

# Macaw Reproduction and Management in southeastern Peru I: Blue-and-gold Macaws

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The Blue-and-gold Macaw (*Ara ararauna*) is found in eastern Panama, western Colombia, western Ecuador and most of the Amazon Basin (Juniper and Parr 1998). Throughout most of this range the species is declining wherever they come in contact with humans. The species is apparently extinct on Trinidad, and extinct in many areas in Ecuador, Columbia and Brazil (Collar 1997). These declines are apparently due to a combination of collection for the pet trade, hunting and habitat loss. Illegal collection is still out of control in many areas and it has been proposed to legalize extraction in some areas so that the harvest can be managed sustainably (Gonzales 1999). To date, our knowledge of the reproduction and management options useable to increase the reproduction of this species is very limited. This sort of information will be vital to the successful development and implementation of management plans designed to aid the recovery of this species. This report presents results from work conducted from November 1999 – April 2000 in a small palm swamp adjacent to the Tambopata Research Center, Department of Madre de Dios, southeastern Peru.

In the early 1990's when researchers first arrived at Tambopata Research Center (TRC) Blue-and-gold Macaws were common visitors to the adjacent clay lick, but none nested in the immediate vicinity. It was known from other areas that the birds nested in dead palms, especially in the large palm swamps, or Aguajales, dominated by the Aguaje palm (*Mauritia flexuosa*). Researchers soon found a small palm swamp near TRC but there were no suitable dead trees for nesting. In 1992 the team developed a technique to cut the tops off the palm trees in the hopes of attracting nesting macaws. Cutting off the top exposes the soft center of the palm to water, fungus, and beetles that all combine to rot the soft center of the palm away while leaving only the hard outer layers of the palm intact. This produces deep tubes perfect for nesting macaws. Once the palms rotted out to a point where they were deep enough, the Blue-and-gold Macaws began to use them (Nycander et al 1995). Since 1992, a total of 42 palms have been cut and they have been used extensively by both Blue-and-gold Macaws and Red-bellied macaws (*Orthopsittaca [Ara] manilata*).

In September of 1999 I visited the palm swamp at TRC for the first time. At this point there were a total of 12 of the original 42 trees still standing. These trees had been cut in a variety of different years including 1992, 95, 96, and 99. Our intensive study of the swamp began in November 1999. By then the last palm from 1992 had fallen leaving the birds with only 11 to choose from. Of these remaining 11, observations showed that 5 were being used by Blue-and-Gold Macaws but there were no Red-bellied's nesting. By climbing to the nests and regularly checking their contents, we found that in one Blue-and-gold nest, two chicks hatched but then disappeared about 1 month later, suggesting that they fell victim to an unknown predator. Another nest, in a palm cut in 1999, was less than 3 ft. deep (90 cm) and over the course of the season the bottom continued to rot making the hole deeper and deeper. Unfortunately, within a few days of hatching the bottom of the nest dropped out presumably killing the new chicks. In a third nest, the first clutch of eggs disappeared before hatching but the pair quickly re-laid. The two eggs from this clutch both hatched but the older chick quickly became much larger than its younger sibling and the younger bird died within about 16 days of hatching. The death of the younger sibling was also seen at another nests, and in both of these cases the older bird went on to fledge successfully. In the 5<sup>th</sup> and final nest, only one egg hatched and this chick went on to fledge about 90 days later. So in summary, five nests started, three failed (at one of these the adults re-laid) and the other three fledged one chick each.

During the '99-'00 nesting season my team conducted a total of over 150 hours of observations on the macaws in the swamp. These were done with the goal of determining the patterns of nest attendance at different points in the nesting cycle. These data will also provide the basis for designing a more detailed study of nest attendance in relation to weather, number of chicks in the nest, chick age and other variables. I am currently working to line up a Peruvian student to coordinate and run this study during the '00-'01 nesting season.

