The Great Green (Buffon's) Macaw:

THE AMBIGUOUS ARA, *(ARA AMBIGUUS)*

By Janice Boyd, PhD

Buffon's Central (A program of the Parrot Fund/Amigos de las Aves USA)

Figure 1: Military macaw

Ara = macaw

Ambiguus = uncertain, doubtful, undecided

Introduction

Ara ambiguus, the Great Green or Buffon's macaw probably received that scientific name because way back when (1811, according to the IUCN) people didn't know whether it was really a distinct species from the Military macaw, *Ara militaris.* They also didn't know their Latin very well, because they initially named it *Ara ambigua.* But *Ara* (the genus name for macaw) is masculine, while *ambigua* is an adjective for a female noun. In 2002 some guys who knew Latin better pointed this out and the name was changed from *Ara ambigua* to the grammatically correct *Ara ambiguus.* So now you know!

But the ambiguous ara—henceforth the Buffon's macaw or Great Green macaw—is no longer ambiguous. We do indeed know that it is a species all its own, although probably allopatric (fancy word) with the Military macaw. More on that later. Ornithologists and other scientists or conservationists typically use the name Great Green Macaw, while in aviculture it is usually called the Buffon's Macaw.

Appearance

The Buffon's macaw is the second largest macaw in the world, surpassed only by the Hyacinth macaw, although some Buffon's individuals may be larger (in weight and/or physical size) than some Hyacinth individuals. In color, the Hyacinth and the Buffon's would never be confused, but the Buffon's does look quite a bit like the Military to the untrained eye (see Fig. 1). However it is in the eye that the most definitive distinction may be made. Both species are basically green (the Buffon's more of a yellow green) with a bare white facial patch with small black feather lines (sometimes partly red) above a large dark grey beak and red feathers on the forehead. A more complete comparison between the two species is given in Table 1. Scattered yellow feathers on the Buffon's body are not uncommon. Scattered maroon (bronze) feathers are also not uncommon, but occasionally birds develop partially

