activities for storks.

Spinoff → "Stork Interest Group" Questionaire.
↓
Summary of results (C. King). → See Izy....
↳ Follow-Up & Future.

II. Principals of Stork Management

A. History of storks in captivity
   * Attitudes & philosophy
   * Traditional mgmt. / spp. held.

B. Overview of stork management.
   * general concepts
   * generalized management strategies.
   * introduction to species accounts & why this technique was selected.

III. Accounts of Species (by Genus)

II. A. The stork family -
   Classification, behavior, similarities, affinities.

WOOD STORK SPECIES ACCOUNT

(Mycteria americana)

I. Conservation Considerations

Status: Regionally threatened (U.S. and Caribbean Basin)

The Wood Stork population in the United States has decreased from an estimated 25,000 - 30,000 pairs early in this century to approximately 6,000 breeding pairs today. This trend prompted the U. S. Fish and Wildlife Service to list the Wood Stork as endangered and a Recovery Plan has been completed.

Outside the U. S., the situation is not yet so critical. In 1971, the National Audubon Society estimated the breeding population of Mexico to be at least 15,600 pairs, the majority of these occurring in a single colony (approx. 10,000 pairs) in Campache State. The species occurs on both the Pacific and Gulf coasts of Mexico. The breeding population of Wood Storks in Belize no longer exists. Only small colonies are known from other Central American countries, the largest being an isolated colony of 3,000 pairs in western Costa Rica. Over 9,000 Wood Storks were counted in an aerial survey of Venezuala in 1983 and the population appears to be stable. The largest population of this species is in the Pantanal of southwest Brazil, eastern Bolivia, and northern Argentina. The population appears healthy, but its future seems threatened by hunting, disturbance at the colonies, and accelerating land conversion to agriculture.

II. Status in Zoos

Brownesville	0.0.2 (0)
Gainesville	0.0.1 (0)
Metrozoo	0.1.0 (0)
Medellin	0.0.1 (0)
Miami Museum of Science	1.1.0 (0)
Total held	1.2.4 (0)
Captive born	0%
Wild born	86%

Wood Storks are also exhibited in South American zoos. In 1984, there were 21 Wood Storks in seven zoos in Brazil (Ellis pers. comm.)

III. History in Zoos

A. Management

Traditionally, Wood Storks in U. S. zoos have been pinioned and kept simply for display purposes rather than captive

breeding.

B. Breeding

There are only two recorded breeding records for Wood Storks in captivity:

! 1932-Wood Storks bred successfully in the Washington Park Zoo in Milwaukee, Wisconsin (Heller 1932).

1986-three eggs laid by 3-year old storks in Miami Museum of Science-two eggs were infertile-the third hatched, but the chick died of a bacterial infection within a week of hatching (B. Mealy, pers. comm.)

Courtship behavior has been observed among the Wood Storks in the Brownsville Zoo.

IV. Management Considerations

A. Housing

This varies from small (40'L x 25'W x 18'H) flight cages (Miami Museum of Science) for full-winged birds to large (150'L x 45'W) open-air exclosures for pinioned birds (Brownsville). The latter are kept in a "natural" exhibits with mixed flocks of pinioned waders. Elevated nesting and perch sites (snags, platforms, etc.) should be provided.

B. Diet

At the Miami Museum of Science each stork receives 2.0 to 2.5 pounds of fish (smelt, herring or capelin) daily, supplemented with Vitamin B and Niacin (and Vitamin E twice each month). At the Brownsville Zoo, they are fed "Bird of Prey" feed, supplemented by fish which the birds catch in a waterway running through the exhibit.

C. Other

Bacterial and fungal infections have resulted in the deaths of immature captive storks at the Miami Museum of Science.

V. Breeding Considerations

A variety of nest materials should be provided since it plays an important role in courtship. Nest "trees" or platforms should be provided. If the storks are pinioned, a ramp or series of perches may be necessary for the birds to get to the nest site.

Research is needed on the effects of pinioning on the breeding of these birds. The ability to fly may be a necessary component of courtship. Study on the effects of the presence of other waders might also be suggested for this colonial species as

well as the effects of increasing the food supply during the bird's "normal" breeding season.

VI. Literature Cited

Heller, E. 1932. A record of the first nesting of the American Wood Stork in captivity. Bull. Wash. Park Zool. Soc., Milwaukee 3(2/3):2-4.

MILKY STORK

(Mycteria cinerea)

I. Conservation Status

Status: Endangered

The situation with this stork is only now starting to become known. Until 1984, no systematic surveys had been undertaken. A series of studies between 1984 and 1986 have revealed locations of non-breeding concentrations. Researchers have estimated the world population at approximately 5,000 individuals, based on aerial surveys in Malaysia, Sumatra, and Java, where the majority of birds occur. It has been suggested that there about 4000 birds in Sumatra, 500 in Java, 200 in Sulawesi and 150 in peninsular Malaysia. The major breeding site in Sumatra has not been located, but appears to be in the southeast section of the island. This region is threatened with plans for a human translocation project. There appears to be no breeding in Java (except for one small island, Pulau Rambut), due to hunting and disturbance. Breeding may occur in Sulawesi and southern Borneo.

II. Status in Zoos

none held in U.S. zoos

Vogelpark Walsrode recently received __ birds that had been caught in the wild. It is assumed that birds are held in Jarkata Zoo in Indonesia as well as at the Jerome Bird Park in Singapore.

III. History in Zoos

A. Management

Unknown

B. Breeding

Unknown, but it has probably not bred in captivity.

IV. Management Considerations

A. Housing

An enclosure should be a minimum of 45'L x 20'W x 20'H, which would be sufficient for either full-flighted birds or flightless birds. The enclosure should include standing or slowly moving water where the birds can wade and, if live fish can be provided, where the birds can forage. Tall, free-standing trees should be included as places where the

birds can perch or build their nests. The trees should stand out.

It was suggested that if the aviary is a flight cage, it should be even larger than the minimum suggested size in order to accommodate the large wing-span and gliding flight. If a large area cannot be provided, then the birds should be deflighted. Perches should be set so the birds can jump from one to another, and this is particularly important for pinioned birds. Such perches may allow flightless birds to reach high nesting platforms.

B. Diet

The Milky Stork feeds primarily on fish in the wild. The best diet in zoos would be similar to that recommended for other species of Mycteria.

C. Other

V. Breeding Considerations

The Milky Stork is a solitary to colonial breeder in the wild. The largest colony recorded included 74 nests, compared to several thousand Wood Storks in Mexico. Sociality is probably not important in stimulating breeding, and group size is probably not an important consideration. Tall, free-standing trees should be present for nest-building.

VI. Literature Cited

YELLOW-BILLED STORK

(Mycteria ibis)

I. Conservation Status

Status: Stable

The population of this widespread species appears to be stable, although further research may reveal localized problems.

