

OBSERVATIONS ON THE JABIRU AND MAGUARI STORKS IN ARGENTINA, 1969

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Little detailed information on the reproductive biology, ecology, and behavior of the Jabiru Stork (*Jabiru mycteria*) and the Maguari Stork (*Euxenura galeata*) has been previously published. This report presents some of the results obtained during July–September 1969 in eastern and northeastern Argentina. These studies were part of a long-term investigation of the comparative behavior and ecology of all the stork species in the world.

STUDY AREAS AND METHODS

Brief observations of non-breeding Maguari Storks were made in July 1969 in the vicinity of Cape San Antonio, Buenos Aires Province. Further field work was conducted 4 August–16 September in Corrientes Province (fig. 1) in northeastern Argentina. Here I found both the Jabiru and Maguari Storks to be common and succeeded in locating a number of active nests of both species. Nesting studies were conducted mainly on and near the "Estancia Santa Teresa," approximately 20 km NE of the town of Mburucuyá, and on the "Estancia Los Angeles," near the small town of Palmar Grande. Further observations of non-breeding storks were made at other areas in Corrientes Province, especially at the point where the road from Mburucuyá to Corrientes City crosses the Estero Del San Lorenzo.

Observations of nesting birds were made with 7× binoculars or through the 600 mm telephoto lens of a camera, from blinds constructed within 12–35 m of the nests. Results were dictated to a portable tape-recorder and later transcribed into a notebook. Field notes were supplemented with 16 mm motion picture and 35 mm still photographs, which were available for subsequent review and study.

On several occasions searches for active nests were made from a small aircraft. From the examination of photographs taken at low altitudes, it was often possible to determine the contents of inaccessible nests, such as those of the Jabiru that were in tall trees or those of the Maguari that were in extensive marshes.

RESULTS

JABIRU STORK (*JABIRU MYCTERIA*)

The Jabiru is a large, heavy-bodied stork with immaculate white plumage. The head and neck are devoid of feathers, except for a small tuft of silvery-gray feathers on the occiput. The skin of the head and upper neck is dull black. A band of red skin, about 75–100 mm wide, encircles the lower portion of the neck,

immediately above the white feathers of the body; the color of this band varies from a deep-pink (when the bird is quiescent) to a brilliant scarlet (when the bird is excited or alarmed). The bill is black and, in most individuals, is slightly recurved. The iris of both sexes is dark brown. Legs and feet are black. In the center of the breast, over the sternum, is a small vertical oval of naked pale-pink skin, approximately 15 mm wide and 50 mm long. This bare patch—possibly connected to the air-sac system—is normally hidden by feathers and is visible only when the bird stands erect with the neck extended, as during display or just before take-off.

The sexes are similar in external appearance, except for size. When a pair is together, the male can usually be distinguished by his larger body size and more massive and straighter bill; females often have a thinner and more strongly recurved bill.

The Jabiru breeds from British Honduras (Russell 1964; D. Weyer, pers. comm.), southward through much of South America east of the Andes to northern Argentina. Non-breeding stragglers have been recorded as far north as southern Texas (Bent 1926), as far south as Córdoba and Buenos Aires Provinces in Argentina (Olrog 1963), and as far west as the coast of Perú (Koepecke 1963).

Apparently the only previously published breeding record for the Jabiru in Argentina is that of Hartert and Venturi (1909). However, Dr. L. L. Short (in litt.) observed an active nest near the Paraná River in northern Corrientes Province in 1967. Furthermore, it is a fairly common nester in the Mburucuyá region of Corrientes Province, and I found the following six occupied nests there in 1969.

No. 1: Estancia Santa Teresa, approx. 27° 59' S, 58° 03' W. Built about 10 m from the ground in a dead tree. Visited sporadically by a pair of Jabirus 9–22 August; many copulations observed on the nest. Eggs not yet laid at my last visit on 25 August.

No. 2: Estancia Santa Teresa, approx. 27° 58' S, 58° 02' W. Built about 14 m from the ground in the flat crown of a living "Timbó" tree (*Enterolobium contortisiliquum*) in a dense forest. Four eggs photographed in the nest from the air on 25 and 29 August; adults in attendance on those dates and when visited on the ground on 5 September.