Characteristic	Buffon's	Military
Subspecies	A a. ambiguus, A.a. guayaquilensis	A. m. militaris, A. m. mexica, A.m. boliviana
CITES Classification	Appendix I (since 8/1/1985)	Appendix I (since 10/22/1987)
IUCN Red List Classification	Endangered (as of 2012)	Vulnerable (as of 2012)
ESA Status	Proposed Endangered as of Oct 2014	Proposed as Endangered as of Oct 2014
Threats in wild	Human habitat modification and destruction; some poaching of chicks. Limited funding for conservation initiatives. Effects of climate change probably negative.	Human habitat modification and destruction; some poaching of chicks. Limited funding for conservation initiatives. Effects of climate change not analyzed.
Body length (incl. head and beak)	77 – 85 cm (30 – 33 in)	70 – 75 cm (27 -29 in)
Adult weight	1100 – 1500 gm (2.4 – 3.3 lb)	800 - 1150 gm (1.7 – 2.5 lb)
Body shape	Stocky, barrel shaped	elongated
Beak	Large, dark grey tipped with pale grey	Dark grey and smaller than Buffon's
Body coloration	Lime-green with bright red forehead patch Blue flight feathers and turquoise rump Olive/maroon feathering along beak and face patch	Olive-green with bright red forehead patch Bluish tinge on hindneck, bright blue rump Olive/maroon feathering along beak and face patch
Wing coloration	Upper back and upper wing feathers lime-green, shading into blue on the flight feathers. Under wing feathers yellow-green	Upper back and upper wing feathers olive-green, flight feathers blue. Under wing feathers metallic yellow.
Tail coloration	Central tail feathers red-orange along central quills to greenish-yellow with light turquoise towards tips. Outer tail feathers blue. Underside of tail feathers yellow-green	Central tail feathers reddish-brown along quills shading to blue along tips. Outer tail feathers blue. Underside of tail feathers metallic yellow.
Tail length	Longer than Military	Shorter and narrower than Buffon's
Facial Markings	White macaw facial patch with small black, sometimes red, feather lines. Flushes red when excited.	White macaw facial patch with small black, sometimes red, feather lines. Flushes red when excited.
Eye coloration	Grey ring separating dark pupil from narrow yellow iris in adult. Dark eyes in immatures.	Yellow iris around dark pupil in adult. Dark eyes in immatures.
Leg and Foot Coloration	dusky grey legs and feet.	Dark grey legs and feet.
Nest box and inspection	Large horizontal macaw box, 18" x 18" x 30" or larger or 50 - 55 gal whiskey barrel/drum size. Entrance hole ~7". Nest inspection should be circumspect to avoid aggressive adults damaging eggs or chicks. Nest box should be inspected from outside.	Horizontal macaw box, 16" x 16" x 30" or larger or 35 gal. pickle barrel size. Entrance hole ~ 7'. Sometimes sensitive to nest box inspection; inspect nest box from outside.
Housing	Should have access to a large enclosure for flight during non-breeding season; keeping permanently indoors not recommended. Strong chewer- provide plenty of wood branches and perches for chewing.	Should have access to a large enclosure for flight for at least part of the year; keeping permanently indoors not recommended. Strong chewer- provide plenty of wood branches and perches for chewing
Recommended cage wire	10 -12 ga, 1" x 1" wire	12 ga, 1" x 1" wire
Suggested cage size	6' x 6' x 10' or larger Suspended 3-4 ft above ground	5' x 5' x 8' or larger Suspended 3-4 ft above ground
Hardiness	Hardy if acclimated	Hardy if acclimated
Diet (quantities are per bird)	Complete parrot pellets (1/2 - 3/4 c), mixed fruits and vegetables (1/2 c), sunflower and other seeds, significant quantity (5-6) of nuts especially prior to and during breeding season	Complete parrot pellets (1/2 c), mixed fruits and vegetables (1/2 c), sunflower and other seeds, nuts (2-3)
Clutch Size	2-4	2-4
Incubation time	26 days	26 days
Hatch weight	23 g	18 – 25 g
Weaning weight	930 - 985 g	628 – 820 g
Ease of hand-feeding	Difficult from early age. Use a macaw hf diet with small amount of peanut butter or ground sunflower seeds added. Inexperienced hand feeders should let parents feed for several weeks.	Difficult from early age. Use a macaw hf diet with small amount of peanut butter or ground sunflower seeds added.
Fledging Age	13 weeks Chicks independent 2 weeks later but should be left longer with parents	12 weeks Chicks independent 2 weeks later but should be left longer with parents
Age at maturity	5-7 years	3-6 years
Maximum breeding age	~ 30 – 35 yrs	~ 30 – 35 yrs
Average life span (captivity)	~ 50 - 60 yrs	~ 50 - 60 yrs
Temperament	Gentle but assertive disposition except in breeding season when can become very aggressive. Mate aggression uncommon. Needs lots of socializing. Loud and strong chewer. Limited talking ability. Requires experienced keeper; not for novices.	Gentle disposition and even temperament. Mate aggression uncommon. Needs lots of socializing. Loud and strong chewer. Limited talking ability. Needs experienced keeper.

Figure 2: Normal and red feathered Buffon's

maroon feathers over much of their bodies (Fig.2), the reason for which is unknown; but sometimes the feathers revert back to green after a moult.

The Military macaw has a darker wash over its body (darker green rather than yellow green, red on tail feathers rather than red-orange), and is noticeably smaller than the Buffon's macaw (Table 1). At least in individuals of these species with origins in Central America, the most obvious distinguishing feature among adults (close up) is in the coloration of the eyes. It was first pointed out by Barbara Gould in the early 1980s, and a drawing of hers is reproduced in Fig. 3 along with pictures of eyes of an adult Military macaw from Mexico and a Buffon's macaw of probably Nicaraguan heritage. Note the Military eye is yellow around the pupil while the Buffon's pupil has a grey ring separating the yellow of the outer iris. I have seen many Buffon's macaws with this characteristic eye, but I have also seen supposed Buffon's in which it is very difficult to tell whether there is a grey ring separating the pupil from the yellow of the rest of the iris. This may indicate a juvenile Buffon's, hybridization with Military macaw(s), heritage from the South American subspecies of the Buffon's (I found no documentation regarding eye color of the Ecuadorian subspecies), or these large macaws may possibly be large Military macaws.