II. Status in Zoos

Knowland	1.0.1 (0)
Metrozoo	1.2.3 (3)
Audubon	2.2.0 (0)
St. Louis	1.1.0 (0)
San Antonio	1.1.0 (0)
Total held	6.6.4 (0)
Captive born	18%
Wild born	43%

San Diego Zoo imported 40 birds in late 1986. These birds have not yet been recorded in ISIS. The captive status in the rest of the world is unknown, but it is thought that few birds are held in captivity.

III. History in Zoos

A. Management

Historically these birds have been kept in groups, often with other species such as large mammals. In most cases they have been pinioned and no sex determination was made.

B. Breeding

Several unsuccessful nesting attempts, including three unsuccessful hatchings, had been made at the Miami Metrozoo until three young were raised successfully in 1986. A synopsis follows:

14 January	- pair bond obvious
29 January	- searching for nest site
02 February	- bill clacking, necking and lacing (continued daily until eggs were laid)
05 February	- first copulation (observed several times per day until eggs were laid
13 February	- initiated nest building

14 February	- first egg laid
15 February	- second egg laid
16 February	- third egg laid
16, 17, 18 March	- hatching of all three eggs
02 May	- chicks ventured off the nest on foot
09 May	- chicks flying on and off the nest, but remained in the nest tree
14 May	- first flight away from the nest
20 May	- left nest site; returned to the nest to roost at night
23 May	- juveniles eating from the feeder on their own

IV. Management Considerations

A. Housing

In the Wings of Asia exhibit at Miami Metrozoo, they are housed in a flight cage of 1 1/2 acres and 65 feet tall. This allows them room to fly and high perches. In severe weather conditions they tend to seek the highest perches rather than shelter. There is no information on the types of enclosures used at other zoos.

An enclosure should be a minimum of 45'L x 20'W x 20'H. This size will be sufficient for either full-flighted birds or flightless birds. It was suggested that if the aviary is a flight cage, it should be even larger to accommodate the large wing-span and gliding flight. If a large area cannot be provided, then the birds should be deflighted. Perches should be set so the birds can jump from one to another, and this is particularly important for pinioned birds. Such perches may allow flightless birds to reach high nesting platforms.

Northern-latitude zoos should consider Yellow-billed Storks as a tropical species and therefore accommodate them in winter quarters.

B. Diet

At the Miami Metrozoo, the daily diet per individual consists of

150 g	Bird of Prey diet
135 g	Meat strips
200 g	Herring
70 g	Smelt

Live food may be an important consideration because of the tactolocation method of feeding. Live food does act as a stimulus but the storks can be conditioned to eat from a container placed over or in water. They prefer whole smelt

less than 6 inches long, or larger bony fish, such as herring that have been filleted.

When feeding frozen fish, a vitamin supplement of B-1 (thaminase) should be added. A good grade vitamin supplement should be included in the diet.

C. Other

Before the success breeding at the Miami Metrozoo in 1986, three clutches hatched but the chicks died while still very young. In 1985 an adult dominant male died and was found to be carrying a septosemic bacteria. This may have been passed to the young. There have been no problems since the death of the dominant male.

V. Breeding Considerations

Yellow-billed Storks are very social and it was suggested that at least 2 pairs are needed to stimulate successful breeding. Other social colonial nesting birds, such as ibises, seem to add to the social group. The number of birds depends on the size of the enclosure and the type of nesting structure. At the Miami Metrozoo there was a positive interaction/competition between species. Sacred Ibises and Eurasian Spoonbills were in close proximity during the storks' nesting period.

The Yellow-billed Storks in the Metrozoo preferred to build their nests in either the tallest tree that would support them or on a high artificial structure. This preference for a high nest should be considered.

These storks used a variety of nest materials. The building of the nest is an important pair-bonding activity and continues throughout the incubation and chick-rearing periods. The kind of nest material used changed throughout the breeding cycle. The size, length, temper, texture of the material changed throughout the nesting period, as well as whether the material was interlocking or not (forked). A branch was added at nest exchanges and added to the nest. After the chicks hatched, the nest grew rapidly, along with the chicks, and it was difficult to see the chicks from below.

VI. Literature Cited

PAINTED STORK

(Mycteria leucocephalus)

I. Conservation Status

Status: Regionally Threatened (Southeast Asia)

The bulk of this once widespread and abundant species is in India, where it occurs in small, scattered colonies. There is a healthy breeding population in Sri Lanka. This stork no longer breeds in Bangladesh and Burma, and has been reduced to approximately five breeding pairs at one site in southern Thailand. The species is rare in Indochina and may no longer breed there. No population estimate exists for this species.

II. Status in Zoos

Brownsville	0.0.1 (0)
Total held	0.0.1 (0)
Captive born	0%
Wild born	100%

Although rare in U.S. zoos, this species is well represented in Asian Zoos. Facilities in Colombo, Sri Lanka; Delhi, India; Rangoon, Burma; Bangkok, Thailand and Kuala Lumpur, Malaysia maintain breeding colonies. At least in the Delhi zoo there are both captive, pinioned birds as well as wild, free-flying birds.

III. History in Zoos

A. Management

At the Gladys Porter Zoo in Brownsville, Texas, the single Painted Stork resides on an island with Marabou and Abdim's Storks, waterfowl, swans and lemurs (Becky Faulk, Education Assistant Gladys Porter pers. comm.). The bird is pinioned.

At the Delhi Zoo, the captive storks were pinioned and exhibited in a 2-Acre lake dotted with islands with other Indian wading birds.

B. Breeding

Painted Storks have not bred in American zoos. However, the storks in Asian zoos breed well. At the Delhi Zoo, in 1971 there were 18 captive Painted Storks. Wild, free-flying birds established a colony in trees on some of the islands. Although the wild birds bred successfully, the captive birds did not breed. We do not know what nesting material and facilities were available to the pinioned birds.

IV. Management Considerations

A. Housing

An enclosure should be a minimum of 45'L x 20'W x 20'H, which would be sufficient for either full-flighted birds or flightless birds. The enclosure should include standing or slowly moving water where the birds can wade and, if live fish can be provided, where the birds can forage. Tall, free-standing trees or platforms should be included as places where the birds can perch or build their nests. The trees should stand out.

B. Diet

A diet of fish supplemented with raw meat seems to be adequate in sustaining breeding adults and rearing young. At the Delhi Zoo, the wild birds fed primarily on fish, but were also observed feeding on meat pieces and ofal. Hand-raised young rejected meat but ate fish willingly (Desai 1971). At the Gladys Porter Zoo the single bird is fed "Bird of Prey" diet, supplemented with chopped herring. The bird also feeds in a natural waterway that flows through the enclosure.

