

Conservation of the Lear's Macaw:

Management of an Endangered Species

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Abstract

The conservation project for the Lear's macaw, *A. leari*, has required a thorough study of this macaw's evolution, environment, range, behavior, food supply and population. A decline in census was identified and its most likely cause determined. We have corrected the causes for decline and have noted a small increase in the macaw population in 1989. An unexpected bonus was the enthusiastic support of the populace. Certain, insoluble problems may ultimately lead to the extinction of *A. leari*. Most important of these are oil exploration by Petrobras and relocation of settlers into the area by a government agency. The Lear's Macaw Project has the support of World Wildlife Fund (WWF) and the environmental agency of the Brazilian government, IBAMA. The infrastructure created for the Lear's Macaw Project may be sufficient to deal with the threats to the continued existence of *A. leari*.

Introduction

Not much can be added to Professor Helmut Sick's original description of *A. leari*, in a paper presented at the I.C.B.P. meeting, St. Lucia, 1980. Professor Sick was reporting observations made by him in 1978. I will summarize his findings which are the first observations of the macaw and its habitat.

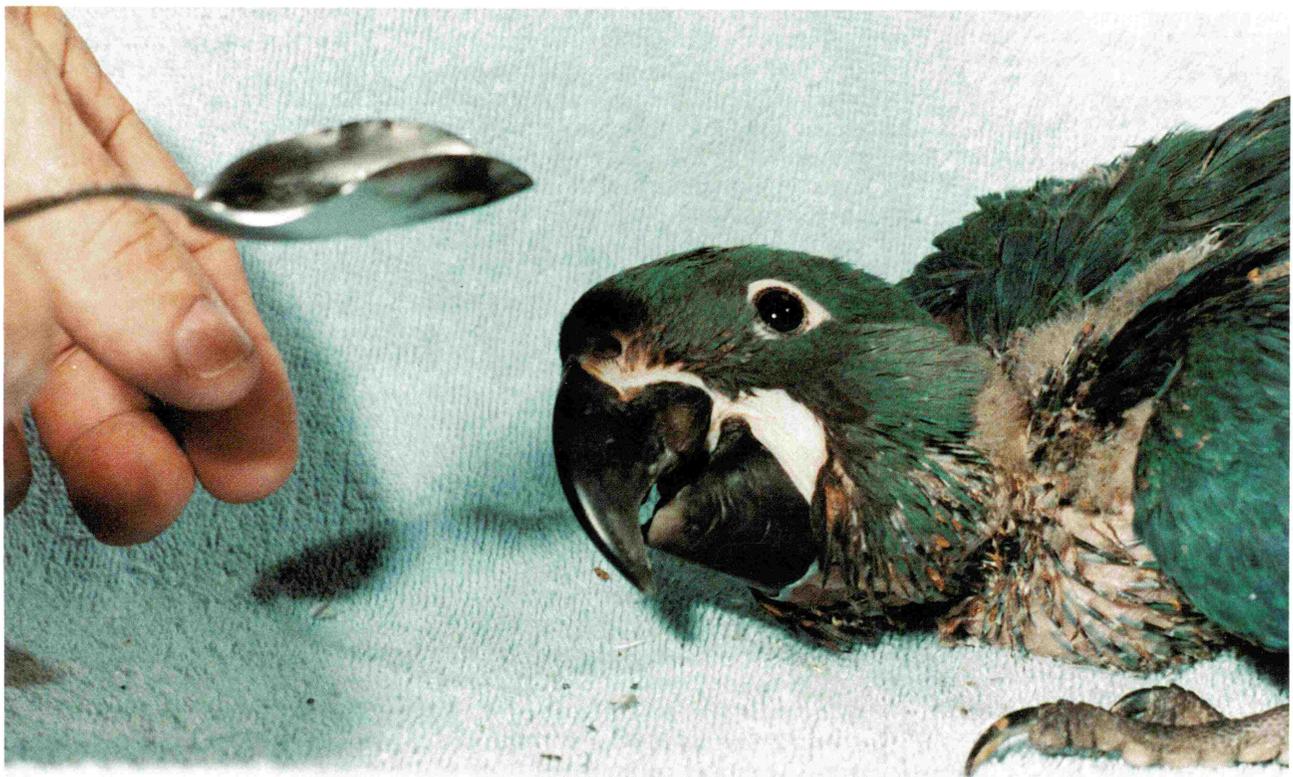
A. leari resembles the hyacinthine macaw, *A. hyacinthinus*, but is smaller, slightly greyer in color and has a shorter tail. The most important morphological characteristic of *A. leari* is the big, nearly triangular, folded, yellow skin at the base of the mandible instead of the flat yellow band of skin that curves around the mandible of *A. hyacinthinus*. *A. leari* lives in flocks which roost together at night in high eroded sandstone cliffs. The macaws leave at dawn and fly long distances to find food, returning to the cliffs at dusk.