Distribution in the Wild

The Buffon's macaw occurs in two subspecies. The most widely-distributed species *(A.a. ambiguus)* is found on the Caribbean side of Honduras, Nicaragua, and Costa Rica, mostly on the Caribbean side of Panama but sometimes on the Pacific side, on small parts of the Caribbean and Pacific sides of Colombia, and in scattered locations in Ecuador where is it classified as the subspecies *A. a. guayaquilensis*. See Fig. 4 for approximate distributions of the two species. The Ecuador subspecies is reported to have a smaller bill and a more greenish underside to flight and tail feathers (Juniper and Parr, p. 424), but the appearance of the eye has not been described in any report I have seen.

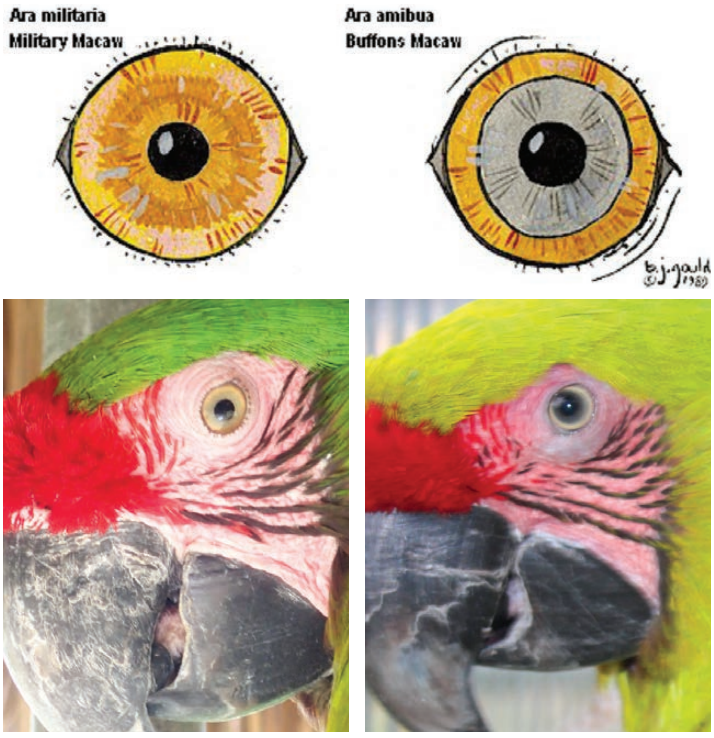

Figure 3: Military and Buffon's eyes

The Buffon's macaw is probably allopatric with the Military macaw: a fancy way of saying they have become so separated geographically that they no longer interbreed and so are considered separate species. Eventually they presumably would diverge so much that they would not be able to interbreed. This geographic separation is illustrated in Fig. 4 where the distribution of the Buffon's and Military Macaws are shown. In only a few regions do the two ranges come close to one another; but one could imagine how the ranges may have been joined in the past when they were only one species.

The Buffon's is very patchily distributed over the 38,600 mi^2 (100,000 km^2) of its range. Due to deforestation and habitat degradation, the habitat of the species is now fragmented into seven regions with isolated populations that probably do not interact very much if at all: the border of Honduras and Nicaragua, the border of Nicaragua and Costa Rica, the Darién region of E Panama and NW Colombia, and two very small populations in W Ecuador. Recent estimates suggest that the global population is less than 2,500 mature individuals (or less than 3,700 in total including juveniles and immatures), with the largest subpopulation in Darién, NW Colombia estimated at less than 1,700 mature individuals (or less than 2,500 in total) (IUCN Red List). The population in Ecuador is probably less than 100. The population trends in the wild are thought to be decreasing, although Monge et al. (2010) report it is presently increasing in Costa Rica; and conservation efforts by the Jambeli Foundation have increased the population somewhat in Ecuador.

