

The Blue-throated Macaw *Ara glaucogularis*: characterization of its distinctive habitats in savannahs of the Beni, Bolivia

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Recebido em 02 de abril de 1997; aceito em 20 de julho de 1997

RESUMO. A arara *Ara glaucogularis*: caracterização de um hábitat distinto nas savanas do Beni, Bolívia. *A. glaucogularis* é uma espécie exclusiva da região conhecida como Llanos de Mojos. É uma arara de savana com palmeiras, pouco predadora de sementes, com alimentação especializada em mesocarpo de palmeiras. A informação sobre a distribuição disponível na literatura anterior a 1993 foi baseada na informação de terceiros. Na literatura a distribuição da espécie esta confusa com a informação histórica e limítrofes no sul da arara canindé (*Ara ararauna*), atualmente parte do Paraguai e Argentina. A captura de Psittacideos ocorrida na década de 1980 foi a principal causa do declínio da espécie.
PALAVRAS-CHAVE: *Ara glaucogularis*, áreas inundáveis, Beni, Bolívia, campos, Llanos de Mojos, palmeiras, Psittacidae, savana.

ABSTRACT. The Blue-throated Macaw (*Ara glaucogularis*) is endemic to the Llanos de Mojos, in the Departamento de Beni, Bolivia. Previous reports (prior to 1993) on the range of the species were based on third-hand information. We document that this macaw is found in savannahs, where it is restricted to groves of motacú (*Attalea phalerata*) palms, but it is not a palm nut cracker specialist, rather a palm fruit specialist. Pre-1993 reports on the range of the species were based on third-hand information and are inaccurate. The accounts on the *Ara caninde* in Paraguay, Vice-Royalty of La Plata is a range of the historical distribution of the Blue-and-yellow Macaw (*Ara ararauna*) in the southern limits of its range (Paraguay and Argentina). The *A. glaucogularis* habitat is known locally as "sartejenal" has a long term human occupation before European colonization. The palm groves in the region are more than 500 years old and the palm population structure suggests long term decline. The parrot trapping activity during the 1980s was the main factor in the decline of many parrot species.

KEY WORDS: *Ara glaucogularis*, Beni, Blue-throated Macaw, Bolivia, grassland, habitat, Llanos de los Mojos, palm, parrot, Psittacidae, savanna, wetland.

The Blue-throated Macaw (*Ara glaucogularis*) Dabbenne 1921 is an endangered species, about which there has been very little information available (Forshaw 1989, Ingels *et al.* 1981, D. Lanning unpublished data 1982, Ridgely 1980). The validity of the species and the name were the subject of much controversy (Forshaw 1973). The taxonomic status of the Blue-throated Macaw was clarified by Ingels *et al.* (1981) who synonymized the *Ara caninde* and *Ara azarae* as junior synonymia of *Ara ararauna*, revalidating the name *A. glaucogularis*.

The distribution of *A. glaucogularis* was a mystery, without type-locality Ingels *et al.* (1981) designated as Santa Cruz de la Sierra. The few museum skins are labeled as general South America provenance; e.g., two skins in British Museum of Natural History (BMNH); River Amazon and Brazil (Ingels *et al.* 1981). Much of the scant available data is based on third-hand information; e.g.,

from bird dealers, aviculturists and trappers. The presumed distribution (Forshaw 1973, Ridgely 1980, Ingels *et al.* 1981, D. Lanning unpublished data 1982, Collar *et al.* 1992) of the species were Paraguay and Bolivia; Buenavista, Yacuiba, Santa Cruz de La Sierra and the Department of Beni. Only in 1992 was the bird found and observed in the wild (Jordan and Munn 1993). Motacuzales, or grove of motacú palms (*Attalea phalerata*) on seasonally flooded savannas, were identified as the most important habitat for the species (Jordan and Munn 1993). In this paper we use *A. phalerata* rather than *Scheelea princeps*, as a reference name of the motacú palm following Henderson *et al.* (1995). The systematic and taxonomy of this group of palm remains unclear (Balslev and Moraes 1989).

Our objective is to characterize critical elements of the habitat of this threatened macaw, based on landscape and vegetation structure. We also discuss historical data, food

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habits, sympatry with other parrots species, population and problems associated with conservation of the open habitats favored by *A. glaucogularis*.

METHODS

We conducted a survey of areas in the Llano de Mojos, Departamento de Beni, northern Bolivia (figure 1), previously visited by C. Munn in 1992. YB joined a Fundacion Armonia survey team from 17 July to 6 August in 1993, CY and YB from 3 August to 8 September in 1994 and from 9 to 19 October 1994 (YB) to characterize the microhabitat of Blue-throated Macaw. We do not reveal

the precise localities at which we found Blue-throated Macaws, in order to protect these populations.