C. Other

V. Breeding Considerations

It may be necessary to maintain full-winged birds in large free flight enclosures to stimulate breeding because the aerial component of their courtship display may be very important. In a flight cage, there should be tall trees where the birds can build their nests. Painted Storks are very gregarious in the wild and it may be necessary to have at least two pairs to stimulate breeding.

VI. Literature Cited

Desai, J.H. 1971. Feeding ecology and nesting of Painted Storks Ibis leucocephalus at Delhi Zoo. International Zoo Yearbook 11:208-215.

ASIAN OPENBILL STORK

(Anastomus oscitans)

I. Conservation Status

Status: Regionally Threatened (Southeast Asia)

Colonies of this once abundant stork occur throughout India and Sri Lanka. The species has become rare in Bangladesh, Burma, and Vietnam. Only one large colony of approximately 10,000 pairs still exists in Thailand. This is undoubtedly the largest colony in all of Asia, and is vulnerable to coastal storms and natural degradation of nesting trees.

II. Status in Zoos

none

Vogelpark Walsrode 1.0.0

Total held
Captive born
Wild born

III. History in Zoos

A. Management

The single Asian Openbill is held together with 1.3 African Openbills in a Cuban Flamingo exhibit at Vogelpark Walsrode. The are the stork is living in measures 1600 m^2, containing a pool of 80 m^2. In winter the openbill storks are kept in a greenhouse, 12 m x 6 m.

B. Breeding

Successful breeding in captivity has not yet been reported.

IV. Management Considerations

A. Housing

The openbill storks at Walsrode are pinioned. Activity of other full-winged stork species suggests that this species should also be full-winged.

There seems to be no trouble keeping this species with other bird species as the openbill seems to be a social species.

B. Diet

The diet at Vogelpark Walsrode consists of sliced fish, chicks and additives such as Osspulvit and vitamins. On several occasions we have observed the openbills feeding on the flamingo diet. Kahl (1970) noted that large fresh-water snails (Pila globosa) were a principal food source, especially in raising chicks, in the wild. At the Vogelpark, the openbills have the opportunity to feed on land snails which are abundant.

C. Other

V. Breeding Considerations

Openbill storks are social and usually breed in colonies. We suggest that when attempting to breed them in captivity, they be kept in groups of several pairs. They may need the social stimulation.

VI. Literature Cited

Kahl, M.P. 1971. Food and feeding behavior of the Openbill Storks. J. Ornithol. 2:21-35.

AFRICAN OPENBILL STORK

(Anastomas lamelligerus)

I. Conservation Status

Status: Stable

This stork is widespread in small colonies throughout much of Africa. No population estimate exists, but it is abundant in Sudan and other countries.

II. Status in Zoos

none

Vogelpark Walsrode 1.3.0

Total held
Captive born
Wild born

III. History in Zoos

A. Management

The African Openbill Storks are held with an Asian Openbill Stork in a Cuban Flamingo exhibit at Vogelpark Walsrode. The are the stork is living in measures 1600 m^2, containing a pool of 80 m^2. In winter the openbill storks are kept in a greenhouse, 12 m x 6 m.

B. Breeding

Captive breeding has not been reported for African Openbill Storks. The African Openbill Storks at Walsrode did build a nest about 30 cm above the ground on a provided platform which consisted of an upside-down root of a tree. They used the same kind of nest materials that the ibises use at Walsrode.

IV. Management Considerations

A. Housing

The openbill storks at Walsrode are pinioned. Activity of other full-winged stork species suggests that this species should also be full-winged.

There seems to be no trouble keeping this species with other bird species as the openbill seems to be a social species.

B. Diet

The diet at Vogelpark Walsrode consists of sliced fish, chicks and additives such as Osspulvit and vitamins. On several occasions we have observed the openbills feeding on the flamingo diet. Kahl (1970) noted that large fresh-water snails (Pila globosa) were a principal food source, especially in raising chicks, in the wild. At the Vogelpark, the openbills have the opportunity to feed on land snails which are abundant.

C. Other

V. Breeding Considerations

Openbill storks are social and usually breed in colonies. We suggest that when attempting to breed them in captivity, they be kept in groups of several pairs. They may need the social stimulation.

VI. Literature Cited

Kahl, M.P. 1971. Food and feeding behavior of the Openbill Storks. J. Ornithol. 2:21-35.

BLACK STORK (Ciconia nigra)

I. Conservation Status

Status: Regionally Threatened (Europe, USSR)

The Black Stork is widespread throughout Europe and Asia, but is not abundant. A secretive and solitary species, they are vulnerable to disturbance and habitat (forest) loss. This stork is endangered in northern Europe, but appears to be more common in southern and eastern Europe. The Black Stork has been listed as endangered in the USSR Red Data list of birds. A small breeding population exists in several countries in southern Africa. These birds are vulnerable, being reproductively isolated from the northern population.

II. Status in Zoos

Ft. Wayne	0.0.1 (0)	NOTE: Mark Weldon says there is one pair
Brownsville	1.0.0 (0)	
Total held	1.0.1 (0)	
Captive born	50%	
Wild born	50%	

III. History in Zoos

A. Management

B. Breeding

Black Storks have never bred in U.S. zoos. However, they have bred successfully at the Vogelpark Walsrode and at the Tiergarten der Stadt in Nuremberg, Germany; at the Jerusalem Zoo and the Tel Aviv University Zoo in Israel; and at the Helsinki Zoo in Finland.

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

Black Storks are solitary nesters in the wild.

VI. Literature Cited

ABDIM'S STORK

(Ciconia abdimii)

I. Conservation Status

Status: Stable

This species appears to be abundant throughout its range in northern Africa. High mortality of banded birds in Sudan may be a result of heavy pesticide use in that area. Insects are the predominant food item of these storks.

II. Status in Zoos

Jacksonville	0.1.0 (0)
Baton Rouge	1.1.0 (0)
Audubon	2.2.1 (0)
Dallas	1.1.0 (0)
Milwaukee	0.0.6 (0)
Total held	4.5.7 (0)
Captive born	31%
Wild born	31%

III. History in Zoos

A. Management

The species can be managed either full winged in flight pens or pinioned in open exhibits. However, pinioned birds have been known to be capable of flight. The birds mix with other bird species without apparent interspecific aggression. The species has been mixed with hoofed stock but some deaths have resulted from hoofed stock induced injuries.

B. Breeding

First reports of captive breeding were at Cairo in 1964, 1965, and Tel Aviv in 1966, 1967. A number of other zoos around the world breed them regularly. First breedings in U.S. occurred in 1983 at Audubon Park and Busch Gardens. Busch Gardens has continued to breed the species since then. both full winged and pinioned birds have bred successfully. Chicks are easily hand reared. When parent reared, the parents feed the chicks the normal food -- no special offerings need to be made.