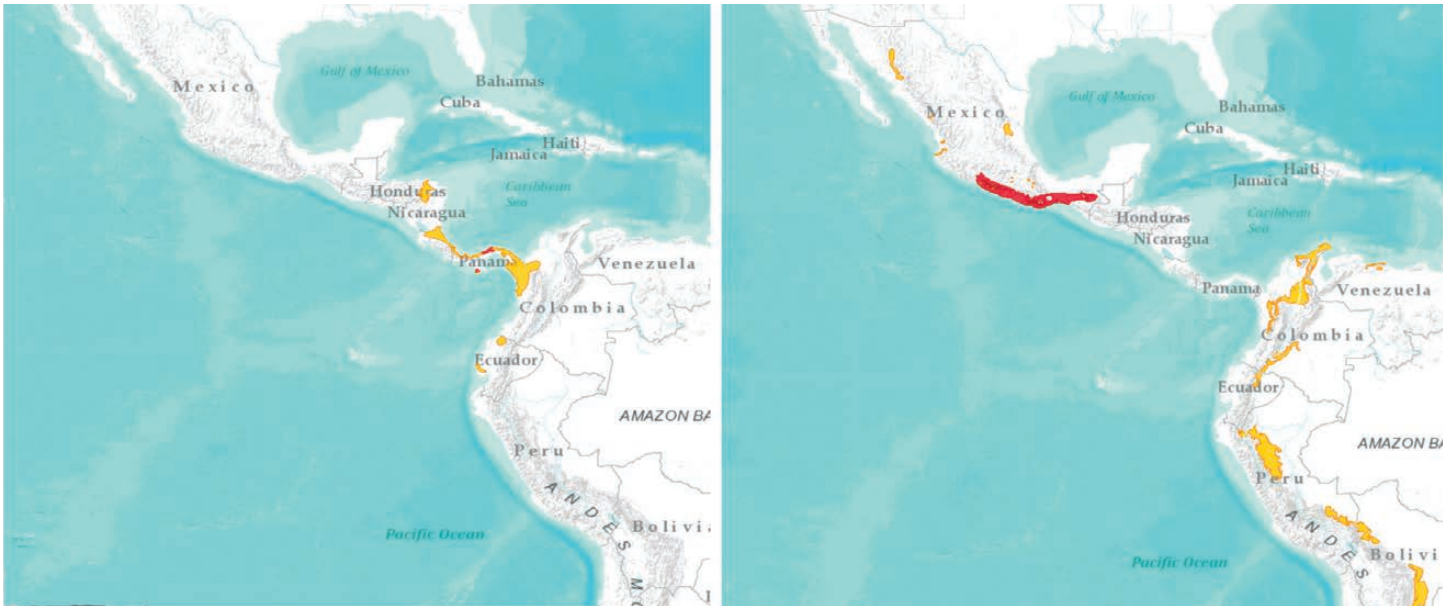

Figure 4: Approximate distributions of the two subspecies of Buffon's macaws

Life History in the Wild

In Central America the species inhabits humid lowland tropical forests, while in its restricted ranges in W Ecuador it is found in the tropical rainforest of the Chocó region near the Colombian border and the dry deciduous forest near Guayaquil. These regimes seem to have resulted from the species adapting to available food and suitably large nesting trees. Most of the research on the lifestyle of the species has been conducted in Costa Rica, beginning with George Powell in 1994. The Great Green Macaw Research and Conservation Project is now being directed by Guisselle Monge and Olivier Chassot of the Tropical Science Center in San Jose, Costa Rica. The breeding season for the species in Costa Rica is February to June. In Honduras and Nicaragua it is likely to be similar, but I found no information on the breeding season in Panama or Colombia. In Ecuador it is June through November. Forty seven major food resources have been identified for Costa Rica, but none for Panama-Colombia, and only some information has been published for Ecuador. In Ecuador, ten macaw food plants were noted by Berg et al. (2007) but one tree, *Cynometra bauhiniifolia,* provided more food than all other nine plants combined. A shortage of food resources was noted in the months of February through May, which according to the authors may be one of the contributing factors to the decline of *A. a. guayaquilensis*.

