



A COMPARISON OF THE MAGUARI STORK, *CICONIA MAGUARI*, WITH THE WHITE STORK, *CICONIA CICONIA*

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INTRODUCTION

Mayr and Amadon (1951), and later Kahl (1971a, 1972), recommended that the monotypic Maguari Stork, *Euxenura galeata* (now *Ciconia maguari*), be changed to the genus of the White Stork, *Ciconia ciconia*. This nomenclature has been followed by Wood (1983, 1984) who analyzed the major skeletal elements of all 17 species of storks by using multivariate statistics, and who found agreement with this taxonomic placement based on behavioural and morphological data. Kahl (1972) reviewed the affinities and differences among the five storks that he placed in the Ciconiidae.

My recent field studies of the Maguari Stork in Venezuela indicate agreement with the name change and the placement of *Ciconia maguari* close to *Ciconia ciconia*. This paper summarizes some similarities I observed between the South American endemic Maguari Stork and the White Stork that were not included in Kahl (1972) and Wood (1984). I also report several differences that I observed between the breeding behaviour of the two species.

STUDY SITES AND METHODS

From 1972-1984, I studied the Maguari Stork in the llanos (savannas) of central Venezuela. Much of this work was done on a 4000 ha cattle ranch, Fundo Pecuario Masaguaral, in the state of Guárico. There I concentrated my work on the storks during their breeding seasons. Other observations of Maguari Storks were made mainly in the Venezuelan state of Apure, both on the ground and during seven aerial stork surveys. All nestling Maguari Storks (n = 128) on the principal study site were banded from mid-season in 1973 through 1976 (Thomas, 1977).

On 14-18 June 1978, I observed White Storks at the Stork Reintroduction Center in Altreu, Switzerland (Gesellschaft zur Förderung des Storchen-

ansiedlungsversuches Altreu). There I spent more than 10 h on two days observing, from *ca.* 25 m distance, the behaviour of eight pairs of free-flying White Storks attending nestlings *ca.* 4-7 weeks old.

RESULTS

In the Maguari Stork the sexes are dimorphic in size (Thomas, 1985), and both are larger than White Storks (Bauer and Glutz von Blotzheim, 1966). Some soft part colours (Thomas, 1984) of the two species differ. The adult Maguari Stork has a large bare, scarlet, carunculated orbital area, and a cream white iris (Fig. 1). The hatching down of Maguari Storks was white. Kahl (1971b) reported it was light-gray in Argentina, but this first down was quickly replaced by thick, blackish down. The first juvenal feathers were entirely black (Thomas, 1979, 1984). Soon after fledging the first basic plumage (Humphrey and Parkes, 1959) of young Maguari Storks resembles the adult plumage. However, these young birds retained the dark brown iris colour of the newly hatched chick, and a dark blackish orbital area for at least a year (Thomas, 1984, 1986).

On my study area of 690 ha, Maguari Stork nests were more often in clusters of 5-15 nests (77%) than solitary (Thomas, 1986). In Venezuela this stork nested, 1-6 m high, on the tops of small stunted trees, or on the tops of dense bushes, surrounded by seasonal marsh water. While in Argentina, in an area generally lacking such nest sites, Kahl (1971b) and Ogden (*in litt.*) found that Maguari Storks nested on the ground in reed beds surrounded by water.

Both members of Maguari Stork pairs built the nest (Fig. 1), and together they defended it against intruders. Serious fights occurred during nest occupation and building-although I observed no deaths as a result of fighting, unlike Schüz (1944). Traditional nest sites were used by Maguari Storks for many years; one site was used for seven consecutive years during my study (Thomas, 1986). Intraspecific behaviours were similar to those of the White Stork, especially the Up-Down (Kahl, 1972). Schüz (1942) gives a fine description of the displays in White Storks. Copulation behaviour of the two species appeared to be similar (Schüz, 1942; Thomas, 1986).

Maguari Storks laid clutches of 2-4 eggs on alternate days. Although the White Stork is reported to lay 3-6 eggs in a clutch (Haverschmidt, 1949), Lack (1954) has shown that clutches are generally larger at higher latitudes. The hatching of Maguari chicks was asynchronous (Thomas, 1984).

There was great similarity of parental feeding behaviour and foods between the two species (Schüz, 1943; Thomas, 1984, 1985). Maguari Storks were generalists, visually feeding mainly on frogs and tadpoles, fish, freshwater eels, aquatic rodents and other aquatic taxa. During my study no small nestlings starved to death, and none were lost to "Kronism". Schüz (1984) found that



Fig. 1. Maguari Stork pair building a nest.

adult White Storks occasionally ate their own young, a behaviour that he named "Kronism". The successful survival of young nestlings in my study area was perhaps the result of abundant food, thus the adult birds were not stressed as suggested by the high (61%) nesting success (Thomas, 1984).

Nestling and juvenile behaviours were generally similar to those of the White Stork. One small difference, perhaps a result of their more cryptic black plumages (Thomas, 1984), was that Maguari Stork nestlings used akinesia only during the first two weeks while they were still largely covered with white down. Whereas White Stork nestlings used this presumably defensive behaviour much longer (Schüz, 1943). Young Maguari Storks first flew from their nests between the ages of 60-72 days. However, they often returned to the nest where they were fed during the early post-fledging period. They also used the nest for as long as six weeks for nocturnal roosting. Fledgling Maguari Storks coalesced in like-aged social groups in nearby marshes. There they were often still guarded and fed by their parents (Thomas, 1984, 1986).