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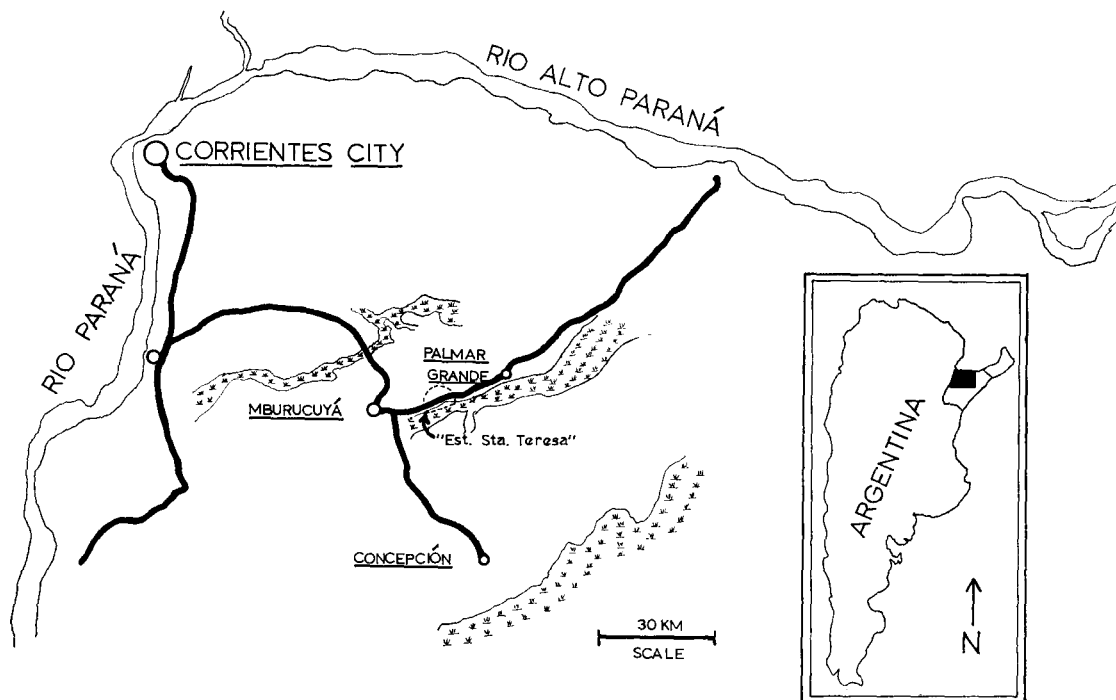


FIGURE 1. Map of northern Corrientes Province, Argentina, showing place names mentioned in the text.

No. 3: NE of Concepción, approx. $28^{\circ} 20' S$, $57^{\circ} 15' W$. Built about 12 m from the ground in the top of a palm tree in a small forest bordering a marsh. Eggs visible in photograph taken from the air on 25 August but their number uncertain; one adult in attendance on that date.

No. 4: SE of Concepción, approx. $28^{\circ} 26' S$, $57^{\circ} 15' W$. Built about 15 m from the ground in the crown of a living tree in a forest of about 10 ha, surrounded by pasture and marsh. Four eggs photographed from the air on 25 August; one adult in attendance on that date.

No. 5: Estancia Santa María, near Mburucuyá, approx. $28^{\circ} 00' S$, $58^{\circ} 00' W$. Built about 8 m from the ground in a dead tree near the edge of a large forest. Visited only sporadically by two birds 29 August–8 September. Nest sticks added irregularly but no copulations seen; no eggs laid during period of observation.

No. 6: Estancia Los Angeles, near Palmar Grande, approx. $27^{\circ} 54' S$, $57^{\circ} 53' W$. Built about 6 m from the ground atop a "Yatay" palm tree (*Butia yatay*) standing in a semi-open, dry savanna (fig. 2). Attended almost constantly by both birds on 11–13 September (the end of my observation period in the area). Frequent copulations and nest-building observed but eggs had not yet been laid by latter date; a firmly established pair.