The transects were made at sites at which we observed foraging Blue-throated Macaws, utilizing a 50 m topcord. All the trees and palms 2.5 m from either side of the transect were counted, measured, and classified by size. Age classes of motacú palms were established according the pattern adopted by Anderson *et al.* 1991 (figure 2). We adopted five size class indices: (1) immature without trunk; (2) mature with old fronds on the trunk-healthy productive palm tree; (3) mature with exposed trunk in good conditions and good productivity; (4) mature with weathering trunk, productive but senile; (5) snag of dead

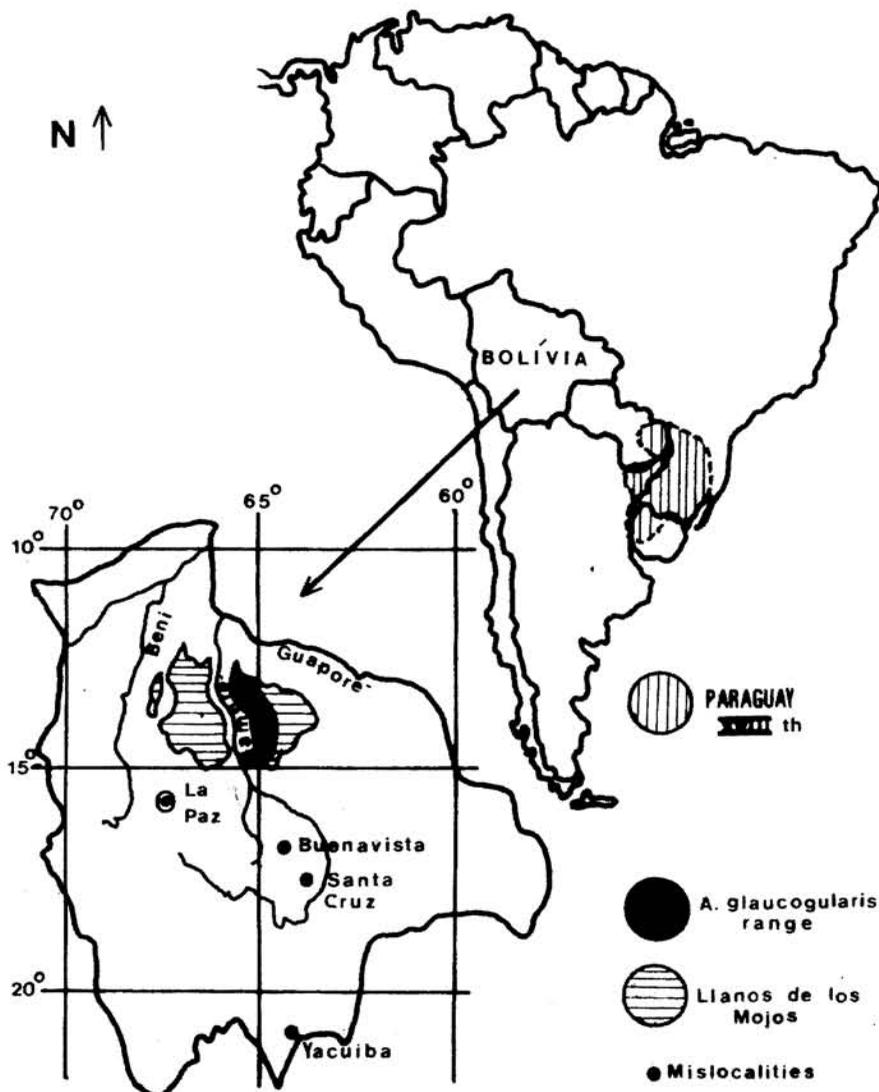


Figure 1. South America map, territory of Paraguay in shaded (adapted from MEC 1968). Distribution of the Blue-throated Macaw *Ara glaucogularis* in Bolivia (adapted from Unzueta 1975).

palm tree. The heights of palm trees were measured from the ground to the base of the crown. Tree heights were measured from the ground to the top of canopy, and the diameter at breast height (DBH) was measured over 10 cm in diameter.

We noted the presence of all the species of parrots. The relative abundance of parrot species was classified as follows: (1) abundant: more than 3 flocks with 12 individuals or more per day; (2) common: between 3-1 flocks of less than 12 individuals/each per day; (3) moderate: 1 flock per day; (4) rare: less than 1 flock per week.

We surveyed the Llanos de Mojos a total of 1,818 km with four-wheel drive vehicle, 380 km through rivers in a boat, 500 km on foot, and 1,040 km on small Cessna plane. The phytogeographical terminology follows Hueck (1972).

Study site. The Llanos de Mojos or Pampas del Beni is a wide savannah plain of edaphic associations, laid in riverine sediments of sand and clay of Cenozoic origin. The region has a poor drainage, and in the wet season is susceptible to flooding. These llanos includes portions of the basins of the Itenez, Mamore, Beni and Madre de Dios rivers. These meandering rivers often change their course, creating oxbows lakes and swamps (Unzueta 1975, Palau y Saiz 1992).

The region, which lies between 200 and 300 m above sea level, is classified as humid subtropical to the Holdridge classification, based on 1000-1500 mm rainfall and average temperature of 23-24° C (Unzueta 1975).

On these large open ranges dominated by grassland, the physical and mechanical factors associated with differing microrelief create a mosaic of habitats including carandam palm (*Copernicia alba*) groves, semi-deciduous woodlands, gallery forests (containing Amazonian elements), and motacú palm (*A. phalerata*) groves on higher, unflooded terrain, islands that may be natural or the work of pre-Columbian humans (Denevan 1980).

The region is bounded by Amazonian rainforest to the north, the Chaco to the South, deciduous woodland and cusi palm (*Orbignya phalerata*) to the east, and by the humid Andean foothills to the west (Hueck 1972).