Maguari Storks were philopatric. Birds banded as nestlings returned to their natal area to breed at the ages of 3-years-old for males, and 4-years-old for females (Thomas, 1987). One banded male returned to breed in his natal area in three years out of five. Both philopatry, and the age at the first breeding for both sexes generally agrees with that of the White Stork (Kuhk and Schüz, 1950; Hornberger, 1954). Maguari Storks appear to be a gregarious species, they leave their breeding areas and return to them in the following year in flocks of more than 50 birds (Thomas, 1986). The destination of migrant Maguari Storks is, at present, unknown but it appeared to be outside of Venezuela. Pre- and post-breeding season dispersal of single birds or small groups are not uncommon in other parts of Venezuela, far distant from their llanos breeding habitat (Thomas, 1987).

I observed three differences in parental nest attendance and care of the young between the White Storks at Altreu, Switzerland and Maguari Storks in Venezuela. (1) Both members of White Stork pairs spend the night together on the nest and take turns brooding and incubating during the same night (Bloesch in Bauer und Glutz von Blotzheim, 1966). One Maguari stayed on the nest at night and pairs either alternated on subsequent nights, or sometimes the same bird stayed on the nest for more than one night (Thomas, 1986). (2) White Stork nestlings at Altreu were not brooded during a rain. On the late afternoon of 15 June 1978 there was a drizzle and rain for 1.5 h during which even 4-week-old nestlings were not brooded, although one or both parents stood on or beside the nest. In Venezuela, where the ambient temperature was always 5°-15°C higher than that day in Altreu, adult Maguari Storks covered and brooded even large feathered nestlings when the slightest rain occurred. Maguari Storks remained brooding continuously through as much as 5 h of steady heavy downpours as well as through light drizzles. (3) The Altreu White Storks allopreened each other and their nestlings much more frequently than Maguari Storks did.

DISCUSSION

There is a considerable difference between the two species nest-sites. Throughout the Venezuelan Maguari Stork breeding habitat there are no suitable buildings for stork nests. However, the nest-site difference may be a result of the attitude of man: the White Stork has become habituated to humans, due to centuries of respect, while Maguari Storks, particularly nestlings, are still harvested for human food. In more remote areas of the White Stork breeding range they are reported to nest in colonies and in trees (Haverschmidt, 1949). This behaviour may be the natural tendency of both species.

Formerly some of the objections to the taxonomic closeness of Maguari and White Storks were based on adult morphological differences. However, the ontogeny of hatching and juvenile Maguari Storks, shows that the iris is brown for at least the first year, that the orbital area is blackish for about a year, and that nestlings are hatched with white down. All of these characteristics are similar to the White Stork, although possibly these early morphological features are common to all of the Ciconiini.

Recent authors (Kahl, 1971a, 1972; Wood, 1983, 1984), have generally proposed that the White Stork and the Maguari Stork are closer to each other than to other members of their genus. My behavioural observations support this view, but we lack life-history data for some of the other congeners. In the few differences I observed between the two species these differences were more a matter of degree, than true dissimilarities of behaviour. Furthermore, these differences might also have been the result of my limited experience with the White Stork.

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SUMMARY

A long-term study of the Maguari Stork, *Ciconia maguari*, in Venezuela resulted in evidence supporting its close relationship to the White Stork, *Ciconia ciconia*. Breeding behaviour, displays, egg-laying, nestling care, nestling behaviour, food, philopatry, and age at first breeding are similar between the two species. Nest-site differences are probably a result of human behaviour. Some morphological differences between adult Maguari Storks and White Storks, such as iris and orbital area colour, are shown to be the results of later ontogeny, and not different in the two species of young storks. This paper supports other authors who have found that the Maguari and White Storks are probably more closely related to each other than to any congenics.

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SAMENVATTING

Een uitgebreide studie van de Maguari Ooievaar, *Ciconia maguari*, in Venezuela bewijst dat deze ooievaar nauw verwant is aan de Witte Ooievaar, *Ciconia ciconia*. Het broedgedrag, de balts, de eileg, de zorg voor de nestjongen, het gedrag van de nestjongen, het voedsel en de jaarlijkse terugkeer naar dezelfde nestplaats en de leeftijd waarop de jongen geslachtsrijp zijn, blijken ongeveer dezelfde te zijn bij beide ooievaars. Het verschil in de keuze van de nestplaats tussen beide soorten, kan een gevolg zijn van de menselijke tussenkomst voor wat de Witte Ooievaar betreft. Sommige morfologische verschillen tussen adulte Maguari en Witte Ooievaars, zoals het verschil in kleur van de oogiris en de naakte huid rond de ogen ontstaan pas op latere leeftijd; bij de jonge ooievaars zijn er geen verschillen. Deze studie bevestigt de resultaten van andere onderzoekers, die tot het besluit kwamen dat beide ooievaars nauwer aan elkaar dan aan de andere ooievaars verwant zijn.

RESUME

Une étude approfondie et vaste de la Cigogne maguari, *Ciconia maguari*, au Vénézuëla prouve que cette cigogne est étroitement apparentée à la Cigogne blanche, *Ciconia ciconia*. Chez les deux cigognes, tout présente des similitudes presque totales: le comportement de couvée, la danse nuptiale, la ponte et le retour annuel aux mêmes endroits de couvaison tout comme l'âge de l'émancipation des jeunes. La différence dans le choix d'endroit de couvaison entre les deux espèces, peut s'expliquer peut-être comme une conséquence des interventions humaines chez la Cigogne blanche. Certaines différences morphologiques entre la Cigogne maguari et la Cigogne blanche adultes n'apparaissent que tardivement; pensons à la différence de couleur de l'iris de l'oeil et la peau nue autour des yeux; chez les jeunes cigognes par contre, on n'observe aucune divergence. Cette étude confirme les résultats d'autres chercheurs qui ont conclu que ces deux cigognes en question sont plus apparentées entre elles qu'elles ne le sont avec les autres cigognes en général.

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