Each of these nests was a massive structure, averaging 1–1.5 m in diameter and 0.5–1 m thick. All were placed in or near the tops of trees and were composed mainly of large sticks, up to 50 mm in diameter and 2 m long. From the size of most nests, it was apparent that they had been in use for a number of

seasons. At those nests where nest-building was observed (nests no. 1, 5, and 6), most stick-gathering was done by the male while the female remained on the nest. This is the normal pattern of nest-building behavior in other species of storks before egg-laying (Kahl 1966, and unpubl. notes). After egg-laying the female Jabiru probably assumes a more equal role in nest-building, as is the case in other storks.

In flight the Jabiru carries its neck extended (fig. 3), with a noticeable bulge along the ventral margin of the neck formed by the loose skin of the throat (Roosevelt 1914:91). Flapping flight is rather slow (ca. 180 flaps/min), and 5–8 flaps are generally followed by a short sail, during which the wings are held steady. Soaring on thermal air currents was common during the warm part of the day.

All Jabiru nests observed in Argentina were solitary, as has been reported elsewhere. Apparently this species does not nest colonially with other individuals of the same species, but Naumburg (1930) recorded finding a nest in the Mato Grosso that had been built in the center of a colony of Wood Storks (*Mycteria americana*).

Breeding dates of the Jabiru throughout its range are summarized in table 1. I made no attempt to climb to occupied nests and observed eggs only from a plane. Nests no. 2 and 4 each contained clutches of four eggs.



FIGURE 2. Jabiru nest no. 6 near Palmar Grande. The male is landing with a stick; female is standing on the nest.



FIGURE 3. Male Jabiru flying toward nest no. 6 with a clump of grass for the lining of the nest. Note that neck is extended in flight; bulge on ventral margin is caused by loose skin of throat sac.

TABLE 1. Breeding dates of the Jabiru Stork.

Locality	Calculated date of egg-laying	Authority
Argentina (Corrientes Prov.)	August/September	Kahl (this paper)
Argentina (Chaco Prov.)	October	Hartert & Venturi (1909)
Brazil (Mato Grosso)	early October	Naumburg (1930)
Brazil (headwaters of Paraguay R.)	September	Roosevelt (1914)
Brazil (mouth of Amazon R.)	July/August	Hagmann (1907)
Surinam	May/June	Haverschmidt (1967)
Guyana (Awaricru R.)	September	Lloyd (1895)
Guyana	August/September	Chubb (1916)
Colombia (San Jorge R.)	September/October	Chapman (1917)
Venezuela (los llanos)	October	Schäfer & Phelps (1954)
British Honduras (Mucklehany Lagoon)	December/February	D. Weyer (pers. comm.)

Eight Jabiru eggs measured in Brazil averaged 73.4×58.2 mm (Hagmann 1906), and 10 other eggs averaged 76.5×58.0 mm (Schönwetter 1960). Two eggs from Surinam in the Penard collection, measured by Haverschmidt (1967), were 86.2×57.4 and 91.8×56.4 mm, respectively.

As was also the case with the related Saddlebill Stork (*Ephippiorhynchus senegalensis*) in Africa and Blacknecked Stork (*Xenorhynchus asiaticus*) in Asia, which are also solitary nesters (Kahl, unpubl. notes), the Jabirus observed were fairly undemonstrative at the nest and gave few ritualized displays. It is probable that most solitary-nesting tropical storks mate for life and, thus, display less to a "familiar" partner, whereas most colonial-nesting storks probably choose a new mate each season and, thus, display more (Kahl, in press).

A few displays were observed at Jabiru nests no. 1, 2, 5, and 6, and at feeding areas. Details of these behavior patterns will be presented elsewhere, in the series of papers on the comparative ethology of the Ciconiidae, and only brief mention of the most significant displays will be made here.

All species of storks possess a homologous "greeting" display, which members of the pair give to each other when one of them returns to the nest after an absence. Because this display is found in a recognizably similar form throughout the family Ciconiidae—but with distinct species-specific differences—it is a useful character in assessing taxonomic relationships within the group.

The "greeting" display in the Jabiru was observed on only two occasions (at nest no. 6). During the display both Jabirus faced each other on the nest, held their necks erect and their heads high, with their bills slightly below the horizontal. Both birds clattered their bills

loudly and rapidly and, at the same time, swayed their heads and necks slowly back and forth from side to side and gave slight up and down movements with the bill, bringing it slowly up to or slightly above the horizontal and then lowering it again.