Abdim's Storks have bred successfully in the Jerusalem Zoo, London Zoo, Audubon Park Zoo and Busch Gardens.

IV. Management Considerations

A. Housing

The species can be housed in flights or pinioned in open exhibits. They can be mixed with other bird species. They are rather timid and undemonstrative. although apparently hardy and capable of withstanding freezing temperatures, they should be treated as a tropical species and be protected from severe weather.

B. Diet

All zoos contacted use a similar diet consisting of chopped or ground fish, ground meat)bird of prey type diet), insects, and natural forage.

C. Other

They are known to be semi-colonial in the wild and can be maintained in groups in captivity. Keeping more than two individuals together will help to insure the development of compatible pairs.

V. Breeding Considerations

Busch Gardens produced a hybrid with a Wooly-necked stork so closely related species should not be mixed. They will nest on the ground or on platforms. Full winged birds that choose their own nest site usually select forked trees with fairly open foliage. The birds will line the stick nest with grass before egg production.

VI. Literature Cited

Farnell, G., and P.W. Shannon. 1987. The breeding of the Abdim's Storks at the Audubon Park Zoo. Colonial Waterbirds 10:251-254.

WOOLLY-NECKED STORK

(Ciconia episcopus)

I. Conservation Status

Status: Regionally Vulnerable (Southeast Asia)

The Woolly-necked Stork is widespread in Africa and Asia, but are not abundant, occurring usually as single birds or pairs. There does not appear to be any immediate danger for this species in Africa. They are widespread in India, but not common. In Southeast Asia, the species has become very rare, reported only occasionally in Bangladesh, Burma, Thailand, and Vietnam. Further investigations are needed.

II. Status in Zoos

Brownsville	1.1.0 (0)
Total held	1.1.0 (0)
Captive born	0%
Wild born	100%

In 1984 there was one Wooly-necked Stork reported in a Brazilian zoo (Ellis pers. comm.).

III. History in Zoos

A. Management

The species can be managed either full winged or pinioned. Like the Abdim's Stork, they mix well with other birds. They tend to be timid.

B. Breeding

First reports of captive breeding were Manila in 1967 and Ahmedabad in 1968 and 1969. there have been no breedings in the U.S., although a hybrid with an Abdim's Stork was produced at Busch Gardens.

IV. Management Considerations

A. Housing

As per the Abdim's Storks. The species can be housed in flights or pinioned in open exhibits. They can be mixed with other bird species. They are rather timid and undemonstrative. Although apparently hardy and capable of withstanding freezing temperatures, they should be treated

as tropical species and be protected from severe weather. They have been housed with small hoofed stock without incident.

B. Diet

All zoos contacted use a similar diet consisting of chopped or ground fish, ground meat (bird of prey type diet), insects, and natural foraging.

C. Other

The species does well in groups. It would be advisable to keep more than a pair together to insure development of compatible pairs.

V. Breeding Considerations

This is a shy species and would probably benefit from off-exhibit breeding facilities or secluded on-exhibit displays. Closely related species should not be housed with them due to possible hybridization. A variety of nest locations should be provided.

VI. Literature Cited

STORM'S STORK

(*Ciconia stormi*)

I. Conservation Status

Status: Unknown, presumed Threatened

The Storm's Stork is almost completely unknown and has a very limited distribution in Borneo and originally Sumatra. Recent sightings have been reported at various rivers in Kalimantan (south Borneo) and on the Sabah/Sarawak border (Malaysian Borneo). These sightings have been of single individuals and small groups. The nest has never been described, and it is unknown if this species is distinct from the very similar Woolly-necked Stork. Large-scale translocations of human communities from Java to Borneo and Sumatra are planned, which could seriously threaten this stork.

II. Status in Zoos

none

Total held
Captive born
Wild born

III. History in Zoos

A. Management

B. Breeding

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

VI. Literature Cited

MAGUARI STORK (Ciconia maguari)

I. Conservation Status

Status: Regionally Threatened (northern South America)

The population of Maguari Storks in Venezuela has been estimated at 5,000 individuals. Betsy Thomas, who has studied a small population of this species for over 10 years, has noted a marked decline in numbers in her study area. No cause has been determined. The stork appears to be secure in northern Argentina and in Rio Grande do Sul (state) in Brazil. The stork is rare, but not threatened, in eastern Bolivia.

II. Status in Zoos

Denver	1.1.0 (0)
Oklahoma	3.1.0
Brownsville	2.2.0 (0)
Milwaukee	1.1.0 (0)
Total held	7.5.0 (0)
Captive born	0%
Wild born	58%

The Buenos Aeres Zoo has a single male Maguari Stork (Diebold pers. comm.). In 1984, among three Brazilian zoos, there were nine Maguari Storks, including 1 known male and 1 known female (Ellis pers. comm.).

III. History in Zoos

A. Management

B. Breeding

Maguari Storks have not bred successfully in zoos. A chick hatched in the Buenos Aeres Zoo between 1946 and 1950, but it did not survive (Haedo Rossi 1969).

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

In the wild, this species breeds singly, in small colonies or even loose aggregates. A group of storks is probably not necessary to stimulate breeding.

VI. Literature Cited

Haedo Rossi, J.A. 1969. Notas ornithologicas observaciones sobre la ciguena Euxenura maguari (Gmelin). Acto Zoologica Lilloana 24(4):19-42.

WHITE STORK (Ciconia ciconia)

I. Conservation Status

Status: Regionally Threatened (northern Europe)

Stork numbers have declined significantly in recent years in Denmark, the Netherlands, and West Germany. The combined breeding population for these three countries is approximately 600 pairs. A consistent 10% decline annually has been observed in Germany and the stork may disappear from this country by the end of the century. Formerly extirpated from France and Switzerland, the storks have been reintroduced and small breeding populations have been established. Elsewhere in Europe, the storks are not critically threatened. Over 30,000 pairs have been counted in Poland alone, and at least that many occur in the western USSR. Furthermore, southeast Europe and Spain have healthy populations. The declines appear to be a result of intensive land use in the more developed countries, and possibly due to heavy pesticide use in Africa where the storks overwinter. Over 100,000 White Storks have been counted in Israel during autumn migrations in 1984. A small breeding population exists in southern Africa.