The life cycle of the species in Costa Rica is described in Table 1 from work by the Great Green Macaw Research and Conservation Project. The breeding season is February to June, when the major food resources are restricted primarily to the large fruits of the mountain almond *(Dipterix panamensis)* and the *Sacoglottis trichogyna* (known locally as titor). A large macaw requires a large nest site, and for the Buffon's Macaw the old, large, emergent Dipterix is the major nesting tree, as well as a major food source in the breeding season. Eighty-seven percent of the nests found by the Great Green Macaw Research Project in Costa Rica were in large Dipteryx trees. Cutting of Dipteryx trees was a major factor in the decline of the species, but in 2008 a law was passed in the country prohibiting cutting. An additional thirty five species of food plants were identified as food resources in the non-breeding season, but access to them required most of the population to disperse outside of the primary breeding range to higher elevations. Hence conservation of the species requires conservation of both the primary breeding area and the larger non-breeding season foraging areas.

Nesting behavior

Typically the macaw is observed in small groups of up to 8 birds, but at times in the nonbreeding season individuals aggregate in mixed age flocks of 50 or more (O. Chassot verbally 2004). But during the breeding season breeding pairs are solitary and establish large, non-overlapping home ranges of approximately 548 hectares or 1,354 acres, although non-breeding birds may also be found in the area. Limited data suggests that breeding pairs do not occupy the same nest site in consecutive years, which may mean they breed elsewhere or that they do not breed every year. When a pair does breed, two to three (very occasionally four) eggs are laid and incubated for 26 days. A report from the Great Green Macaw Research project describes nesting behavior:

> *"Observations of nests with a marked adult revealed that one of the adults, presumably the female, incubated the eggs while the other adult foraged and returned to feed the incubating adult. Incubating adults flew to perches near the nest to receive feedings, and only rarely flew off for short foraging trips (less than 30 minutes). The second adult was never observed taking over incubation when the incubating adult left to forage.*
>
> *Both parents participate in feeding nestlings. They forage together and return to the nest about every 2 to 4 hours to feed their young, with absences growing longer as the nestlings*

