Natural history and conservation of Blue-and-gold Macaws in Peru

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Abstract

The Blue-and-gold Macaw is a stunning bird that is well known in the pet trade. It is found in the wild from Panama to eastern Brazil and Bolivia. While not formally endangered, it is declining in most parts of its range due to habitat loss and poaching for the pet trade. In many areas, the species is closely tied to the presence of palm swamps dominated by *Mauritia flexuosa* (Aguaje) palms. The birds eat the fruit and nest in the hollow dead palms. However, this palm tree is also threatened, as people commonly cut down the entire palm to harvest the edible fruits. The Blue-and-gold Macaw is a common site at the clay lick and in the palm swamps near Tambopata Research Center (TRC). In this report I will present information from my work at TRC on how the annual patterns of food supply apparently drive the timing of breeding and the movements of the birds, and how these drive the fluctuations in clay lick use. I will describe the creation of a Blue-and-gold nesting colony near TRC by mimicking naturally dieing sections of palm swamp. I will also discuss how ecotourism and nesting macaws can combine to help conserve valuable tropical forest areas.

Introduction

The family Psittacidae (parrots, macaws, parakeets, and relatives) is the most endangered large bird family in the world (Bennett & Owens 1997; Collar 1997). In the Americas, the trend is just as bad with about one of every three species declining or threatened with extinction (Beissinger & Snyder 1992). The Blue-and-gold Macaw is arguably one of the most stunning New World parrots and is well known in the pet trade. It is found in the wild from Panama to eastern Brazil and Bolivia (Forshaw 1989). However due to a mix of habitat loss, local hunting and collection for the pet trade, the species is declining or locally extinct over large parts of its range (Desenne & Strahl 1991; Juniper & Parr 1998). The species went extinct on the island of Trinidad in the late 1960's but has since been reintroduced (Oehler et al. 2001, B. Plair pers. com.).

Macaws and parrots are considered quintessentially tropical, and sightings and photo opportunities are highly prized by the growing number of “ecotourists” that travel to the tropics every year (Christian et al. 1996; Munn 1992). Often these birds can be seen by the dozens at clay licks in southeastern Peru (Brightsmith 2004). Here the birds consume soil to obtain sodium (Brightsmith & Aramburú 2004; Emmons & Stark 1979) and protect them from the toxic compounds in their diets (Gilardi et al. 1999). The Blue-and-gold Macaw is unusual in that it eats soil at very few clay licks compared to other local species like the Green-winged Macaw. In fact most Blue-and-golds apparently never eat soil. The reasons for this are still unclear, but work on this is underway.

Over large portions of its range, the Blue-and-gold Macaw is closely tied to the presence of one particular species of palm tree: *Mauritia flexuosa*. The palm is a tall single-trunked species that can reach over 30 m (100 ft) tall and up to 60 cm (20 inches) in diameter (Henderson 1995; Penn 1999). While the birds are not strict specialists, they commonly eat the fruit and nest in the dead hollow trunks of this palm (Brightsmith 2005; Forshaw 1989; Nycander et al. 1995). The *Mauritia flexuosa* palm (known as the Aguaje in Peru and Buriti in Brazil) grows in swampy areas throughout northern and central South America and on the island of Trinidad (Henderson 1995). In these swamps, it is usually the dominate species, forming patches of nearly pure palms (Kahn & de Granville 1992; Penn 1999). These swamps are common in many areas, covering over 4 million hectares (10 million acres) in Peru alone (Penn 1999). The palm is dioecious, meaning that only the females produce fruit (Henderson 1995). These fruits are consumed by a wide range of species including parrots, macaws, monkeys, tapirs, peccaries, fish, turtles and humans (Bodmer 1990; Bonadie & Bacon 2000; Goulding 1989).

Human consumption of the palm fruits is important in many lowland areas. In the city of Iquitos the people can consume up to 15 tons per day of the aguaje fruits (Padoch 1988; Vásquez & Gentry 1989). Unfortunately the easiest way to collect the fruit is to cut down the entire female palm tree. As a result, these palms have been eliminated from huge areas near major cities.

In this report I present results from ongoing investigations at Tambopata Research Center and adjacent areas on the natural history of Blue-and-gold Macaws. In addition I present a management scheme that creates macaw nesting colonies in *Mauritia flexuosa* palm swamps by mimicking naturally dieing swamps found in the Tambopata area.