Although solitary at the nest, Jabirus often feed in flocks. Naumburg (1930) and Hudson (1951) have reported large feeding flocks in areas where food was abundant. On 8 August I saw many Jabirus feeding in the Estero del San Lorenzo, about 15 km N of Mburucuyá. At one point some of them took wing and joined in a large soaring flock overhead. I counted 33 Jabirus in the air at once, and I estimate that another 20–30 remained on the ground.

Jabirus generally foraged while wading in shallow water. Typically a bird waded along with its neck extended forward and its bill held 30–40 cm above the water and pointed downward at an angle of about 45° . With every few steps the bird bent down and probed in the water with its bill open about 50 mm at the tip. If nothing was contacted, the bill was withdrawn, and the bird continued to wade. When a prey item was contacted, the bill was quickly closed, the head was lifted, and the item was swallowed with a backward toss of the head.

A number of catches were witnessed but, unfortunately, always at too great a distance to permit identification of the prey. In other areas Jabirus have been reported feeding on frogs, fish, snakes, snails, insects, and other invertebrates (Pelzeln 1868–71; Lloyd 1895; Chubb 1916; Hudson 1951). A Jabiru at nest no. 1 was once seen playing with a dead snake about 30 cm in length; the bird repeatedly picked up and dropped the snake in the nest, and finally the reptile fell to the ground below and was lost.

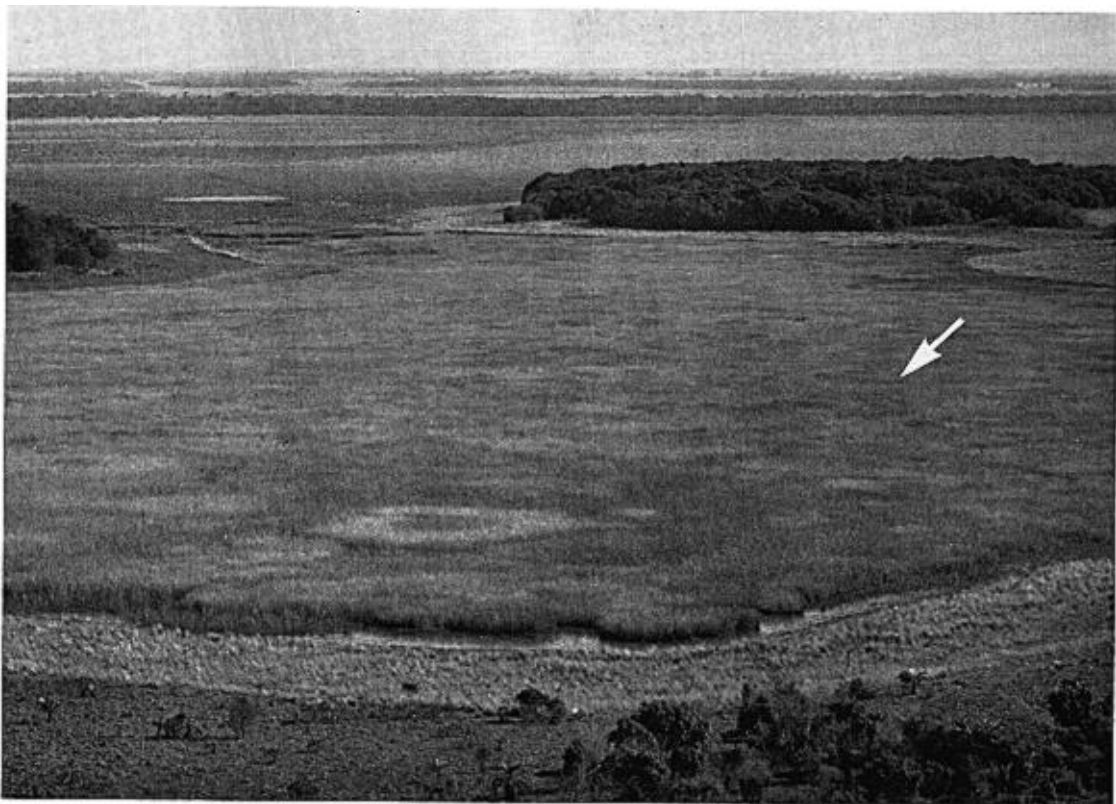


FIGURE 4. Aerial view of *Cyperus giganteus* marsh at Estancia Santa Teresa. This marsh contained approximately 20 nests of the Maguari Stork; arrow indicates location of nest shown in figures 5 and 6.