Yamashita (1985) adds that in comparison to *A. hyacinthinus*, *A. leari*

has a proportionately longer wing and a shorter tail.

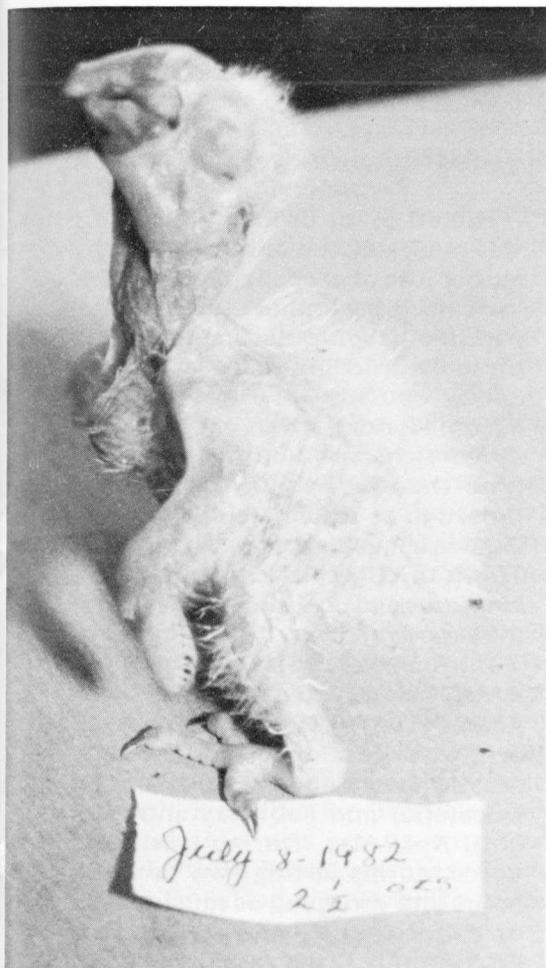
A. leari is adapted to the very hot, dry climate of the region where the daily temperature range is between 59 degrees F and 113 degrees F. The macaw has never been seen to drink water and probably gets all of its liquid from the milk of the immature nuts of the Licuri palm and from other wild fruits.

The ecosystem that supports *A. leari* is called Caatinga. Caatinga formations develop in areas receiving less than 800 mm annual rainfall and on sandy soils poor in organic material. The range of *A. leari* is partially within an area called the Raso Da Catarina. In the "Raso", plateaus, 300 m to 800 m in height, are cut by canyons and rimmed by sandstone cliffs. The Vasa Barris river runs through the "Raso". This river and its flood plain provide arable soil to feed a relatively dense human population, which has existed here since 1870.



Photos courtesy of Busch Gardens, The Dark Continent

The first world captive breeding of the Lear's Macaw (*Anodorhynchus leari*) occurred on June 28, 1982 at Busch Gardens in Tampa, Florida. This was a cooperative breeding between Busch Gardens and Parrot Jungle, Inc. Each owned one of the parents. The photo shows the young Lear's Macaw at two months of age.



The Lear's Macaw chick at 11 days old.

The favored food of *A. leari* is the fruit of the Licuri palm, *Syagrus coronata*. The fruit contains a nut filled with a fatty meat similar to coconut. The palm trees grow best in arable soil and are often left in farmer's fields as an indication of the productive level of the land. The foliage and raceme of unripe fruit are often cut to provide food for cattle.

The original estimate of the size of the macaw population was 200, based on the assumption that other flocks of macaws would be found. Later estimates put the total number of Lear's macaw at about 70 when discovered in 1978.

The discovery of *A. leari* and subsequent writings by professor Helmut Sick became known to me in 1984 just as I finished a five month study of the breeding behavior of *A. hyacinthinus* in the Mato Grosso of south western Brazil. In 1985, World Wildlife Fund and I, with the assistance of SEMA (now IBAMA), Carlos Yamashita of IBDF (now part of IBAMA) and Luis Gonzaga of the National Museum of Rio de Janeiro, began to put together facts and guesses about *A. leari*. This led to the creation of the Lear's Macaw Project. The ulti-

mate purpose of the project was to provide money and a plan to protect the macaw. However, the project soon became a series of problems, the solutions to which have been found after a good deal of research and observation.