Study Site

This work was carried out in the vicinity of Tambopata Research Center in the Department of Madre de Dios, southeastern Peru between November 1999 and March 2004. The area receives 3,200 mm of rain annually, has a weak dry season from April to September and is classified as tropical moist forest

(Brightsmith 2004; Tosi 1960). The study was conducted in four different sections of *M. flexuosa* palm swamp (see Brightsmith and Bravo 2006 for more details). The first two swamp areas were located in the 537,000 ha Bahuaja Sonene National Park (BSNP) at 250 m elevation (13º 17′ S, 69º 36′ W). Here, the swamp has a dense closed canopy composed almost exclusively of *M. flexuosa* palms and the canopy contains almost no other trees. In this swamp, two sections were studied: healthy sections of the swamp and a dieing 3 ha section of the same swamp where a small stream was filling the area with sand and gravel from a nearby hillside and slowly killing the palms. Only low shrubs, grass and a few juvenile palms were growing on the newly deposited gravel and sand among the dead and dieing palms. The third study area was a 13 ha swamp immediately adjacent to Tambopata Research Center (TRC) in the 275,000 ha Tambopata National Reserve (13º 08′ S, 69º 37′ W; 250 m elevation). The canopy of this swamp is also dominated by *M. flexuosa* but the canopy also contained small numbers of other palms and other broad-leafed trees. The fourth site was a < 1 ha section of the preceding TRC swamp where the understory vegetation was cleared and the tops of 41 palms removed between 1992 and 1999. All four study sites were within 16 km of each other and near a large clay lick where dozens of Blue-and-gold Macaws and up to 28 bird species consumed soil daily (Brightsmith 2004). The study site was set in a matrix of thousands of hectares of natural habitat free from hunting and human habitat disturbance.

Methods

Tree fruiting and flowering

Community wide tree fruiting and flowering patterns have been monitored since July 2004 using monthly direct observation of 1,650 trees spread among four habitats (*terra firme* forest, mature floodplain forest, succession river edge forest, and *Mauritia* palm swamp, K. Quinteros unpubl. data). I used these data to generate a rough index of potentially available psittacine food by calculating the proportion of trees that contained flowers, unripe fruits or ripe fruits, as all three are commonly consumed by parrots (Forshaw 1989). As we are still compiling the lists of species eaten by psittacines at the site and identifying the 1650 trees, the data presented here include all tree species not just those eaten by psittacines.

Macaw nesting

Nests in the naturally dieing swamp were found, observed and measured during a 4-day trip during February 2002. Here we systematically observed stands of dead trees in the early mornings (dawn to 7:30 EST), evenings (15:30 to dusk), and irregularly throughout the rest of the day. Trees were considered nests if chicks called from inside, adults remained inside throughout the day or adults entered in the early morning. Often the alarm calls of adults drew our attention to active nests. Our observations at the nearby swamp at TRC showed that at this time of the year most Blue-and-yellow Macaws had chicks or had abandoned the

nest sites for the season, indicating that trees occupied at this time were almost certainly nests. Nests in the healthy TRC swamp were discovered opportunistically and observed for activity approximately once every seven to ten days throughout the nesting season. We observed nests in the managed TRC swamp throughout the breeding seasons from 1999 to 2004. As it was unsafe to climb dead palms directly, we used tensed diagonal or horizontal rope bridges strung between tall live palms near the dead palms to access the nests and record the number of eggs or chicks (Nycander et al. 1995). Due to the great difficulty of this technique, we climbed once every 10 to 20 days in Dec 1999 to March 2000, Nov 2000 to March 2001 and Nov 2001 to January 2002. After January 2002 the central support tree was deemed unsafe and climbing ceased. Since that time all nest monitoring has been by observation.

Parrot abundance

To determine the abundance of parrots in the forests around the study site, researchers conducted 10-minute point counts from January 2003 – December 2005. A total of about 900 point counts were completed per year at a total of 18 different points spread among four different habitats (terra firme forest, mature floodplain forest, succession river edge forest, and *Mauritia* palm swamp). Each point is separated by at least 400 m from every other point. Observers recorded all parrots seen or heard, the number in the group when seen, and the approximate distance to perched birds. The index of parrot abundance presented here is the monthly average number of groups (including flying and perched birds) recorded per 10-minute point count. Since clay lick activity is most intense in the morning, censuses were carried out in the afternoon (after 15:30) to avoid inflated encounter rates caused by birds flying to and from the clay lick (Brightsmith 2004).

Soil consumption

Observers recorded bird use of the clay lick during approximately 20 early mornings per month from February 2000 – December 2005. Researchers were at the site before the birds began arriving (approximately at sunrise) and stayed until the birds finished their early morning lick use (usually before 07:30 EST). Every 5 min observers recorded the weather as rain (rain falling on the observer), sun (sun hitting the ground anywhere in the vicinity of the clay lick), or cloud (if neither of the others applied). The presence or absence of fog was also noted. Observers recorded the time, number and species of the first birds that landed on the lick. Starting from this point, observers counted all birds on the lick every 5 min using binoculars and a spotting scope (Brightsmith 2004).

Results and Discussion

Natural history

In the Tambopata region, the Blue-and-Gold Macaws nest from December – March (the wet season). Clay lick use is lowest from March – August, is higher from September – November and spikes up to its highest level in December and

January. The censuses show that the macaws are most common around TRC from November through April. Food abundance is lowest February – May then increases gradually until peaking November – January. The food availability in the palm swamp shows a similar pattern. When taken together it appears that the macaws, like most birds worldwide, breed at the time of highest food abundance. Clay lick use is highest during breeding. After breeding, during the time of lowest food availability, the birds apparently leave the area. It is currently unknown where they go at this time, but these movements may have important consequences for conservation as many of the birds likely leave the protected areas (Tambopata National Reserve and Bahuaja Sonene National Park). Together these protected areas are larger than the state of Connecticut, but if the parrots and macaws of Tambopata regularly leave the protected areas, then even these large areas may not be big enough to protect the clay lick and the birds that use it.