On 8 August I watched a pair of *Jabirus* foraging in a shallow marsh just northeast of Mburucuyá. Suddenly the male dashed wildly through the shallow water, his legs flailing and his wings flapping. He first ran up to the female, halted, turned, and then ran away. At the end of his second dash, the male stopped, closed his wings, bent down, and picked up something from the water that looked like a piece of water-weed. He soon dropped the item and continued with normal foraging.

Interpretation of such wild antics is difficult. The male may only have been pursuing prey that was attempting to escape. However, I have seen similar wing-flapping performances in feeding pairs of the related *Ephippiorhynchus* and *Xenorhynchus* storks of the Old World tropics, and I believe them to be ritualized displays, probably serving a courtship function. It is possibly significant that the storks of the genera *Jabiru*, *Ephippiorhynchus*, and *Xenorhynchus* are the only ones I have seen to perform this action, and they are also the only storks that possess white primary and secondary feathers in the wing, producing a striking spectacle when the wings are opened.

MAGUARI STORK (*EUXENURA GALEATA*)

The Maguari is a medium-sized stork, standing approximately 1.2 m tall, with predominantly white body plumage and black on the wings and tail. In general appearance it is similar to the White Stork (*Ciconia ciconia*) of the Palearctic, except for its short, black, deeply-forked tail. Breeding adults have a bluish-gray bill shading to blackish-maroon in its distal-third, red skin around the eyes and on the lores, a lemon-yellow iris, and red legs. Elongated, stiff, white under-tail coverts extend beyond the length of the forked, black tail and themselves resemble a true tail; I suspect that the under-tail coverts do indeed function as a tail from an aerodynamic standpoint.

The sexes are indistinguishable externally, except for the male's slightly larger body size and longer, more recurved bill.

Maguari Storks range throughout much of South America, generally east of the Andes, from Columbia, Venezuela, and the Guianas, southward to Chubut Province in Argentina (de Schauensee 1966); the species apparently occurs uncommonly in Chile but is not known to breed there (Johnson 1965).

In Argentina nests have previously been reported from the Cape San Antonio region of



FIGURE 5. Photograph taken from low-flying plane of nest of Maguari Stork, Estancia Santa Teresa, Corrientes, on 29 August 1969. Adult at nest is giving a threat display to plane; open wings cover the two nestlings which were 23–27 days old.

central Buenos Aires Province (Gibson 1880; Weller 1967), but I found none there in 1969, owing to a prolonged drought in the area. A number of apparently newly occupied nests were observed from the air in the Estero del San Lorenzo, Corrientes Province, in late June 1969 by D. Crider and M. Rumboll (in litt.). In August and September 1969 I found at least 40–50 nests scattered singly or in loose colonies in the Estero del Santa Lucía and in the marshes of the Estancia Santa Teresa (fig. 4), northeast of Mburucuyá, Corrientes Province.

The nests of the Maguari Stork that I found in Argentina were unique for a stork. They were composed of piles of reeds and other vegetation and were built *on the ground* in shallow water in treeless marshes (fig. 5). The nests resemble those of a crane (*Grus* sp.)

or screamer (*Chauna torquata*) more than they do the nests of other species of storks, all of which normally build elevated nests on trees, rocks, or house-tops. Maguari nests that I examined closely in Corrientes Province were conical structures 1.5–2.5 m in diameter at the base, tapering to a flat platform 1–1.5 m in diameter at the top; they rose 0.5–1 m above the ground, and at least 0.2–0.5 m above the surface of the water in the marsh. Construction was largely of reeds (*Cyperus giganteus*) and marsh-grass (*Zizianopsis bonariensis*), dominant plants in the marshes around the nests, and a few plant-stems of *Eryngium horridum*, which were probably gathered on dry land nearby. Each nest was surrounded by several square meters of open area, where the vegetation had been beaten down by the birds or removed for nest material.