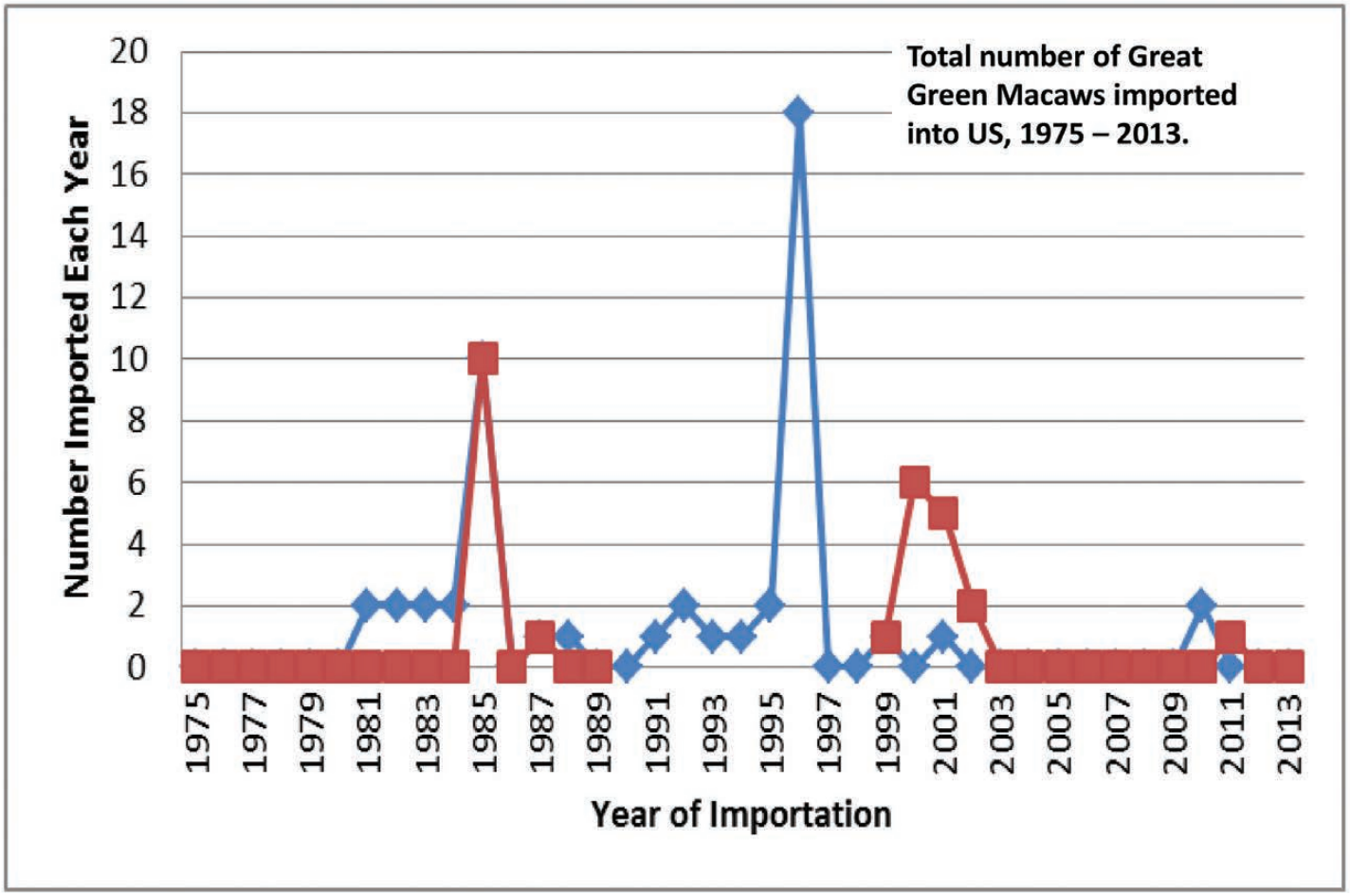

Figure 5: Imported Buffon's

mature. One adult enters the nest while the other remains perched in the mouth of the nest or on a nearby branch. In many cases, both adults slept in the nest, both before and after fledging. However, in several nests one adult did not sleep in the nest but rather slept in the crown of a nearby tree or flew off to an unknown location. Casual observation of nest hole interiors suggests that some nests were too small to hold both adults and the young.

At fledging, young sometimes land on the ground because they cannot sustain flight long enough to reach a landing site in a nearby tree. The adults actively induce a young that is on the ground back up into a nearby tree by flying down to it, but refusing to feed it until it follows the adult up into the tree. Once in a tree, the fledged young move very little for the next 1 to 2 weeks while the adults bring food to them. Gradually, they begin to follow the adults on foraging flights; and by the end of their first month as fledglings, they follow the adults to feeding trees.

The family remains together until the onset of the next breeding season, when the young gradually separate from the adults, generally remaining in the same vicinity but grouping with other macaws." (Powell et al., 1999)

Conservation Status in the Wild and Conservation Initiatives

According to the IUCN Red List the Buffon's macaw is classified as Endangered because the global population is estimated to number fewer than 2,500 mature individuals, or fewer than 3,700 individuals total including juveniles. The global population is estimated to have been reduced over the past three generations by >50%. In most parts of its range, the population trends are downward due to the usual suspects that all come down to human overpopulation—high annual deforestation and habitat degradation rates combined with some poaching and some subsistence hunting. However, conservation measures have caused an uptrend in the population in Costa Rica and slightly in Ecuador. The species is on track to be classified as Endangered under the US Endangered Species Act. It has been a CITES Appendix I species since 1985.