Macaw nesting and swamp management

Macaws nested in two different types of palm swamps: the healthy live swamp near Tambopata Research Center (N = 3 nests) and in the dieing palm swamp in Bahuaja Sonene National Park (N = 50 nests). In the live swamp, the canopy of palms was dense and closed and the birds used only the tallest, most isolated dead palms that rose above the general canopy level. These palms were chosen presumably because they were the best protected from predatory mammals. In the dieing swamp the nests were at a very high density (> 10 per ha or > 4 per acre). As nearly all the palms were dead or dieing, the habitat was very open with almost no leaves at canopy height. Under these conditions, there was no measurable difference between the dead palms that the macaws used and the palms that were unused. This may be because under these open conditions all were similarly well protected from predators.

From 1992 to 1999 researchers under the direction of Eduardo Nycander created a nesting colony of Blue-and-gold Macaws by recreating the conditions found in the naturally dieing palm swamp in Bahuaja Sonene National Park. To do this they cleared away the understory vegetation in a small area of swamp and cut the tops off of 41 palms. The macaws used the palms from 5 to 17 months after they were cut, and the palms collapsed or fell over 4 to 7 years after cutting. From 1999 to 2004 Blue-and-gold Macaws made 12 nesting attempts. About 34% of the available palms were used in each year, and young macaws fledged from 19% of the available palms. Using the average values for nesting and palm persistence, I estimate that for each palm cut, 0.7 chicks were produced before the palm fell over. For a more detailed discussion of the macaw nesting and swamp management see Brightsmith & Bravo (2006).

In order for this management scheme to be acceptable for further use, it is important to know if the palms regenerate after they are cut. The data show that eight years after cutting, the density of seedlings in cut areas were similar to that

in normal healthy swamp (> 3,000 per ha). The number of juvenile palms was twice as much as in normal swamp (> 1,900 per ha, Brightsmith & Bravo 2006). These data suggest that the palms do regenerate after cutting.

Combining all these figures, a management scenario can be produced to use small areas of *Mauritia* palm swamps to create nesting colonies of Blue-and-gold Macaws. If the tops are cut from 5 palms per year, by year 6 there will be an annual average of 20 standing dead palms. Given palm densities seen near TRC, 5 palms per year could be cut for 100 years using a total of only 2 – 4 ha (5 – 10 acres) of swamp. If the occupancy rates are like those of TRC, the palms would attract about 6 nesting pairs of Blue-and-golds and produce 3.4 chicks per year. Many large macaws and parrots face a shortage of suitable nesting sites and not all pairs breed (Guedes & Harper 1995; Marsden & Pilgrim 2003; Munn 1992; Murphy et al. 2003; Nycander et al. 1995). Managing *M. flexuosa* palm swamps could increase a population's reproductive output and help the species naturally recolonize areas from which they have disappeared. In areas where hunters and poachers take Blue-and-gold Macaws from nests, creating nesting colonies through swamp management could concentrate nesting birds in protected areas while enforcement and education campaigns work to reduce the threat from local people (Forshaw 1989; González 2003; Vaughan et al. 2003); Powell pers. com.).

The proposed management scheme could also create a valuable ecotourism resource. Nature based tourism is a multi-billion dollar business worldwide (TIES 2000) and observation and photography of large macaws and parrots is potentially worth thousands of dollars annually (Christian et al. 1996; Munn 1992). The macaws at TRC begin to defend nest sites in July or August and most chicks fledge by April so managed swamps should have macaw activity for up to 10 months per year (DJB pers. obs). At TRC, Rainforest Expeditions constructed a 15 m scaffolding tower in the middle of the stand of dead palms. The tower was open on top and from here groups of up to 10 people would observed the nesting colony year-round. The macaws nested successfully in dead palms that were within 15 m of the tower in spite of the daily presence of people (DJB unpubl. data). At this site where guests paid approximately $900 for a five-day visit, up to 11% of the guests considered the macaw colony the highlight of the trip and the more macaws present the higher the level of tourist satisfaction.

The idea of cutting natural palm swamp to provide a tourist attraction may not be acceptable to all. However, there are many scenarios under which a macaw colony could generate enough conservation benefits to justify the costs. *Mauritia flexuosa* palm fruits and macaw chicks are being unsustainably harvested from thousands of hectares of tropical swamps (González 2003; Padoch 1988; Vásquez & Gentry 1989). Without some intervention these activities will continue to destroy these ecosystems throughout the western Amazon basin (Penn 1999). While it is widely acknowledged that ecotourism is not a panacea (Belsky 1999; López-Espinosa de los Monteros 2002; Snow 2001), properly planned and

implemented ecotourism projects could help protect large areas of swamp and adjoining forest by funding protected areas, hiring local guards, restoring degraded swamps, sponsoring education campaigns and providing economic alternatives for local people (Báez 2002; Bouton & Frederick 2003; Menkaus & Lober 1996; Stronza 1999, 2000).

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