Similar ground-nests have previously been reported for the Maguari in Brazil (Hagmann 1907) and in the Cape San Antonio region of Argentina (Gibson 1880; Sclater and Hudson 1889; Hudson 1920). However, along the Matillure River in Venezuela, Maguari nests were placed atop “round-topped bushes,” which rose about 1.8 m out of the water (Zahl 1950). The large tree-nest that was described for the Maguari Stork in Surinam by Penard and Penard (1908), “*Het groote, uit kleine takken en twijgen samengestelde nest, vordt gebouwd in hooge boomen*,” does not sound at all typical for this species and probably refers to the Jabiru instead.

The few available breeding dates for the Maguari Stork throughout its range are summarized in table 2.

In the only nest I visited that contained eggs, they measured 77.4×56.2 and 76.3×56.2 mm, respectively. Other authors have given average egg measurements for the Maguari as 75.6×51.9 mm (n not given, Gibson 1880), 74×52 mm (n not given, Gibson 1919), and 75.1×53.4 mm (average of 18 eggs; Schönwetter 1960).

The majority of nests visited, or seen from the air, contained young. I found two young in each of the three nests that I visited on foot.

TABLE 2. Breeding dates of the Maguari Stork.

Locality	Calculated date of egg-laying	Authority
Argentina (Cape San Antonio)	mid-August	Gibson (1880)
Argentina (Cape San Antonio)	July	Weller (1967)
Argentina (Corrientes Prov.)	July/August	Kahl (this paper)
Brazil (mouth of Amazon R.)	July/August	Hagmann (1907)
Venezuela (Matillure R.)	August/September	Zahl (1950)



FIGURE 6. Nestling Maguari Stork, about 10 days old, giving a "greeting" display and bill-clattering to the author. Nest-mate is about 2 days younger. Note pale gular skin (orange in life), gray body down, black head down.

They were approximately 8–10 days old (14 August), 20–24 days old (26 August), and 36–40 days old (4 September), respectively. Assuming an incubation period of about 30 days, the first eggs in this area must have been laid in late June or early July.

Nestling Maguari Storks look quite unlike their parents. Newly-hatched young have apparently not been described. An 8-day-old nestling had most of its body and wings covered with rather sparse gray down and had shorter, curly black down on the head and neck (fig. 6). Its 10-day-old nest-mate was similar but had a second coat of denser black down beginning to surpass the gray down on the body and wings. Each had a black bill with the distal 5–10 mm cream-colored and a white "egg-tooth" near the tip of the upper mandible. The naked gular skin was a bright orange, and the skin of the sparsely feathered abdomen was a shiny bluish-gray, with a stripe of pale yellow extending up the ventral apteria almost to the base of the gular region. The iris was dark brown and the legs and feet



FIGURE 7. Female Maguari Stork regurgitating food for two nestlings approximately 28–32 days old. Note patch of white down in region of tail of young; tail feathers themselves (too small to be visible in photo) were black.

shiny black. A nestling approximately 10–12 days old was collected and the specimen was presented to the U. S. National Museum, Washington, D. C. (USNM no. 534262).

By 20 days of age the nestlings were covered with a dense coat of dull black down. They appeared all black except for the rich orange gular skin, which had a few black spots along its borders, and a small patch of white down above and below the tail (fig. 7). Nestling Maguaris do not have a white tail, as stated by Gibson 1880. Apparently the nestlings remain predominantly black until about the time of fledging (Hagmann 1907). They then begin to acquire patches of white feathers (Hudson 1920), and by eight months of age they reportedly take on an appearance similar to that of the adult (Gibson 1880).

Numerous observations were made from a blind, about 15 m away, of parents bringing food to the young, and on several occasions frightened nestlings regurgitated their previous meal when I visited their nests. Most of the meals given to the nestlings consisted of eels between 75 and 200 mm in length; the remainder of the identifiable food items were small fish and, once, an earthworm (Annelida) about 125 mm long. Both of the parents fed the young. Food was regurgitated onto the floor of the nest by a parent (fig. 7) and then was quickly eaten by the nestlings. An adult Maguari, observed in July north of Dolores, Buenos Aires Province, was seen killing and eating a live snake about 30–40 cm long, which it had captured in a grassy meadow. Elsewhere the Maguari has been reported eating

TABLE 3. Some morphological and behavioral similarities between the genera *Jabiru*, *Ephippiorhynchus*, and *Leptoptilos*.