RESULTS AND DISCUSSION

Historical account and distribution. Records of *A. glaucogularis* from Argentina and Paraguay had mistakenly been based on a description of Caninde's Macaw of Felix de Azara (1802-1805) in Paraguay which, during the XVIII th Century, was a territory of the Vice-royalty of La Plata including parts of present day's: North-eastern Argentina, South-western Brazil and South-eastern Paraguay (figure 1). The historical account of the Caninde by Azara (1789, 1802-1805) detailed its description as "a yellow and blue macaw, white bare face, below the eye three feathered black lines and a green forecrown", which would be the *A. ararauna* rather than *A. glaucogularis*. The description of Caninde is corroborated by an earlier, richly detailed report of Sanchez Labrador (1767) "debajo del pico, en la garganta son las plumitas negras. Los lados del cuello, lo restante de la garganta, todo el pecho y vientre, visten plumas de color dorado, de un amarillo incendiado. La extremidad de la cabeza, lo alto del cuello, toda la espalda, y lo exterior de las alas, tienen plumas de un azul muy bello.", unequivocally the Blue-and-yellow Macaw (*A. ararauna*). In Sanchez Labrador 1767's book reprint in 1968, the editor's note refers as *A. caninde*. For many decades *A. caninde* was used improperly as a synonymy of *A. glaucogularis*: e.g., Forshaw (1973), Ridgely (1980), D. Lanning (unpublished data 1982), and Nilson (1981, 1989). The confusion was caused by misinterpretation of Azara (1802-1805). The Azara (1789) manuscript when described it, says: "Guacamayo azul, y oro, o Canind or Caninde". "...Gola grande azul-turqui hay en las vertebras

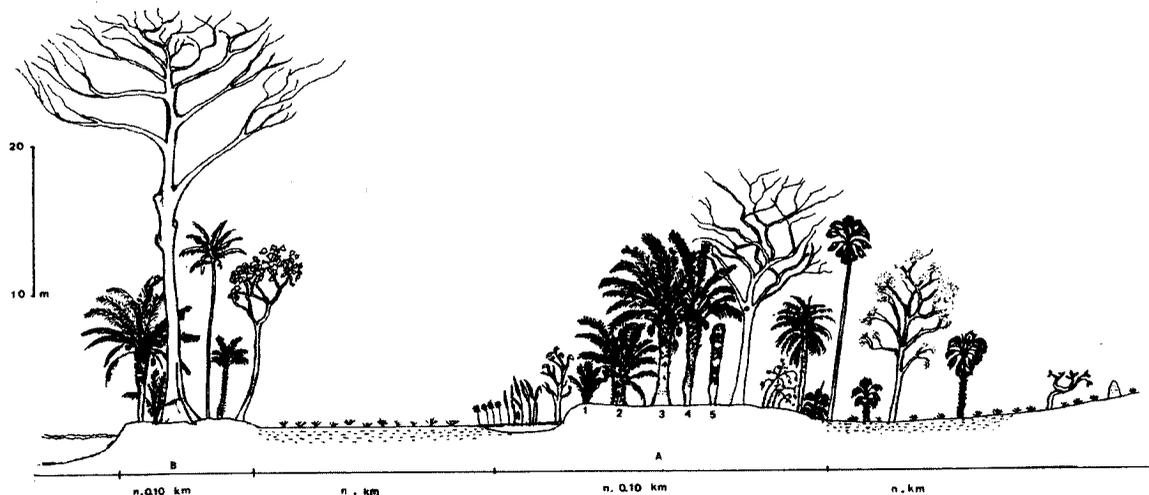


Figure 2. Schematic physiognomy profile of Blue-throated Macaw habitat on the Llanos de Mojos, upper Mamoré River, Bolivia. A. Palm island. B. Gallery woodland with motacú palms dominance. The number under the palms is related to age class. The (N) is whole number for distance. The scale is given in m and km.

mas altas del cuello. De allí lo inferior, y cortador del ave, y cobijas, bajo el al es amarillo-dorado". The color blue-turquoise was assumed improperly as a throat by all previous papers (Dabbenne 1920, Forshaw 1989, Ingels *et al.* 1981, Ridgely 1980) or bluish-black throat color of *A. ararauna* (Ingels *et al.* 1981). In our point of view Azara's description refers to the blue turquoise upper parts (top neck, nape, upper parts) of *A. ararauna* that is blue-turquoise and the under parts yellow-gold.

All information on Caninde from "Paraguay" (The territory of the Vice-Royalty of La Plata, where Felix de Azara and Sanchez Labrador lived including parts of Argentina, Paraguay and southern Brazil) from the end of the 19th and early 20th centuries, should be considered a synonymy of *A. ararauna*. Nowadays an extinct bird of that region, during the end of XVIII the species was already a rare bird (Sanchez Labrador 1767). Caninde is a specific Tupi-Guarani name for *A. ararauna*. Collar *et al.* (1992) still consider the possible historical occurrence of *A. glaucogularis* in Paraguay, even well contrary to the arguments of Ingels *et al.* (1981).

There are museum specimens labeled "Bolivia" and also third-hand information that the species occurred in this country (Forshaw 1973, Ridgely 1980, Ingels *et al.* 1981, D. Lanning unpublished data 1982, Collar *et al.* 1992).