II. Status in Zoos

Calgary	2.1.0 (0) Cc	
Pittsburg	1.0.0 (0) Cc	
Toronto	1.1.0 (0) Cc	
Riverbank	1.1.0 (0) Cc	
Metrozoo	1.1.0 (0) Cc	
Brownsville	0.0.3 (0) Cc	
Sedgewick	1.1.3 (0) Cc	
Dallas	0.1.0 (0) Cc	
Louisville	1.0.0 (0) Cc	
Milwaukee	0.1.0 (0) Cc	
Ft. Wayne	6.8.11 (0) Ccc	
Omaha	0.0.4 (0) Ccc	
Des Moine	0.1.2 (0) Ccc	
Milwaukee	0.0.1 (0) Ccc	
Topeka	0.1.1 (0) Ccc	
Louisville	0.1.0 (0) Ccc	
St. Louis	0.0.2 (0) Ccc	
Total held	8.7.6 (0)Cc	6.11.21 (0)Ccc
Captive born	9%Cc	60%Ccc
Wild born	23%Cc	13%Ccc

White Storks are commonly kept in European zoos where it is frequently bred. In 1984, there was one White Stork reported in a Brazilian zoo (Ellis pers. comm.)

III. History in Zoos

A. Management

B. Breeding

This species has been bred very frequently in captivity. The Zoo de L'Orangerie in Strasbourg, France, has a particularly successful captive breeding program.

The European White Stork has been studied through many decades in Europe. The species started decreasing around the 1930's and that has caused the developing of reintroductions among European countries. A method used is called a stork station where storks are kept as captive birds for future releasing.

One of the active countries in raising and releasing storks is the Netherlands. The number of storks in that country decreased from 273 in 1934 to 1 in 1983. the first stork station was established in 1974 and by 1987 there were ten stork stations. Storks are released from captivity after they form a pair bond at age of two to three years old. (Storks released as young birds rarely survive.) The releasing of paired storks has resulted in the establishment of "local" breeding populations. Once a station has produced a number of pairs, their chicks are released directly into the wild. These young storks become a migrating population when they join other young migrating storks.

In France, the number of White Storks has decreased tremendously. In a region called Alsace there were 155 storks in 1934 but only 4 in 1983. The city of Strasbourg in this region has a small zoo for the citizens of the area. There is an enclosure for storks of approximately 10 x 30 m where a dozen pairs and another dozen free-flying birds come to feed. The first and second clutches of the captive birds are artificially incubated and the young are hand-reared. The third clutches are incubated by the parents which also raise the young. The young from this clutch are released. The young join a migrating flock on their own in the late summer.

The rapid decline in number of White Storks in Western Europe has been the result of modern agricultural development in Europe, but also by large changes in the wintering ground. The reintroduction program will be effective in increasing the population only when both the breeding and wintering grounds are protected.

IV. Management Considerations

A. Housing

B. Diet

White Storks at the Strasburg Zoo are fed fish, one-day old chickens, cooked pork lungs, chicken feet, necks and heads as well as vitamins and calcium (Schmitt, pers. comm.)

C. Other

V. Breeding Considerations

White Storks will breed both singly and in colonies.

VI. Literature Cited

ORIENTAL WHITE STORK (Ciconia boyciana)

I. Conservation Status

Status: Endangered

This species once bred throughout East Asia, including Japan, Korea, China and the USSR. Now extinct from Japan and Korea as a breeding species, it is found only on the Sino-Soviet border, with the majority breeding on the Soviet side of the Amur River. During the fall migration of 1986, 2729 Oriental White Storks were counted in Bedaihe, China (Williams unpubl. report). Scientists have estimated a world-wide total of approximately 500 breeding pairs for these storks. The breeding population in China is small based on aerial surveys. Agricultural development, pesticides, cutting of nesting trees, and direct human disturbance to nests are threats in the breeding grounds in both countries. The birds winter in some numbers along the Yangtze River where they are illegally hunted.

II. Status in Zoos

A. U.S.

San Diego	3.1.0 (0)	NOTE: Kyoko indicates only 2.1.0 in San Diego and none at Ft. Wayne
Ft. Wayne	1.0.0 (0)	
Total held	4.1.0 (0)	
Captive born	0%	
Wild born	0%	NOTE: I would think all were wild born (?).

B. Asia

Beijing PRC	0.0.4
Chengdu PRC	0.0.2
Guangzhou PRC	0.0.4
Harbin PRC	0.0.12
Hefei PRC	0.0.2
Huaiyin PRC	0.0.1
Nanchang PRC	0.0.6
Nanjang PRC	0.0.1
Ninbo PRC	0.0.4
Qingdao PRC	0.0.3
Shanghai PRC	0.0.10
Xukzhou PRC	0.0.1
Kobe Oji Jap	1.1.0
Tama Jap	3.4.0
Toyooka Wh. St.	5.6.0
Total held	4.1.0 (0)

Captive born	0%		
Wild born	0%	Ctr.	5.6.0
Pyongyan N.Kor	0.0.2		
Grand Park S.Kor	0.1.0		
Total held	9.12.52 (0)?		
Captive born	0%		
Wild born	0%		

C. Europe

Berlin E.Ge.	1.1.0		
Vog. Walsr.	5.6.0		
Moscow	3.1.0		
Total held	9.8.0 (0)		
Captive born	0%		
Wild born	0%		

D. World

Total held	22.21.52 (0)		
Captive born	0%		
Wild born	0%		

III. History in Zoos

A. Management

B. Breeding

A breeding program for the Oriental White Stork was initiated in Japan in the 1960's, but with no success. the last bird from the Japanese population which was kept in captivity died in 1985. The Japanese effort for the propagation continues with the storks from the mainland. Several institutions around the world have received storks from the Soviet Union in an effort to develop a breeding program for the species. the Vogelpark Walsrode, W. Germany, received a total of 12 storks in 1980/81, and initiated intensive behavioral observations on the maturing storks in the winter of 1984. Tierpark Berlin, E. Germany, and Moscow Zoo, USSR, also received 2 and 5 storks respectively in 1981, but have had no success on their breeding yet. An additional 10 storks were brought to the Japanese zoos from China and the Soviet Union in 1985. At least 50 storks have been reported from Chinese zoos, and Shanghai Zoo has had a breeding success according to an unofficial report, but no detail is known.

IV. Management Considerations

A. Housing

Oriental Storks should not be pinioned but should remain with full-wings, otherwise the birds may have difficult maintaining balance during copulation.

The Oriental White Stork is both shy and aggressive. The enclosure should be free of human activities, noise, and human traffic. Artificial isolation can be created by plants or fences. The birds when disturbed may take to flight and so the enclosure should be small enough to discourage flight and so avoid accidental death. At the same time the cage should be tall enough to provide space to allow the storks to copulate on the nest. At the Vogelpark flight enclosures measure 45'L x 13'W x 10'H for single birds and 45'L x 25'W x 10'H for pairs.

The ground should be flat with short grass and only several scattered shrubs. A small platform or a perch should placed at the nest level or lower. A door between two adjacent cages makes it easier to bring birds together.

B. Diet

Food should be available all day long. At the vogelpark, each Oriental White Stork was fed 1 to 4 whole fresh fish (each 4 to 6 inches long) and 5 to 15 one-day-old chickens every day throughout the year. Prior to and during the breeding season, calcium and multi-vitamin powder should be added to the diet and a slight excess of food is desirable.