Trait	Description in <i>Jabiru</i>	Most similar to:	
		<i>Ephippiorhynchus</i>	<i>Leptoptilos</i>
Morphology			
Bill size	massive		X
Bill color and shape	black and slightly recurved	X	
Head and neck	devoid of feathers, except for occipital tuft		X
Throat sac	enlarged but not pendant; colored red and black		X
Bare breast spot	elongated, vertical oval; pale pink in color	X	
Eye color	dark brown irides in both sexes		X
Wing	primaries and secondaries pure white	X	
Under-tail coverts	not fluffy, elongated, or otherwise modified	X	
Behavior			
Nest	solitary; rather massive; used several seasons	X	
Flight	with neck extended	X	
"Greeting" display ^a	pair clatters with bills held approximately in normal position and side-by-side; bill not pointed vertically up or down	X	
Flapping dash ^b	in water at feeding area, one bird dashes toward or away from mate with wildly flapping wings	X	
Feeding	food largely live-caught; forage with slow walk and probing with open bill	X	

^a See text, p. 223.^b See text, p. 224.

frogs, fish, reptiles, insects, crustaceans, small mammals, and the eggs and young of marsh-nesting birds (Fraser 1843; Pelzeln 1868-71; Gibson 1880, 1919; Goodall et al. 1951-57).

Because nests were closely surrounded by high (2-2.5 m) marshgrass or reeds, it was difficult to observe the behavior of adults at most nests. I spent many hours watching from a nearby hillside overlooking the nesting marsh, and from this vantage point it was possible to observe the comings and goings of adults at about 15-20 nests. However, once a bird landed at a nest, it was generally hidden by vegetation. On several occasions I could hear vocalizations and short bursts of bill-clattering from adults that had just landed at nests, and I once saw a pair throw their heads upward, with bills just behind vertical, and clatter their bills in a "greeting" display homologous to those given by other storks. The vocalizations heard during the "greeting" display were wheezy, bisyllabic, whistling notes, uttered about every 1-1.5 sec; the sound can be fairly closely duplicated by pursing the lips to whistle and then breathing forcefully out and in. These vocalizations were similar in quality, although deeper in pitch and given at a slower tempo, to sounds uttered during the "greeting" displays of the storks *Sphenorhynchus abdimii* and *Dissoura episcopus* of the Old World tropics (Kahl, unpubl. notes).

The head movements appeared similar to those of *Sphenorhynchus abdimii* and were also reminiscent of the "greeting" display in the White Stork (*Ciconia ciconia*) of the Palaearctic (Schüz 1942), except that the head was not thrown all the way backward until resting on the back.

Unfortunately, no adult "greeting" displays were observed at the nest near which my blind was constructed. There the 20-30-day-old nestlings were often left unattended by their parents, and the male and female rarely visited the nest at the same time to feed the young. The nestlings, however, gave frequent "greeting" displays to their parents, particularly when the adult arrived at the nest after a long absence. In this display the nestling throws its head up with the bill nearly vertical and clatters the mandibles rapidly 5-8 times (fig. 6). Owing to the softness of the young's bill, little clattering sound is produced. Such "greeting" displays in nestling Maguari appeared similar to those described and illustrated in the young White Stork (*Ciconia ciconia*) by Schüz (1942:10-11). After giving the "greeting" display, the nestling Maguari usually proceeded to beg for food from the parent. These and other social displays of the Maguari Stork will be described in greater detail and compared with those of other storks elsewhere (Kahl, in prep.).

DISCUSSION

In its morphology and behavior the Jabiru Stork shows affinities with the Old World storks of the genera *Ephippiorhynchus*, *Xenorhynchus*, and *Leptoptilos* (table 3). Elsewhere (Kahl, in press) I have suggested that the two former genera are so similar that they should be combined into one genus, *Ephippiorhynchus*. Since the Jabiru is intermediate in so many respects, I feel that it should be retained in its own monotypic genus, *Jabiru*, between *Ephippiorhynchus* and *Leptoptilos*, but it is more closely related to the former.