There are two *A. glaucogularis* specimens in the Carnegie Museum US, with the locality of Buenavista (17°28'S, 63°37'W) (Forshaw 1989, Ingels *et al.* 1981, K. Parkes, *in litt.*) collected by Steinbach during the early 1920s. The Steinbach family had been bird-skin traders for three generations in Bolivia and sold thousands of bird skins, especially to US museums (O. Rocha, pers. com, K. Parkes *in litt.*, J. van Remsen, *in litt.*). There are no field notes for the collection dates, and the Steinbach used to collect birds all over Bolivia. The Steinbach's headquarter had been Buenavista. It is unlikely that if a high prized bird such as a *A. glaucogularis* had occurred in Buenavista, so few skins had been sold, especially during early century when large series of macaw skins were arriving in U.S. museums. The rare scarce birds' skins that arrived in shipments of trade skins (e.g. Spix's Macaw *Cyanopsitta spixii*, and Indigo Macaw *Anodorhynchus leari*) were all from species with unknown ranges. The Buenavista local habitat is unlikely a suitable one for *A. glaucogularis*, and it is one of the most well-known richness sites for birds in Bolivia (Gemuseus and Sagot 1996), casting further doubt on the validity of this collection location.

The other locality Yacufba, Tarija Department, close to Argentine border told by C. Olrog (Ingels *et al.* 1981, pers. com.) came from the source of Mr. R. Romero, one of the most important live wildlife trader during the mid 1970s to mid 1980s. The local people report that he operated during the period throughout lowland Bolivia, especially in the Beni Department.

The type-locality designation as Santa Cruz de La Sierra in the specimen of MACN-Buenos Ayres (Ingels *et*

al. 1981) can not be accepted. Santa Cruz de La Sierra (Paynter *et al.* 1975) had been the regional important city of all eastern (lowland) Bolivia. All Beni commerce was linked by regional center Santa Cruz. The eastern Bolivia foreign affairs was dependent, especially from Buenos Ayres, through Tucuman following the Camiño Real, during the 1860's when the mounted skin was donated to Museo Argentino.

In the XVIII Century Paraguay and Bolivia, the localities Buenavista, Santa Cruz de La Sierra and Yacufba have a quite different habitat and it seems to be unreliable that *A. glaucogularis* had occurred at any time there.

Vegetation characteristics. The *A. glaucogularis* range harbors a complex mosaic of different landscape types. The habitat composition includes some specific microhabitat, although ecotones between them add further heterogeneity, described below (figure 2):

1. *Natural and artificial palm islands.* 0.2- 1 ha area. This is unflooded terrain, dominated by motacú palms with semi-deciduous emergent trees such as *Enterolobium cortisiliqun* Leguminosae, *Sterculia striata* Sterculiaceae, and *Tabebuia heptaphylla* Bignoniaceae. Typically these palm islands are surrounded by seasonally flooded grassland. The water ditch is covered by macrophytes as *Thalia paniculata* Maranthaceae, papyrus (*Cyperus giganteus*) Cyperaceae, and some *Erythrina* sp. Leguminosae trees.

At the water ditch side, the island is colonized by spiny bamboo *Actinocladum* sp. short trees, and carandá palm *C. alba*, due the fact that this area is seasonally flooded, but becomes extremely dry during drought.

The emergent trees can reach more than 30 m and are concentrated at the center of the islands. All the older individuals of such trees can supply potential cavities, the principal source of nesting sites for large-bodied parrots such as macaws.

2. *Gallery woodland along rivers.* Characterized by Amazon forest influence, with some trees reaching more than 40 m height. e.g., mapajo or kapok tree (*Ceiba pentandra*) Bombacaceae, and *Hura crepitans* Euphorbiaceae. Densities of motacú palm (*A. phalerata*), sumuqui palm (*Syagrus botriophora*) and chontilla palm (*Astrocaryum vulgare*) vary greatly. On this formation it is possible to distinguish two degree of plant strata- one of emergent trees and below a evergreen leaf palm grove.

3. *Woodland bands and gradient to grassland.* The woodland band is characterized by Chaco (alkaline soil) and Cerrado (acid soil) influences. Much of the vegetation has structures to avoid water loss. The trees reach 15-20 m, and more than 50 percent are semi-deciduous. There are large extension of carandá palm and totai palm (*Acrocomia aculeata*). The carandá palms associated with soil that has high levels of salt, is seasonally flooded but experiences periods of severe drought. The totai palm occurs on higher terrain that never floods, on alkaline soil with very seasonal water availability.

4. *Cerrado.* This formation is characteristic of higher

and better drained terrain on acid soil. The formation is characterized by grasslands, thickly barked and twisted trunks shrub (e.g. *Curatella americana* Dilleniaceae, *Byrsonima* sp. Malpighiaceae, and *Qualea* sp. Vochysiaceae), and many nest ground termites.

5. *Grassland savanna*. Seasonal shallow flooding with vegetation dominated by grasses. During the rainy season the grasses reach more than 2 m height. The composition includes *Hyparrhea* sp., *Digitaria* sp., *Andropogon* sp., *Elyonorus* sp., *Arundinella* sp., *Hypagynium* sp. and *Paspalum* sp.