C. Other

Single storks should be kept in individual cages where they have visual contact with all the other single storks, so that pairing can take place. Each pair should be isolated or at least visually from the other storks.

V. Breeding Considerations

Careful observation is important and necessary for accurately identifying stork pairs, and should be made from visually isolated blinds. Pairing birds can be sexed with a behavior called "female's bill-clattering" (Archibald and Schmitt, Ms). Introducing pairing male and female into the same cage is usually extremely difficult due to the male's aggression toward the female. Introduction of an artificial egg into the next effectively reduces the male's aggressiveness and allows for subsequent pair bonding. This method is called 'dummy egg technique' (Archibald, Ms). A nest platform is essentially for pairing birds to complete their pair bond because each pair

copulates on the nest. The diameter should be about 6 feet and the height about 3 feet from the ground. The nest should be slotted for drainage. There should be a ramp leading from the ground to the platform. Initially, a rough nest of sticks. Sticks and straw should be provided for the birds. Nest material should also be provided.

VI. Literature Cited

Archibald, K. Ms. Recommendations for captive management of the Eastern White Stork (Ciconia boyciana).

Archibald, K. and B. Schmitt. Ms. Behavioral Comparison between the Eastern White Stork (Ciconia c. boyciana) and the European White Stork (Ciconia c. ciconia).

BLACK-NECKED STORK (Ephippiorhynchus asiaticus)

I. Conservation Status

Status: Regionally Threatened (Asian Continent)

The Black-necked Stork is widespread but nowhere abundant. It has become rare in India, as well as Sri Lanka where a small breeding population exists. The stork is gone from Bangladesh, Burma, Thailand, and perhaps Vietnam. Black-necked Storks occur in substantial numbers only in New Guinea (Irian Jaya-650 estimated from major wetland areas) and northern Australia, where there is no major threat at present.

II. Status in Zoos

Metrozoo	2.1.0	(0)
San Antonio	1.1.0	(0)
Total held	3.2.0	(0)
Captive born	0%	
Wild born	40%	NOTE: Ron indicates that 100% are wild born.(?)

In 1984, there were one male and one female at one zoo in Brazil (Ellis pers. comm.).

III. History in Zoos

A. Management

Historically, because of its large size, Black-necked storks have been kept flightless in large paddocks, usually in mixed-species flocks. They have frequently been kept with large hoof stock.

B. Breeding

There is no record of any breeding or attempted breeding.

IV. Management Considerations

A. Housing

Black-necked Storks are solitary nesters and can be aggressive. No more than one pair should be kept together. Pairs should be housed so no visual contact is made; otherwise "passing" behavior may develop along the common boundary.

We recommend enclosures 100'L x 50'W for flightless birds.

We recommend two sizes of flight-cages for full-winged birds. A flight cage should either either be small enough to inhibit flight or large enough to allow flight. We recommend 100'L x 50'W x 30'H for the size of the smaller cage, where the birds can fly to perches but will not attempt gliding flight. A cage with three times the area would allow gliding without the danger of the birds hitting the side panels. It is recommended that any newly imported storks be left full-winged and kept in a flight cage.

The enclosure should include a pool or marsh area where the birds can wade. The enclosure should have vegetation of various heights to give the birds an opportunity to forage but not the vegetation should not be allowed to reach a height above the storks' line of sight.

B. Diet

At the Miami Metrozoo, each individual stork receives in the morning and in the evening

200 gm Bird of Prey diet
135 gm horse meat strips
130 gm whole herring
240 gm smelt

Black-necked Storks prefer whole fish 6 to 9 inches in length. They also prefer such items as mice or frogs. The amount offered to storks depends, in part, on the security of the pens and the among that wild birds, such as herons or gulls, may take.

C. Other

These birds are shy and keep a large distance away from staff. They can also be aggressive if cornered and care should be taken during any restraint.

Plants chosen for the enclosure should be of a low-maintenance variety to minimize disturbance to the birds when the plants are being cared for.

V. Breeding Considerations

Although no breeding has occurred in captivity the following recommendations are made based on observations of captive birds and natural history information from several sources. It is felt that whenever possible, the birds should be left full-winged and housed accordingly. In the wild these birds are found nesting on high trees and a high nesting platform or nesting platform should be provided. However, these birds have not been observed perching as much as the Mycteria species, and therefor may not utilize perches to reach a high nesting platform. Because these are shy birds, the nesting platform should be away from high traffic areas and in a low maintenance area where disturbance is

low. As with other storks, a constant supply of suitable nest material should be provided. A variety of branches should be provided for them to select. The nest building is important in pair bonding. A cache of sticks may be provided away from the nest site from which they will select the material.

When young are raised they and their parents should be watched closely as the young mature for parental aggression. In the wild parental aggression disperses the young. It is not known at what age this occurs.

VI. Literature Cited

SADDLEBILL STORK (Ephippiorhynchus senegalensis)

I. Conservation Status

Status: Stable (Watch Species)

The Saddlebill has a widespread distribution but is solitary and nowhere abundant. Several African ornithologists have suggested that it could face regional declines in the future as habitat is lost to agriculture, irrigation etc. More research could reveal regional scarcities of this species.

Natural historical considerations: The Saddlebill Stork is Africa's tallest stork. It is a non-migratory, solitary species most often seen singly or in pairs. A resident of extensive wetlands and water systems in tropical Africa, it nests singly usually in the top of tall trees. The large, bulky nest is comprised mostly of sticks but may also include aquatic vegetation and dirt. Two to four eggs are laid and hatch after an incubation period of approximately 30 to 35 days. Adults feed mostly on fish, although small mammals, reptiles and amphibians are also taken. It is a shy bird, susceptible to disturbance, particularly at the nest.

II. Status in Zoos

Metrozoo	2.1.0 (0)
Asheboro	0.1.1 (0)
Brownsville	1.1.0 (0)
Total held	3.3.1 (0)
Captive born	0%
Wild born	71%

III. History in Zoos

A. Management

Until recently, the Saddlebill Stork was not a common species in captivity. It has traditionally been maintained in large open enclosures, often in mixed species exhibits including hoofstock.

B. Breeding

There are no recorded breedings of this species in captivity. Recent increases in the captive population size and greater distribution of breeding groups should enhance captive propagation efforts.

IV. Management Considerations

A. Housing

It should not be kept in groups of more than two and it may be advantageous to maintain pairs alone, not in a mixed situation. A pond or other suitable water source should be provided due to the birds habit of washing food items and their affinity for bathing. The enclosure should be large enough to accommodate their display and minimize disturbance, particularly around a potential nest site.