The Maguari Stork has for many years been classified in the monotypic genus *Euxenura*. It shows morphological similarities with several Old World storks, e.g.: plumage pattern and soft part coloration similar to *Ciconia ciconia* (especially the eastern race *C. ciconia boyciana*); forked tail similar to *Dissoura episcopus*; skull structure similar to *Ciconia*, *Dissoura*, and *Sphenorhynchus*. Furthermore, in behavior *Euxenura* shows a close resemblance to *C. ciconia*, *Dissoura*, and *Sphenorhynchus*. Recent studies of all stork species (Kahl, unpubl. notes) have shown that the monotypic genera *Sphenorhynchus*, *Dissoura*, and *Euxenura* resemble each other and *C. ciconia* and *C. nigra* more closely than *C. ciconia* and *C. nigra* resemble each other. Therefore, I propose that all of these genera be united in the genus *Ciconia* (see also Delacour and Mayr 1945:105) and that their sequence be changed to reflect phylogenetic relationships, as follows:

Old (Peters 1931)	New (proposed here)
<i>Sphenorhynchus abdimii</i>	<i>Ciconia nigra</i>
<i>Dissoura episcopus</i>	<i>Ciconia abdimii</i>
<i>Ciconia ciconia</i>	<i>Ciconia episcopus</i>
<i>Ciconia nigra</i>	<i>Ciconia galeata</i>
<i>Euxenura galeata</i>	<i>Ciconia ciconia</i>

The Maguari differs most strikingly from other storks in its nesting on the ground. All other species of storks normally build elevated nests, although *C. ciconia* has been known rarely to nest on the ground (Witherby et al. 1939:114; Thienemann 1911). However, I feel that such a change in nesting behavior could evolve rapidly under the influence of strong selection pressure (e.g., invasion of a largely treeless area, such as the Pampas), and its existence does not preclude the possibility that the Maguari is closely related to *C. ciconia* and the other species listed above. The fossil stork, *Ciconia maltha*, which was widespread in the Pleistocene of North America (Brodkorb 1963:289–290), may represent a link between the *Ciconia* storks of the Palaearctic and

Old World tropics and the Maguari of the Neotropics.

Perhaps the black coloration of the Maguari nestling is somehow related to their ground-nesting. Some of the possible adaptive functions of black plumage have recently been discussed by Cowles et al. (1967). It was obvious to me from a small plane that the black nestlings were considerably more difficult to see from above than were the predominantly white adults. Thus, the camouflage afforded by black plumage might make medium-sized young—which are left alone by their parents but are not yet large enough to defend themselves fully—less vulnerable to attacks by predatory birds such as *Polyborus plancus*, *Busarellus nigricollis*, and *Circus buffoni*, which are common in the nesting areas and which may sometimes take young storks. Another possibility (suggested by Cowles et al. 1967, and further elaborated by Heppner 1970) is that black plumage is metabolically advantageous when daytime temperatures are below thermoneutrality, because a black bird is able to absorb a greater proportion of radiant energy from the sun than is a white bird. Since the Maguari breeds at the end of the winter in the southern part of its range, the young are often subject to low environmental temperatures while in the nest.

SUMMARY

Studies were conducted July–September 1969 on the Jabiru and Maguari Storks in Argentina. Most field work was done in Corrientes Province, and a number of active nests of both species were found there. Data are presented on reproductive biology, ecology, and behavior.

Although there is only one previously published breeding record for Argentina, the Jabiru is not an uncommon nester in Corrientes Province. Many aspects of the morphology and behavior of the Jabiru resemble the Old World storks of the genera *Ephippiorhynchus* (includes *Xenorhynchus*) and *Leptoptilos*, although the Jabiru's affinities are closest to *Ephippiorhynchus*. I suggest that *Jabiru* should be retained as a monotypic genus.

The Maguari Stork is a fairly common breeding bird in Argentina, south as far as Chubut Province. Many nests were found, singly or in loose colonies, in the marshes of Corrientes Province. The Maguari is unique for a stork in constructing its nest on the ground in a marsh, rather than on an elevation as do other storks. In its morphology and behavior, the Maguari shows close affinities with the Old World Storks of the genus

Ciconia, and it is suggested that the genus *Euxenura* be included in *Ciconia*, along with *Sphenorhynchus* and *Dissoura* of the Old World tropics.

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