6. *Moriche palm (Mauritia flexuosa) groves*. This swampy formation is specific dominated by the palm *M. flexuosa*, characterizes by flooded depressions on acid and poorly drained soil, in the savanna, but also along rivers.

All *A. glaucogularis* sightings were in habitats 1 and 2. We found the *A. glaucogularis* only in natural and artificial palm islands and gallery woodland along rivers. The macaw favored tall trees and those areas with continuous motacú palm fruit production. Within the riverine gallery woodlands, the macaws were not observed where the motacú palm represented less than 60 % of the trees.

Population structure of motacú palm groves. Our population structure is based on 18 transects totaling 1,013 m, a total of 64 trees, 171 motacú palms, 10 carandá palms, 1 chontilla palm. The individual density of dicotyledoneous trees and palm trees were 2.49 per 100 m². The density of trees were 0.66 per 100 m². The density of motacú palms as 1.72 per 100 m². Of those measured 26% were trees and 69 % are motacú palms. The Beni motacú can reach 11 m trunk height, with a maximum DBH of 65 cm. The motacú palm produces continuous fruit throughout the year; the same palm tree may have 3-5 racemes each with a different stage of fruit development.

The dicotyledoneous trees (N = 64) measured in our

transects, the mean height 12 ± 5 (range 3 - 26 m) and the mean DBH was 36 ± 21 (range 10 - 85 cm). In the transects we observed many remnant hardwood stumps indicating heavy logging of large DBH tree individuals.

Based on our data the age population structure of motacú palm are: class (1): 9.9 % are trunkless immature (N = 17); class (2): 17 % are health without exposed trunk (stipe mean height = 3 ± 1 m, range = 5 - 1 m; mean DBH = 39 ± 7 cm, range 25 - 50cm; N = 29); class (3): 19% are in good conditions with exposed trunk (stipe mean height = 4 ± 2 m, range = 1 - 8 m; mean DBH = 25 ± 8 cm, range 25 - 65 cm; N = 33); class (4): more than 51.4 % are senile (stipe mean height = 6 ± 2 m, range = 1 - 11 m; mean DBH = 36 ± 7 cm, range 20-55 cm; N = 88); and class (5): 2.3 % found as snag (N = 4). A population structure of low immature palms outnumbered by old palm individuals, suggests a long-term palm grove decline (figure 3) caused by long term cattle grazing on unflooded terrain and annual burning practice by cattle ranchers during decades to centuries. Between 80- 90 % of motacú palms, including senile class produces raceme with nuts throughout the year. This intrinsic characteristic of this palm will insure, at least for a few decades, that there should be no lack of food for macaws.

Nest site availability. The emergent trees could produce cavities that would be potential sites for nesting, but to have a cavity with a minimum of 30 cm of internal diameter, the tree must have a DBH of 60 cm or greater. More than 45% of these trees have a DBH of greater than 40 cm, but very few individuals have a DBH of greater than 60 cm. On our sample (see above) we found only one huge tree (25 m tall, 85 cm DBH) with a cavity. This cavity at time was occupied by Africanized bees, but it also was used as a nest by *A. glaucogularis* in 1992 according locals.

From a total six nests of *A. glaucogularis* in palm

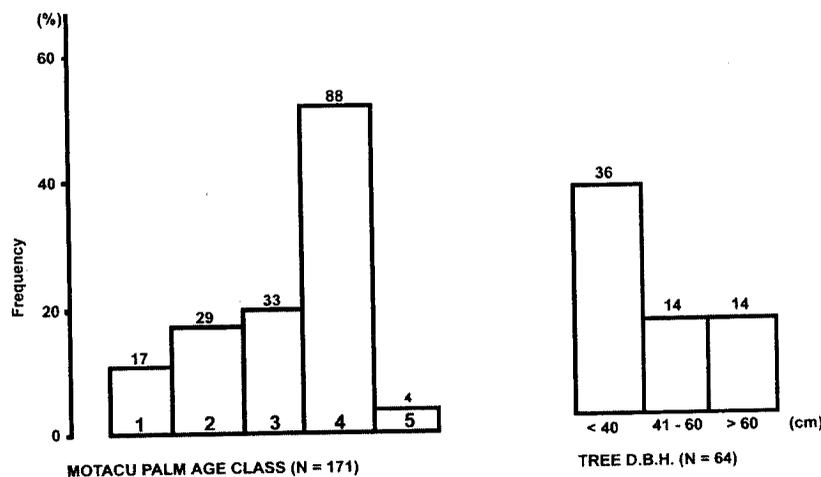


Figure 3. Left: Age classes of Motacú palms groves (N = 171) Class (1) Immature trunkless palm; class (2) mature and productive with old fronds on the trunk; class (3) mature and productive with weathering trunk; class (4) senile and productive with weathering trunk; class (5) snag. The numbers above the bars are the number of individuals of each class and right: associated trees with DBH classes (N = 64).

snags that were utilized between 1993-1994, three nest sites, were in snags that had fallen down in the last visit. We estimate that the annual rate loss of natural palm snags is 50 % of potential cavities for nesting. The motacú palm snag class is of 2.3 % of population (see figure 3). We have no data on the mortality rate of motacú palm, the passage between age class four to five (snag).