Problems

Several separate problems were seen to exist. They were: guarding of the area to prevent hunting and trapping of the already endangered macaws by smugglers; delineation of feeding range and identification of roosting and breeding sites; understanding of feeding patterns, breeding behavior and general flock behavior; surveying of food sources, their importance and availability; determination of an accurate flock census; education of the local populace and the promotion of the public awareness of the Lear's Macaw Project; determination of the causes for the observed decline of the species; and finally, reversal of this decline.

Solutions

Now, five years later, the Lear's Macaw Project has solved most of the original problems, identified new ones and in so doing, uncovered facts

that led to both favorable and unfavorable conclusions.

Protection

The guarding of the area has been accomplished through three strategies: Employment of local guards, enlistment of protective landowners, and secrecy.

In 1979, SEMA hired two local men as guards of a canyon where the original roosting site was identified. The Project augmented the salaries paid to these two guards, provided them horses to increase their effective range, and set up a communication network for their support. The movements of all strangers in the area are monitored by the guards and access to sensitive areas is denied. The Project was able to utilize the infrastructure of a local SEMA office set up to administer an ecological station for the protection of the Caatinga Ecosystem in the Raso da Catarina.

Wealthy land owners were contacted and found to have a protective interest in the macaws and other wildlife. These owners will "shoot to kill" to protect their land from hunters and smugglers.

The Project shunned publicity,

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especially in the scientific community. At major meetings, where project members presented papers, maps were withheld and misleading information was given on exact locations. Unfortunately, secrecy is the best protector of an endangered species.

Survey of Range and Identification of Roosting and Breeding Sites

Quietly, singly, or in small groups, Project members surveyed the surrounding area, questioned farmers and ranchers and studied all available reports. This information was given to two graduate students in biology, who had applied for grants to research the macaws' range, roosting and breeding sites. These same researchers studied feeding and flock behavior. Using the accumulated information from the Project, they were able to make an accurate census of the macaw. Exactly fifty four (54) members of the species, *A. leari* remain in the wild.

An additional roosting site was found, 50 km from the site found by Professor Sick in 1978. We had hoped that this site was used by another, as yet, unidentified flock. To our surprise, however, the original flock of fifty four macaws had a range of 100 square miles and at night, used whichever roost was nearest to their days' forage.

Feeding Behavior and Food Supply

In studying the macaws' feeding habits, the researchers found that when the Licuri palm nuts are scarce, the macaws eat corn, maize and the seeds of the local piao (*euphorbia-ciae* sp.).

Researchers tagged and monitored representative groups of Licuri palms in all of the feeding areas. The age, abundance and seasonality of their fruit was calculated. All the palms were old (thirty years or greater) and only half of them were producing well. Very few seedlings or young palms were found.

The Licuri palm nuts are most abundant, December through March, and sparse the remaining five months of the year. Corn, on which the macaws show an increasing dependence over the past ten years, is usually planted when there is a chance of rain, August-September and December-January. The piao, which grows best in any disturbed or cleared area, produces a small tripar-

tite nut, ripening one month after a significant rain.

Breeding and Related Flock Behavior

The study of breeding behavior was more difficult and was done by me because of my experience with *A. hyacinthinus*. From a study of comparative development, assisted by the only breeding records in existence, (courtesy of Parrot Jungle, Miami, Florida), it was expected the *A. leari* chick would fledge in less time than *A. hyacinthinus*. This proved to be true. Hatching to fledging was about eighty seven (87) days. This is three weeks less than *A. hyacinthinus* and equivalent with that of the large Ara species.

The timing of the breeding periods, which I observed over a three year period (1987 to 1990), was coincident with the rainy season. The rainy season starts sometime between December and February and lasts until April-May. During this time, fierce storms lasting two or three hours and dropping as much as ten or more inches of rain are not uncommon. The resulting flash floods which occur in the deep sandstone canyons of the nesting sites are dangerous and have probably discouraged observation and exploration by the local populace. This may explain why even the most astute of the natives was unaware of the long time the macaw chicks remain in the nest.

Flock behavior changes dramatically at the onset of the breeding season. Fewer and fewer macaws use the traditional roosting sites. Small groups of macaws scatter to other cliffs at nightfall. The reason for this behavior was found to be the increasingly hostile and territorial actions of a breeding pair of macaws intending to nest in one of the deep burrows in the traditional roosting cliffs.