The species is the subject of several conservation initiatives in both Central America and Ecuador, although limited funding has been and continues to be a major problem. The major conservation and habitat conservation project in Costa Rica is the Great Green Macaw Research and Conservation Project, led by Guisselle Monge and Olivier Chassot of the Tropical Science Center (CCT-Centro Cientifico Tropical) in Costa Rica. A number of habitat protection initiatives have been implemented

in that country, including the San Juan-La Selva Biological Corridor and the Maquenque National Wildlife Refuge, which connect with Great Green habitat in Nicaragua. For more information, see *http://cmsdata.iucn.org/downloads/parks_chassot.pdf* and other references available through an on-line search. The Rainforest Biodiversity Group promotes bird and nature tourism in the San Juan-La Selva Corridor through the Costa Rican Bird Route (CRBR), which features possible sightings of the Great Green Macaw as one of its attractions (see *http://www.rainforestbiodiversity.org/our-work/bird-route/).*

In Ecuador, Fundacion de Conservacion Jocotoco, an NGO (Non-governmental Organization, *http://fjocotoco.org/*), established its fifth reserve, the Rio Conande Reserve *(http://fjocotoco.org/reserves-rio-canande/)* in 2000 in the Chocó tropical rainforest region near the Colombian border that provides a key protected area for the Great Green Macaw and a large variety of threatened and endangered species. Artificial nest boxes have been placed in ''Guayacán" trees to encourage breeding of the macaws. In addition, in the SW near Guayaquil, Ecuador's largest cement producing company (Cemento Nacional) established a foundation, Fundacion Pro-Bosque *(http://bosquecerroblanco.org/en/),* to manage protected areas in the dry tropical forests of coastal Ecuador, including the Cerro Blanco Woodland Reserve. This reserve is owned by the cement company and is located only 9 miles from the city of Guayaquil.

Captive breeding and release programs for both subspecies exist in Costa Rica (Ara project, *http://thearaproject.org/*) and Ecuador (Jambeli Foundation, *http://pro-forestfoundationorg.blogspot.com/* and *http://fundacionjambeli.org/*).

Status in Aviculture

The status of the Buffon's macaw in US aviculture is quite precarious. According to the CITES Trade Database, the total number of Buffon's macaws imported into the US was 49 (Fig. 5). Other sources combined to give 26. While the exact yearly numbers from the CITES database are questionable, no one with a long history in US aviculture believes the founder population could be much higher than 49 and might be as low as 26. The birds acquired by ABRC (an unknown number), which bred quite a few of the species before being closed in 2001, were most likely primarily from Nicaragua (Trent Swigert, 2013, personal communication). The number of founders (mainly in Europe) from the International Studbook for the Buffon's macaw (ISB) is 21. The total number of living birds in the United States is probably under 100. I know of one breeding pair in Canada. The number of living animals in the ISB is 144. Thus the captive population in North America and Europe is at best 250. The species would be well-served by a greater number of US breeders working on breeding the species and also US breeders of this species joining forces with the members of the International Studbook kept by Sandrine Silhol *(ssilhol@zoodessables.fr)* of Zoo des Sables d'Olonne in France.

Captive Breeding

In 1995, Abramson (1995) wrote: *"Male Buffon's are highly aggressive to their mates, forcing them into the nest box. Unfortunately, they do not always copulate with the females prior to their forced incarceration, and subsequent egg infertility is not uncommon…Breeding has been sporadic…They are unquestionably difficult birds to breed. Unlike the Blue and Gold and Military Macaws, these are highly aggressive birds and either the male or female can be dominant, especially during the breeding season. They do not appear to be as consistent to breed as some of the other macaws and present more of a challenge."* Now, 20 years later, this is not much different from what I hear talking with other people about breeding the species.

General guidelines for breeding are summarized in Table 1. In addition, we may be able to get some clues on successful breeding techniques by looking at the species behavior in the wild and looking at techniques used by some successful breeders. First, recall that the Costa Rican researchers noted that breeding pairs had home ranges that did not overlap. Non-breeding macaws could use the habitat within the home range, but not other breeding macaws. In captivity breeding pairs are very aggressive during the breeding season. This suggests that breeding pairs in captivity need to be isolated as much as possible from disturbances, especially being disturbed by other breeding Great Greens. When I was working with a group in Costa Rica, they tried wrapping their large breeding cages in tarpaulins so the birds were isolated from disturbances. This turned out to be overkill, but limiting the disturbances to the breeding pairs did lead to increased breeding success. This project evolved into the Ara Project, which has successfully bred and released large numbers of Great Greens. But with the loss of their experienced breeders, only time will show if their breeding successes will continue. The Loro Parque breeding center also provides privacy for their breeding pairs, with panels up on the walls of the cages near the nest boxes so that breeding birds looking out from a nest box or sitting on a nearby perch cannot see other breeding pairs in adjacent cages, and thick vegetation growing up between cages to give privacy (Fig. 6). Thus one suggestion is to limit the