This species has proven to be cold sensitive and should be provided with suitable winter quarters in cooler temperate regions. An ecnlosure 20 feet x 20 feet, divided into two 10 feet x 10 feet stalls would be adequate to maintain a pair. Care must be taken, however, to monitor for aggressive behavior between individuals while in confined quarters. If aggression develops, the birds may be separated into their individual stalls until the following spring. An ambient temperature of approximately 50^{o} F should be maintained.

B. Diet

The diet of Saddlebill Storks in the wild consists primarily of fish. Fish would also be appropriate in captivity, although rodents, meatproducts and young chickens may also be included. The latter two items should not be a major component of the diet unless supplemented with vitamins and minerals, particularly calcium. Avoid using excessively oily fish, such as sardines, as contamination of the bathing water may result. Adult birds consume approximately 500 to 1000 g of fish per day, depending on season. Frozen fish is susceptible to thiaminase activity which may result in a thiamine deficiency. Therefore, birds maintained on frozen fish should have their diets supplemented with 50 mg thiamine (Vitamin B1) for every 200 - 250 g of fish.

C. Other

V. Breeding Considerations

Sexes are distinguishable by eye color. Males have a brown iris and females a yellow iris. When possible, birds should be kept full-winged or wing-clipped, as pinioning may inhibit successful copulation. Nesting platforms should be provided, though a pair at the Miami Metrozoo built a nest on the ground. It may be advantageous to start a nest in what is believed to be a suitable site, as a partially constructed nest may stimulate nest building activity in the adults. Disturbance around the nest site should be minimized.

VI. Literature Cited

JABIRU STORK (*Jabiru mycteria*)

I. Conservation Status

Status: Regionally Threatened (Central America)

There appear to be three distinct populations of the Jabiru: Central America, northern South America, and central and southern South America. Although the latter two populations appear to be stable, they could be threatened in the near future if the widespread wetland alterations continue at the present rate. In Central America, the stork was probably never abundant. Less than 100 nesting pairs occur throughout an eight-country region and the number may be much smaller. Only 15 nests are known with certainty for Mexico, Belize, Nicaragua, and Costa Rica, combined. The Jabirus require extensive wetland areas for foraging and tall trees for nesting, which are disappearing rapidly. The species is still hunted in some areas.

II. Status in Zoos

A. U.S. Zoos

Audubon	3.2.0 (0)	Feb., 1987
San Antonio	1.0.0 (0)	Feb., 1987
Total held	4.2.0 (0)	
Captive born	0%	
Wild born	50%	

B. Europe

Antwerp	0.0.1	Oct., 1986
Dortmund Ge	2.1.0	Dec., 1985
Duisburg Ge	1.0.0	Dec., 1985
Vogelpark	0.4.0	Oct., 1986
Total Held	3.5.1	

C. Asia

Jurong Bird Park, Singapore	0.0.1	Dec., 1986
Total Held	0.0.1	

D. Latin America

Georgetown Guyana	0.0.2	Status unknown
Maracay, Ven	2.0.0	Status unknown
Medellin, Col	2.2.0	Aug., 1986
Merida, Ven	0.0.1	1985

Braz. zoos	0.1.22	Dec., 1984
Total Held	4.3.25	

E. TOTAL HELD 11.10.27

III. History in Zoos

A. Management

The four Jabirus at the Audubon Park Zoo have been kept in portions of two exhibits. The South America I exhibit has approximately 1 acre of land and slightly less water. The vegetation includes small to medium-sized trees, scattered bushes and irises along much of the shoreline. The Jabirus share the exhibit with tapirs, capybaras, rheas, macaws and many waterfowl. The mud-bottomed lagoon harbors native turtles and fish upon which the birds prey. Public viewing areas are raised walkway along two adjacent sides; the service area is along the other two sides. The Jabirus have access to all areas in the exhibit.

The second area is South America II. This also has about 1 acre of land and slightly less water. Small, isolated areas with access to the water have been created at either end of this exhibit. Both of these areas are heavily planted with vegetation to provide the birds with a feeling of security. The storks share the overall exhibit with a flock of Caribbean Flamingos. The two species are not mixed but are separated by a fence. The viewing area is along two sides; and the service area is along two other sides.

All birds at the Audubon Park Zoo have been pinioned.

B. Breeding

There are no records of breeding attempt in zoos. The Jabirus at the Audubon Park Zoo have exhibited courtship and nest-building behavior from 1985 through 1987. The pair at the Brownsville Zoo have also exhibited courtship and nest-building behavior.

IV. Management Considerations

A. Housing

Jabirus often stand on high spots in their exhibits. The birds seem to like to view as much of the surrounding area as possible. The enclosure should include an elevated perch or nest platform. A pond or water system, where the birds can forage on live fish should also be included if possible. This may also be important because the birds at the Audubon Park Zoo carry their food from the pan to the water and wet

it before swallowing it.

Jabirus can be very aggressive toward other species they are housed with. They have been known to kill waterfowl. The males appear to be more prone to interspecific aggression that females. However, some birds have been kept in mixed exhibits without any difficulty. Two Jabiru deaths due to intraspecific fighting have been reported. Both were caused by males.

As a tropical species, Jabirus are not cold tolerant. In zoos in temperate climates they should be provided shelter during the winter.

B. Diet

At the Audubon Park Zoo, Jabirus are fed once a day on a diet consisting of smelt, mackerel, and a commercially prepared chopped meat product.

The birds will eat a variety of meats, but fish seems to be the favored food. Frozen fish must be supplemented with thiamine since freezing activates thiaminase which destroys the naturally occurring thiamine. Some zoos offer frozen, ground meat; others offer whole rodents or chicks. If possible, the enclosure should include a water system with fish, where the birds can forage.

C. Other

Institutions with compatible groups of Jabirus have either acquired the birds as juveniles or the birds arrived already familiar with each other. Introductions of adult birds must be done slowly and with constant supervision. The female seems to initiate social contact and must perservere until the male accepts her. Sufficient space for escape is important during introductions as the male may kill the female.

Stork/human interactions are variable and depend on the specific personality of each individual bird. Some birds are totally tractable while others require the keeper to carry weapons into the exhibit for self-defense in case of attack. Such aggression can be seasonal, coinciding with the breeding season. They distinguish between individual keepers and respond differently to different people.

Large birds such as Jabirus are often pinioned (the metacarpals of one wing are removed), and exhibited in open exhibits. Because males may have difficulty balancing during copulation, if possible, it would be advisable to leave the birds fully-winged, exhibited in flight cages, or wing-clipped in open cages.

V. Breeding Considerations

Jabirus are solitary nesters. Furthermore, they are very aggressive birds. It would be best to have no more than a pair in an enclosure.

Nests in the wild are often located at the tops of tall solitary trees that afford good visibility of the surrounding area. A nest platform in a tall, solitary tree or structure should be included for nest construction. Alternatively, we do not know whether Jabirus can be induced to nest on the ground.