Two or three breeding pairs were able to tolerate each other in the same area. I noted that the cliff burrows of macaw pairs in a multiple breeding site were never in sight of each other. However, trips to and from the breeding area were extremely noisy, involving challenges from each pair.

Education and Promotion

In 1986, a proposal was made by the Brazilian Special Secretary for the Environment, Dr. Paulo Nogueira-Neto, in which *A. leari* would

become the "flagship" species for the Caatinga of Bahia and for Brazilian conservation overall. This Special Secretariat was called SEMA. The SEMA staff was to provide eight conservation education specialists to promote the public awareness of this project.

Soon after our acceptance of the proposal, elections were held and Dr. Nogueira-Neto was replaced. The new Special Secretary completely reorganized the mission, nullifying all previous proposals. The process of negotiating new agreements was begun only to have the Secretariat reorganized again, under a different department and new acronym, IBAMA.

From the foregoing, it is clear that no governmental agency will have the stability to carry out long range plans for conservation. The present course of action is to implement our own plans through a Brazilian foundation, Fundacao Biodiversitas. This foundation was set up to move money into Brazil, purchase land, provide liaison with Brazilian scientists and politic with whichever government department currently most influential. This method is acceptable to IBAMA which gives tacit approval to most proposals.

Our best public relations came as a result of the natural personalities of our graduate researchers. They gave rides in their Jeep to mothers and babies and helped out in emergencies. They charmed the women and became fast friends with the men.

"T" shirts with the macaws pictured on the front were given to a few very important local people and became collector's items. Woven patches showing the macaws and the logos of both World Wildlife Fund (WWF) and IBAMA were given to trustworthy people who helped in the macaw census. Bumper stickers were given to everyone.

So far, education efforts have been geared towards adults. We do have plans to utilize WWF's expertise to reach the school age children.

Determination of Reasons for Population Decline

Sixty to 100 years ago, the Lear's macaw was common in N.E. Bahia, around the head waters of the Vasa Barris river. Grandparents of the current residents remember seeing large flocks of these blue macaws flying overhead. Within the last thirty years, *A. leari* has ceased to exist in the

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northern part of its range. Coinciding with or contributing to the disappearance of *A. leari*, was the tremendous oil exploratory effort of Petrobras, the Brazilian national oil company, begun some twenty five years ago in the region. The roads built by Petrobras opened up large areas of the wild Caatinga to human settlement, ranching, farming and hunting.

We are sure of at least two reasons for the species' decline. They are the decrease in the number and productivity of the native Licuri palm and the increase in human population around the remaining groves of Licuri palm. The Lear's macaw is a shy bird and will not tolerate more than an occasional glimpse of human activity. Ranching brings with it additional problems. Free range cattle and goats eat all of the palm seedlings they can find. Few survive to replace the dying palms in the old groves of mature Licuri.

These factors combine to cause the macaws to feed in only a limited area, low in human activity and safe from hunters. As a result, the amount of palm fruit suffices to feed the flock of fifty four macaws for only three or four months. For the rest of the year, they are forced to subsist on alternate food sources. We fear that the increased feeding on corn has caused angry farmers to kill some of the macaws.

It is certain that the Lear's macaw was hunted for food and sport in the past. As the macaws have become more scarce, hunters save their precious bullets for more easily killed game. However, the loss of even three birds a year to hunters is sufficient to continue the decline in population when other natural forces are considered.

We estimate that six or seven nest-

ing pairs in our flock of fifty four will produce chicks, normally one but rarely two, per year. Certainly two or three macaws will die of old age, leaving a net increase in the flock of only three or four per year. At this population level, hunting alone could be responsible for the extinction of *A. leari*.

Reversal of Population Decline

Our first priority is therefore to halt the killing of the macaws. We made sure that everyone understood that jail or worse awaited anyone who injured a macaw. A macaw was shot in front of a witness. The macaw was wounded and lived long enough to engage public sympathy. The government police were notified and arrived from the capital (an eight hour drive away), complete with automatic weapons. The unfortunate macaw shooter groveled and pled for mercy. He was let off but warned that if another macaw was injured in the area, he would be taken to jail immediately. The police stayed overnight in the area and impressed everyone greatly with their mercy and wisdom. The killer was a poor man with many children to feed. It would benefit him in the future to prevent any more killings of macaws. The whole incident was an "event" and served to show the people that the macaws were important. Our prestige was enhanced by the fact that the police responded to our call.