Food habits. We observed *Ara glaucogularis* feeding on fruits, seeds, flowers and leaf steams of eight plants species (N = 18 feeding bouts), but mainly motacú palm mesocarp (N = 11) (table 1). With its specialized modification of the beak; (e.g., narrow chisel and longer lower jaws than *A. ararauna*), *A. glaucogularis* left characteristic marks in the ripe fruits of palm, making it possible to identify fruits used in the field. The palm fruits are scraped and then wheeled, cleaning the palm mesocarp (figure 4).

Jordan and Munn (1993) observed the birds plucking unripe palm nuts and drinking the juice in them, as do two other, large sympatric macaws (*A. chloroptera* and *A. ararauna*) (pers. obs.). *A. glaucogularis* is not a palm nut cracker as *A. chloroptera* in the region (pers. obs.) but specializes in palm fruit mesocarp (figure 4). Others food items, except unripe seeds of *Hura crepitans* Euphorbiaceae, represented a small amount of food intake, including flowers, flowers petals, and leaf stems after chewing and discarding the fibers. This motacú palm is the most important food item, its mesocarp is very orange with a high level of fat and carotenoids.

Parrots species sympatric with *A. glaucogularis*. We found 21 species of parrots (table 2) in the Llanos de

Mojos. *A. glaucogularis* is endopatric and syntopic with its species pair *Ara ararauna* (figure 5), and *Ara chloroptera*. For these large macaws there is about 30 (difference in weight between one another, with weights of between 600-700 g for *A. glaucogularis* (J. Abramson, in litt.), (*A. ararauna* 1040-1286 g and *A. chloroptera* 1050-1320 g Forshaw 1989). In our experience the Scarlet Macaw *Ara macao* is not syntopic with *A. glaucogularis* (contra Ingels *et al.* 1981); *A. macao* is found only to the north in continuous rainforest.

The Llanos de Mojos is the distributional limit of such species pairs as Blue-fronted Amazon *Amazona aestiva* and Yellow-headed Amazon *Amazona ochrocephala*; Blue-headed Parrot *Pionus menstruus* and Scaly-headed Parrot *Pionus maximiliani*; and Canary-winged Parakeet *Brotogeris chiriri* and Cobalt-winged Parakeet *Brotogeris cyanoptera*.

The presence of some species reflects the influence of some of the vegetative formations that are adjacent to northern Bolivia, for example the Peach-fronted Parakeet *Aratinga aurea* and the Yellow-faced Amazon *Amazona xanthops* of the Cerrado, Blue-crowned Parakeet *Aratinga acuticaudata* of the Chaco, and the Dusky-headed Parakeet *Aratinga weddelli* of western Amazonian rainforest. Our observations of the Brown-throated Parakeet *Aratinga pertinax* in Llanos de los Mojos area a new distributional record of a species that has disjunct populations on periphery of the Amazon Basin.

Among the species that potentially are sympatric with the *A. glaucogularis*, only the Orange-winged Amazon *Amazona amazonica* was not observed by us, although

Table 1. Food items observed eaten by *Ara glaucogularis* at Llanos de los Mojos, August 1994.

Latin name	Local name	Part consumed	Observed habitat	
			Palm island	Gallery forest woodland
Palmae				
<i>Attalea phalerata</i>	motacú	mesocarp	X	X
<i>Acrocomia aculeata</i>	totali	mesocarp	X	X
<i>Syagrus botryophora</i>	sumuqué	inflorescence	X	
<i>Astrocaryum vulgare</i>	chontilla	inflorescence	X	
Euphorbiaceae				
<i>Hura crepitans</i>	ochohs	unripe seeds, leaf steam	X	
Cochlospermaceae				
<i>Cochlospermum</i>				
<i>hybisoides</i>	tutumillo	flower petals	X	
Sapindaceae				
<i>Sapindus saponaria</i>	isotoubó	unripe seeds	X	
Rubiaceae				
<i>Genipa americana</i>	bi	leaf steam	X	