The birds require not only sticks, but also large amounts of greenery including such things as banana leaves, long grasses, palm fronds or any similar vegetation. New material should be added daily because the birds build rapidly and may pull pieces from the nest if nothing else is available.

VI. Literature Cited

LESSER ADJUTANT STORK (Leptoptilos javanicus)

I. Conservation Status

Status: Regionally Vulnerable (Southeast Asia)

The Lesser Adjutant is more abundant than its larger relative, the Greater Adjutant. Breeding colonies still exist in Sri Lanka, India, Bangladesh (although relict), Vietnam, Malaysia, and Indonesia. Over 1,000 birds were sighted in coastal Sumatra. Without protection of breeding habitat (mostly coastal mangroves and swamp forest), the species could quickly disappear from Bangladesh, Malaysia, and Vietnam.

Disturbance of colonies and hunting are problems. This is a Watch Species for Southeast Asia.

II. Status in Zoos

Audubon	1.0.0 (0)
Total held	1.0.0 (0)
Captive born	0%
Wild born	100%

III. History in Zoos

A. Management

B. Breeding

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

VI. Literature Cited

GREATER ADJUTANT STORK (Leptoptilos dubius)

I. Conservation Status

Status: Unknown, presumed Endangered

The Greater Adjutant was once common from northern India through to Indochina. Large breeding colonies were reported historically in Burma. These colonies are gone, and the species breeds with certainty only at the Kaziranga Reserve in Assam, northeastern India. The species is no longer present in Bangladesh, where it was hunted out, and Thailand. A small breeding population may still exist in Vietnam, although the species is rare in that country. This species may be in the most critical of conditions, requiring immediate conservation action.

II. Status in Zoos

Metrozoo	1.0.0 (0)
Franklin Park?	1.0.0 (0)
Brownsville	1.0.0 (0)
Total held	3.0.0 (0)
Captive born	0%
Wild born	66%

In 1984 there was one Greater Adjutant Stork reported in a Brazilian zoo (Ellis pers. comm.).

III. History in Zoos

A. Management

B. Breeding

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

VI. Literature Cited

MARABOU STORK (Leptoptilos crumeniferus)

I. Conservation Status

Status: Stable

This species is not only holding its own throughout Africa, but appears to be increasing in numbers in some areas due to its fondness for scavenging near human settlements.

II. Status in Zoos

Birmingham	1.0.0	(0)
Jacksonville	1.2.0	(0)
Louisvlle	1.1.0	(0)
Asheboro	1.1.8	(0)
Abilene	1.1.0	(0)
San Diego	0.2.0	(0)
W Palm Beach	1.1.0	(0)
Audubon	2.1.0	(0)
Cincinnati	0.0.2	(0)
Dallas	1.0.1	(0)
San Francisco	0.0.3	(0)
Metrozoo	3.5.0	(0)
St Louis	1.1.0	(0)
Oklahoma	1.1.0	(0)
Milwaukee	1.2.2	(0)
Santa Barbara	1.2.0	(0)
Ft Wayne	0.0.2	(0)
Omaha	2.0.2	(0)
Tulsa	2.4.0	(0)
NZP-Washington	3.2.0	(0)
Sedgewick	2.2.0	(0)
NY Bronx	0.0.1	(0)
Knoxville	0.0.2	(0)
Total held	25.29.23	(0)
Captive born	2%	
Wild born	53%	

III. History in Zoos

A. Management

B. Breeding

Marabou Storks have been bred successfully in the Al Ain Zoo, Abu Dhabi, U.A.E.

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

VI. Literature Cited

UNKNOWN STORK (*Ciconia spp.?*)

I. Conservation Status

II. Status in Zoos

Moore Park	1.0.0	(0)
Total held	1.0.0	(0)
Captive born	0%	
Wild born	0%	

III. History in Zoos

A. Management

B. Breeding

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

VI. Literature Cited

SHOEBILL (Balaeniceps rex)

I. Conservation Status

Status: Of Special Concern

The Shoebill is widely distributed, but only locally abundant. They appear to be more exclusively restricted to marshes than other storks and are, therefore, vulnerable to wetland drainage. The largest population occurs in the Sudd Swamp of Sudan, which has been threatened by drainage for irrigation. ICBP lists this species as "Of Special Concern."

II. Status in Zoos

A. U.S. Zoos

San Antonio	0.2.0 (0)
Total held	0.2.0 (0)
Captive born	50%
Wild born	50%

NOTE: I believe that both birds were wild caught (?).

B. Outside U.S.

Berlin E. Ge	1.1.0
Berlin W. Ge	2.0.0
Budapest Hun	1.1.0
Copenhagen Den	1.0.0
Duisburg Ge	1.0.0
Stuttgart Ge	1.1.0
Ito Jap	0.0.1
Kuwait	1.0.0
Walsrode Ge	2.0.0
Total held	10.3.1 (0)
Captive born	0%
Wild born	100%

III. History in Zoos

A. Management

Shoebills have traditionally been exhibited singled, though occasionally pairs have been put together.

B. Breeding

there has been no attempt to breed Shoebills in captivity.

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

Shoebills are solitary nesters in the wild. They defend territories. Pairs should be separated.

The nests are floating structures in deep water. The birds should have a lagoon or other water area for nest building and emergent vegetation for nest material. Papyrus may be particularly important.

VI. Literature Cited

Anonymous. 1986. Census of rare animals in captivity. pp. 565-622 in Olney, P.J.S., ed. 1986. 1984/1985 International Zoo Yearbook. Zoological Society of London. 651 pp.

Collar, N.J. and S.N. Stuart. 1985. Threatened Birds of Africa and Related Islands. International Council for Bird Preservation and International Union for the Conservation of Nature and Natural Resources. Cambridge.

HAMERKOP

(Scopus umbretta)

I. Conservation Status

II. Status in Zoos

NZP-Washington	1.1.0	(0)
NY Bronx	1.1.3	(5)
San Antonio	1.2.0	(0)
Chicago Br	1.2.0	(0)
Philadelphia	1.0.0	(0)
Milwaukee	1.0.0	(0)
Audubon	1.1.0	(0)
Pitts Ca	0.0.2	(0)
Franklin Park?	4.2.5	(1)
Riverbank	1.1.0	(0)
Detroit	1.1.0	(0)
Dallas	1.1.0	(0)
Total held	14.12.10	(6)
Captive born	88%	
Wild born	8%	

III. History in Zoos

A. Management

B. Breeding

IV. Management Considerations

A. Housing

B. Diet

C. Other

V. Breeding Considerations

VI. Literature Cited

GENERAL LITERATURE CITED

Olney, P.J.S., ed. 1986. 1984/1985 International Zoo Yearbook. Zoological Society of London. 651 pp.