disturbances the birds experience during the breeding season and to put up partitions to separate the nest boxes from visual contact with neighbors. If you have lots of space and money you might even try scattering large breeding cages with paneled sides around in a field or planted gardens. But more realistically, the general idea should be to give the breeding pairs as much privacy as possible.

A second aspect of their biology in the wild is for breeding pairs to be isolated in the breeding season but then to gather together in small or even large mixed-age flocks in the non-breeding season. This is something I will try with my Buffon's: have good-sized breeding cages but also have a large flight in which pairs can interact and socialize in the nonbreeding season and perhaps pick new mates, because another comment I have heard from successful breeders (Ara Project; Loro Parque) is that Buffon's don't like to be forced paired; they prefer to pick their own mates.

Figure 6: Great Green at Loro Parque

Summary

The Great Green or Buffon's macaw is naturally associated in the wild with mature forest landscapes with large trees suitable for nest sites. It is considered a habitat specialist that selects areas of contiguous mature forest in Central America and parts of northern South America (Monge et al. 2009). Past, present and future forest destruction and degradation has led to substantial declines in its population, and it exists in small, unconnected populations. The increasing human population causing habitat destruction and degradation is the major threat facing the species, and while poaching is limited, it can have a significant effect on the small and isolated populations. Each range country for this species has protections in place, but for reasons such as limited budgets and limited enforcement capabilities, the laws and protections are generally not able to adequately protect the species or to adequately protect its remaining habitat. There are conservation, reforestation and population reinforcement efforts being conducted with some of the remaining populations and their habitats. However, due to funding limitations and the lack of effective governmental cooperation in preserving and expanding habitat, the efforts cannot be as successful as they might otherwise be.

The US Fish and Wildlife Service's evaluation of the status of the Great Green/Buffon's macaw as leading them to conclude that the species qualifies as "Endangered" under the definition of the Endangered Species Act (US Fish and Wildlife Service, 2012) is correct. However, that law does not allow for actions that could improve the status of the species. First, no US Government funding is made available for additional conservation actions and second, the law assumes that conservation of a species only can happen in the wild. There is no recognition of the fact that still increasing human populations with resulting poverty and political instability will make maintaining, to say nothing of improving, the status of the species in the wild for the near term and perhaps for the long term a very difficult proposition. To survive into the future, the Buffon's macaw is one example of many species that will need help from what David and Tracy Barker call the Invisible Ark. In the face of the human-caused Sixth Extinction, captive breeding for many species is needed to serve as a conservation safety net. We, in the United States and elsewhere, need more aviculturists to breed the Buffon's Macaw in captivity. No zoos in the US are doing that. The private sector is needed - you and me, fellow bird lovers. For captive breeding to work on a large scale, there needs to be economic incentives. Breeders of the birds need to be able to recoup their expenses by being allowed to sell the surplus into the pet market. Yet as specifically stated by the Endangered Species Act, commercial captive breeding can be allowed only if it "promotes the conservation of the species in the wild." A strict interpretation of this meaning needs to be loosened up and/or the Endangered Species Act needs to be restricted primarily to only non-native species.

The future of the Buffon's macaw will probably depend upon the Invisible Ark: get the book, read it, take it to heart, and do something to help.

About the author: The author came to appreciate the Great Green macaws after working with them for several years in Costa Rica. In 2008 at the AFA Annual Convention, she and fellow AFA member and aviculturist, Fred Smith, began talking about the species, and from that a program in captive breeding of the species was hatched. In 2013, after Fred needed to cut back on the number of birds in his care, the birds were moved to the farm of another aviculturist in Texas. The author is an Adjunct Assistant Professor at the Schubot Exotic Bird Center at Texas A&M University.

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