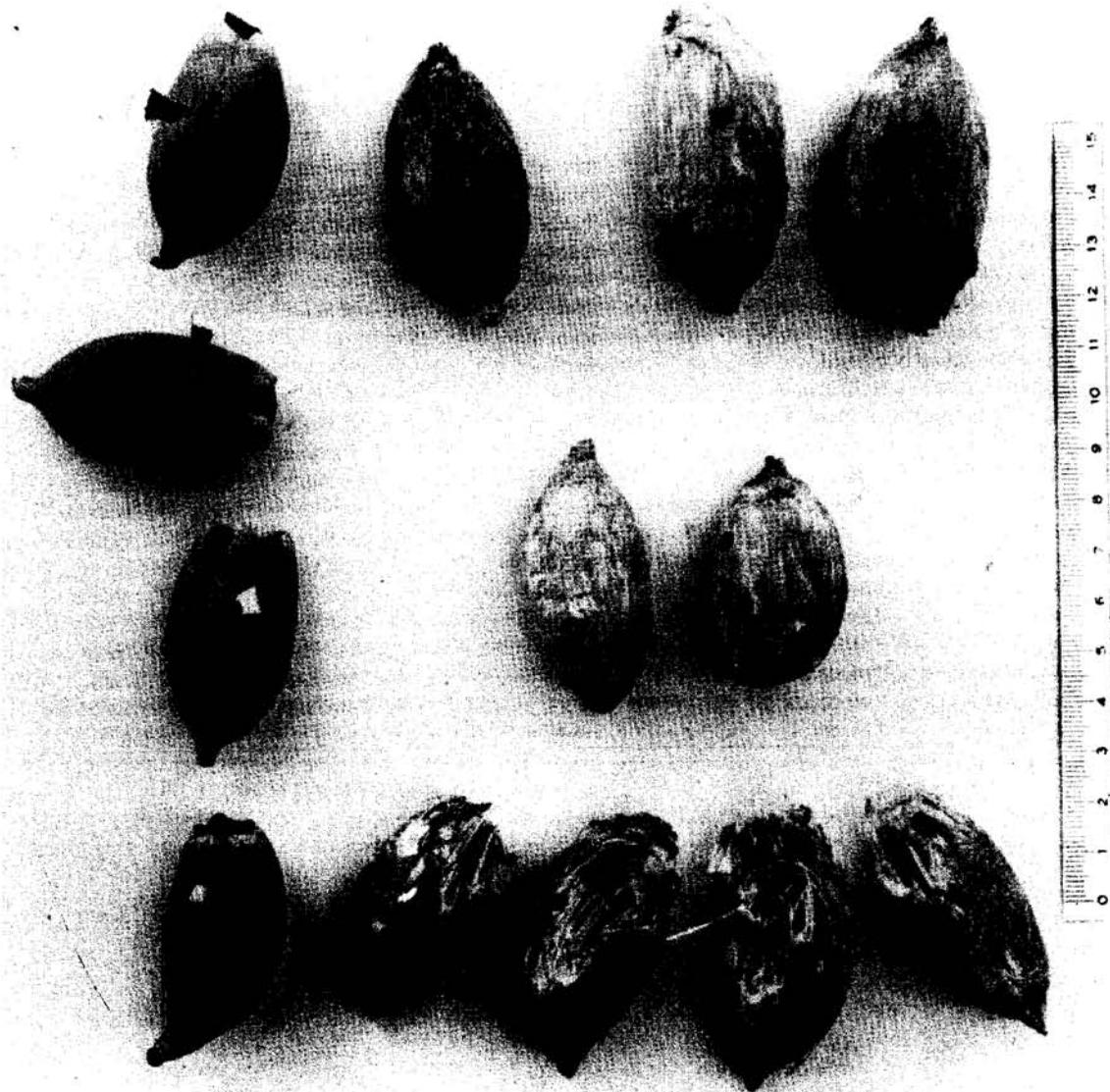


Figure 4. Palm nuts of motacú with macaw traces. Left column: unripe nuts which macaws drank the juice in them. The arrow indicated the puncture of the tip of upper jaws on the plucked fruits. In this tracks it is not possible the macaw species identification. Top right: Different pattern vestige by syntopic large macaws, *A. glaucogularis*; the fruit's mesocarp is consumed and there is a narrow chisel spin tracks, *A. ararauna*; the mesocarp is scraped longitudinally, wider chisel mark, *A. chloroptera* predated the nut's kernel. Photo: C. Yamashita

there is a record from the northern portion of the area inhabited by the macaw in Mamoré river (Remsen *et al.* 1986).

Population. During the study we had 112 records of this species. Most observations were of birds in pairs ($N = 43$) or family groups ($N = 68$), although the largest number observed at one time was a single record of a flock of 15 *A. glaucogularis*. The total minimum number of individuals detected in the 2,000 km² region of the survey was 54 individuals.

This macaw is largely restricted to these palm islands and is only locally present within its range. The Llanos de Mojos is an isolated savanna grassland on the upper Rio Mamoré system, surrounded by forests: Andean lowlands, Amazonia, and deciduous to the east. Almost all macaw species of "medium" size (400 - 800 g) have a restricted distribution, e.g., Red-fronted Macaw *Ara rubrogenys* - Central Andean dry intermontane valleys (Lanning 1991, Collar *et al.* 1992), Military Macaw *Aramilitaris* - montane and sub-montane foothills (Terborgh 1977, Forshaw 1989),

Table 2. The sympatric parrot species of Llanos de los Mojos and their relative abundance. All the species were sighted in August and October 1994.

Species	Motacú palm	Palm swamp	Gallery forest	Open woodland
<i>Ara chloroptera</i>	common	absent	moderate	moderate
<i>Ara ararauna</i>	common	common	moderate	rare
<i>Ara glaucogularis</i>	moderate	absent	moderate	absent
<i>Ara manilata</i>	absent	abundant	absent	absent
<i>Ara auricollis</i>	rare	absent	absent	rare
<i>Ara severa</i>	moderate	absent	abundant	rare
<i>Ara nobilis</i>	rare	moderate	rare	rare
<i>Aratinga leucophthalmus</i>	common	absent	abundant	moderate
<i>Aratinga aurea</i>	moderate	absent	rare	moderate
<i>Aratinga acuticaudata</i>	absent	absent	absent	moderate
<i>Aratinga wedelli</i>	moderate	rare	common	moderate
<i>Aratinga pertinax</i>	absent	absent	absent	rare
<i>Amazona aestiva</i>	common	absent	rare	common
<i>Amazona ochrocephal</i>	common	absent	moderate	common
<i>Amazona farinosa</i>	moderate	absent	moderate	rare
<i>Pionus menstrus</i>	absent	absent	rare	absent
<i>Pionus maximiliani</i>	rare	absent	absent	rare
<i>Brotogeris chiriri</i>	moderate	absent	rare	abundant
<i>Brotogeris cyanopectus</i>	moderate	absent	abundant	rare
<i>Forpus xanthopterygus</i>	moderate	absent	abundant	abundant
<i>Amazona xanthops</i>	absent	absent	absent	rare