More effective than threats has been simply dissemination of information about the macaw. There is a good deal of local pride and residents have come to feel proud of "their macaw" since there is no other such bird anywhere in the world.

Owners of corn fields in the area were consulted about the macaw's

destruction of their corn. We have promised them benefits if they tolerate macaws in their fields. These benefits include replacement of lost corn as well as up to date cultivation information through the local government agricultural agency, EMATER. EMATER has a large enough infrastructure to undertake this part of the project.

A plan for large scale planting of Licuri seedlings has met with enthusiasm. EMATER is willing to help overcome obstacles such as protection from live stock. This project will require cooperation and ingenuity to avoid the tremendous expense of new fence to exclude the wily and ubiquitous goats.

One wealthy land owner has fully understood our concern with food supply for the macaws. He has bought a large amount of land around an old plantation near one of the macaw roosting sites. Over a period of five years, during which cattle and goats were excluded, the land has returned to a wild state. A large number of young Licuri palms has grown up. These vigorous young palms bear a large amount of fruit.

During the year of 1989, the macaw count increased to 61 as the young chicks rejoined the flock with their parents in May and June. We hope that these gains are permanent and indicate the positive effects of increased awareness, decreased hunting and a moderate increase in food supply.

Conclusions

We are encouraged both by the apparent increase in the numbers of macaws and by the greatly positive response from the local populace. We suspect that the fate of *A. leari* is tied, ultimately, to the fate of the Licuri palm. I believe that the genus *Anodorhynchus* requires the high fat content of the palm nut to thrive in the wild.

Certain seemingly insoluble problems have surfaced and remain. The Brazilian oil company, Petrobras, is interested in the geology of the region in which the macaws range. There has been a recent re-exploration of the area with seismic soundings. If the macaws are sitting on top of oil, extinction is soon and certain. In Brazil, conservation is not considered a factor in the development of natural resources.

Because of a threefold population increase in northeast Brazil in recent

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years, the State Land and Relocation Bureau has been sending many people to our area to farm and raise goats. The head waters of the Vasa Barris river were dammed to provide a reservoir for irrigation and public water supply. The small town of Cocorobo, which sits nearby the macaw's range, has mushroomed in size. One of the two roosting and breeding sites is a possible relocation site. Unless we can purchase the land and present it to the environmental agency, IBAMA, for protection as a sensitive area, development is likely.

On the positive side, as the town attracts wealth and jobs become available, there is less need for the local populace to depend on wildlife for food. Well fed people are more receptive to the concepts of conservation than are starving people.

We are committed to the Lear's Macaw Project for many years to come. The cost so far has been \$30,000. The money pales in comparison with the infrastructure we have created. Future plans call for continued involvement with the town's business as regards planting innovations and banning of all wild life products from the town's markets.

Many aviculturists are maintaining bird populations in captivity with the intent to return them to the wild. In the case of large birds and hook bills, the resident wild population must be studied as thoroughly as we have studied the Lear's macaws. We know that captive breeding will not benefit the wild *A. leari* population. The harsh conditions of the environment and the tremendous wing muscle strength necessary to fly the required 80 km per day for food argue against survival of a cage raised bird. However, were an injured bird to be captured and brought back to health, we know the exact time and place for release under optimum conditions.

Bibliography

- Yamashita, Carlos, 1985, *Field Observations and Comments on the Indigo Macaw (A. leari) a Highly Endangered Species from North Eastern Brazil*, IDBF/DN - CEMAVE, Caixa Postal 4-34 Brasilia, DF Brazil.
- Machado, Ricardo Bonfim and Brendt, Alexander, 1990, Various Unpublished Research Papers, Fundacao Biodiversitas, Belo Horizonte, M. G. Brazil.

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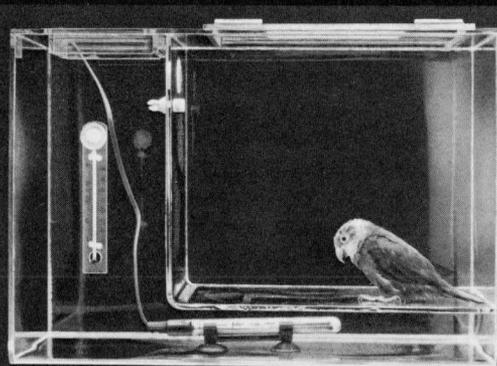
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