The big question in the palm swamp remained why did the macaws nest in only 5 of the 11 available palms? In most areas macaws seem to prefer trees that are in relatively isolated from the surrounding vegetation, so we took measurements at each of the palms to get an idea of the relative amount of vegetation surrounding the used and unused trees. These data will be analyzed to provide a more detailed

description of the nest sites used by Blue-and-gold Macaws in the swamp. While I have not formally analyzed these data, it seems that there is no real difference in the degree of isolation from surrounding vegetation among used and unused nest trees. Instead, the difference seems to be much simpler. I climbed each of the 11 palm trees and measured the physical characteristics of the cavities available for the macaws. The difference between used and unused palms became crystal clear. The difference was in the depth of the cavities. In those palms where the macaws nested, the cavities were on average 12.5 ft (381 cm) deep while those that the macaws didn't use averaged only about 2 inches (5 cm) deep. One tree that was not used was cut in 1996; despite the fact it was cut 3 years earlier there was no cavity at all (depth=0 cm). Interestingly the exposed center where the palm had been cut was dry and hard and showed no signs of starting to rot. The other 5 palms that were not used by nesting macaws were cut in 1999. Three of them had no cavities at all but all were wet and showed signs of active rotting. The other two unused palms had small cavities in the top but these were only 6 and 4 inches deep (15 and 11 cm). By next year it is hoped that all 6 of the palms cut in 1999 will be deep enough for the macaws to use, increasing the number of nest sites available in the swamp.

The data collected this season are the first that allow the calculation of the average useable period for the palms and the average number of chicks fledged per palm. While the sample sizes are still small, they do allow us to get a general idea of the effectiveness of topping palms to encourage macaw nesting. The data suggest that the average palm lasts for less than 4 years before it rots and falls over (fallen palms are obviously of no use to nesting macaws). Most palms (5 of 6 or 83%) are not useable for nesting during the first season after they are cut. As a result, most palms are available to nesting macaws for a little less than three nesting seasons. The nesting data from this season show that three chicks were fledged out of the five palms used by macaws (0.6 chicks per nest). This is similar to the data from natural nests where 10 chicks fledged from 14 nests (0.71 chicks per nest Nycander et al. 1995). Combining these data sets gives us an average of 0.68 chicks per nest. This suggests that during the time a palm is useable (an average of about 3 nesting seasons) a total of about two chicks will be fledged ( $[0.68 \text{ chicks per nest}] \times [3 \text{ nesting seasons}] = 2.05 \text{ chicks per palm}$  over the useful life of the palm). Of course the palm survival estimate is based on a small number of palms, and nest success data are from a combination of natural nests and nests in cut palms so the final figure of 2 chicks per palm should be considered only preliminary. In addition, the researchers that worked from 1992-1996 habitually cut holes in the side of the palms to allow them to remove the chicks for measuring. I suspect that this habit hastened the fall of the palms. If this is the case it will mean that palms may last significantly longer than the 4 years suggested here.

One additional goal of the project is to find an alternative nesting substrate for the Blue-and-gold macaws. Towards this end, my assistants and I hung an artificial nest box in the palm swamp this March. The nest box is made from a 2.5 meter long piece of 12-inch diameter PVC pipe. The 12-inch diameter matches almost exactly the diameter of the palm cavities the birds are using naturally. It has a metal bottom but no top, in order to imitate the open-topped palm cavities that the birds use naturally. It is hung from a live palm at a height of about 13 meters. My plan is to hang an additional 2 or 3 such boxes in the swamp this July in an effort to test if this sort of box is a suitable alternative to natural palms. Despite the fact that the box mimics the natural characteristics of the palm nests the macaws already use, there is some concern that the birds will not use this design. This is because the Blue-and-golds in southeastern Peru do not nest in live palms even when good cavities are available (Eduardo Nycander personal communication). As a result, these boxes, hung from live palms, may not induce the birds to nest. Despite this concern, hanging these boxes is our first step towards designing a more durable artificial alternative to dead palms. If the boxes we place this year fail to attract macaws in the 2000-2001 breeding season, we will go forward with plans to make more complex freestanding structures in future years.

This work forms part of the larger Tambopata Macaw Project whose principle goals are to develop and test new techniques to increase the reproductive output of large macaws and increase our general knowledge of these species. The work presented here adds to our knowledge of the nest success for Blue-and-gold Macaws and provides the first analysis of cutting palms as a macaw management tool. The knowledge gained from this work at Tambopata Research Center will be diffused globally so that it can be used to help the recovery of wild macaw populations in areas where their numbers have been reduced by habitat alterations and collection for the pet trade. Feel free to forward this report to others. If you would like to reprint this article or any portion of it please contact me at the e-mail listed below. Similarly if you have questions or comments or would like to be added or removed from this list, feel free to contact me directly.

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