Figure 5. Silhouette of syntopic *Ara glaucogularis* and *Ara ararauna* in the same tree. The last in right corner is largest with wider flight feathers *A. ararauna*. Besides the smaller size the four (left) *A. glaucogularis* has a high pitched voice. This picture confirms the previous possibility pointed out by Forshaw (1973): a valid species sympatric with *A. ararauna*. The possibility to be juvenals or subspecies of *A. ararauna* is discard. The large macaws are extreme of altricial birds, the juvenal reach fully size when fledging. Photo: Y. Barros

Indigo Macaw *Anodorhynchus leari*- "Licuri" (*Syagrus coronata*) palm groves (Yamashita 1987), Glaucous Macaw *A. glaucus*- "Yataf" (*Butia yatay*) palm groves (Yamashita and Valle 1993) and Spix's Macaw *Cyanopsitta spixii* "Caraiba" (*Tabebuia caraiba*, Bignoniaceae) gallery woodland (Juniper and Yamashita 1991). *Ara glaucogularis* does not seem to be an exception to this pattern, based on its limited distribution and restriction to a particular habitat. Unzueta (1975) estimates the area of this habitat on the pampas or savanna of the Beni, which he calls "sartejenal", to be about 40 km by 200 km or 8,000 km². This corresponds to the area in which we observed *A. glaucogularis*, from 40 km south of Loreto to 50 km south of Magdalena. Therefore, our estimates for the total population is 200 individuals in the wild.

Conservation. In the pre-Columbian times the savannas were resting areas for nomadic bands of human hunters and agricultural societies. These agricultural societies had intensive technical capabilities, as shown by the hand made terraces of earth built up on flooded terrain, such as along the Mamoré river (Denevan 1980, Palau y Saiz 1992). After the Spanish conquest these agricultural platforms were abandoned (Unzueta 1975, Denevan 1980). It is on this unflooded terrain that motacú palm groves, currently the favored habitat of *A. glaucogularis*, became established, sometime in the past 500 years.

For centuries, open habitats in the Americas have been used as free range for cattle, and the Llanos de Mojos were no exception. This region is the main range for cattle ranching in Bolivia (Unzueta 1975). Local ranchers typically burn the pasture annually. Consequently, in all the rangeland that we visited there is almost no recruitment of palm groves due the long term effect of the overgrazing and annual dry season burning practice.

During the 1980s intensive trapping of parrots for the commercial trade took place in Bolivia, primarily in the Beni. Before 1980 very few *A. glaucogularis* were available in the international market, and it was almost an unknown bird (Low 1992). Based on CITES permits importation to the U.S., Nilson (1981) records 38 birds in 1980 alone, and 112 birds from 1980-85 (Nilson 1981, 1989). Assuming the same level of discrepancies between CITES permits and quarantine data (US Department of Agriculture) as was demonstrated with Hyacinthine Macaw (Munn *et al.* 1990), there are at least two times as many imported specimens, or a minimum of 300 Blue-throated macaws, exported to the U.S. alone. If we assume that Europe, Southeastern Asia, and South Africa also received comparable numbers, we can extrapolate that more than 1,200 wild-caught Blue-throated macaws entered the commercial trade in the 1980s. Even in the 1990s the occasional wild-caught bird was offered in the international market through Argentina (C. Bertonatti, per. com.), Spain, and Brazil. During our field work a ranch manager pointed out that at one local farm more than 5,000 macaws had been captured in an area of around 100,000 ha Munn (1995). The local people voiced their concern, noting that before

the macaw trade years there were huge flocks of macaws, compared to "nothing" of today. Currently there is a lot of habitat available, with few remaining macaws.

ACKNOWLEDGMENTS

We thank C. Munn who gave us the opportunity to conduct this field work. A. Calatayud sent a copy of unpublished handwritten manuscript of Azara. Fundacion Armonia organized the first expedition in which YB participated to the Llanos de Mojos. O. Rocha, C. Quintela, and P. Ergueta provided copies of Bolivian literature. C. Olog, K. Parkes, J. van Rensen, C. Bertonatti, J. Abramson answered my letters (CY) concerning *A. glaucogularis*. R. Guzman from Fundacion Amigos de la Naturaleza for the plants identification. G. Jafet from Fundação Zoológico de São Paulo for the the black and white picture. P. Martuscelli, J. Wiley, R. Bierregaard and T. Schulenberg made many suggestions, comments and improvement on the manuscript. We dedicated this paper in honor to Ted Parker who devoted his life to the study of the neotropical avifauna, and who had many discussions with CY about the possible range and habitat of *A. glaucogularis* before this species was rediscovered in the wild. Two anonymous referees and M. Rodrigues improved the final version of the manuscript.

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