

the trees nearby the release site the same day of release. Other birds were still dependent on the food provided. We supplemented food and water until all birds were fully competent in the wild (up to 6 months).

Post-monitoring phase was performed using telemetry equipment. Four Green-cheeks and six Yellow-heads were tracked during the 12 months after the release, for as long as the batteries of radio-transmitters were active.

Post-release findings

We identified a clear difference in the dispersion of the two species of parrots. Two flocks of Green-cheeked Parrots were formed, both flocks were stimulated by wild flocks of Green-cheeks passing over the area and left the release site. Only one of these flocks returned to the release site some months later, but left the area again after several days. The Yellow-heads formed small flocks of 2 to 4 birds and moved together around the release site. They basically remained 5 km around the release site and used this location as a roosting site for an extended period of time. Both species' behaviour was expected, according to the normal behaviour reported in our previous studies on wild populations.

The Green-cheeks behaved more "wild" or "rustic", except for one tame individual. After 12 months of release, at least 6 birds were confirmed to be active around the area.

Most of the Yellow-heads demonstrated a strong fondness for the training enclosure and the release site. Several of them seemed to be accustomed to the supplemental feeding as well as to human presence. Two parrots were especially tame, two of the juveniles that hatched in captivity from wild-born parents. After 12 months of release, 14 parrots were still observed around the area.



Released Yellow-headed Amazon feeding on wild vegetation.

One of the most rewarding findings was the nesting attempt of the two existing pairs of Yellow-headed Parrots near the release site. One of them actually raised two chicks, but unfortunately, these chicks together with their parents were poached. This strongly supports that a release program should be linked to a long-term educational program with the local people in order to reduce one cause of the parrots' extirpation, the illegal capture.

Recommendations

Based on the results of this parrot release, we conclude that using a soft release procedure was crucial to the successful rehabilitation and reintegration of at least 50% of the parrots involved. We strongly recommend a soft release procedure when reintroducing confiscated endangered parrots into the wild.

Reintroduction is currently a controversial

issue when referring to the protection and conservation of parrots. This is due to the numerous risks involved and the failure of similar projects in the past. Reintroducing confiscated parrots back into the wild is a challenging and difficult task to ensure that the released birds really represent a benefit for the conservation of their wild populations and that they do not cause potential and irretrievable damage to their own species and/or other wildlife species.

However, it is important to remember that other strategies for the management and conservation of confiscated birds have been proposed. When implementing a release strategy, it is fundamental to reduce the risks involved and to keep focus on the potential benefits that the released flock will bring to the wild populations.

We hope that our work will offer some guidelines for future conservation efforts of other parrot species worldwide.

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Helping local people value their natural treasures

By ANDREA JOHNSON and DONALD BRIGHTSMITH

Santiago Duran leans toward us through the blazing heat of a Peruvian jungle at midday. "Years ago," he recounts, his weathered hands absently swatting sandflies, "the men from the community used to go upriver to the big palm swamp. They would go in January, and take their machetes, and they would cut down the palms where the macaws had chicks. Thirty, forty nests at a time - they hardly thought twice, there were so many birds. And I tell you, the macaw stew we would eat..."

Times have changed, for both the men and the macaws. Today, that big palm swamp is part of Bahuaja-Sonene National Park, which along with the Tambopata-Candamo Reserve Zone and Bolivia's Madidi National Park, encompasses over 3.1 million contiguous hectares of primary rainforest in the southern Amazon basin. The Native Community of Infierno (NCI), a mixed indigenous and mestizo community of which Don Santiago is an elder member, lies along the banks of the Tambopata River at the edge of this grand swathe of forest. Nowadays, when people from Infierno go upriver, they are most likely to be accompanying a boat of ecotourists intent on seeing the very macaws to which our host refers as stew fodder.

The terrain of the native community forms a buffer to one of the largest remaining forested areas in the Western Amazon basin, and the indigenous Ese'ejá people's historical relationship with the land has ensured that their lands thus far remain mostly covered with lush tropical forest. Within the community's 10,000 hectares, 40% is set aside as a reserved area, and the rest is a matrix of good secondary forest and cleared farmland. For generations land use consisted of shifting agriculture, low-level timber extraction, and subsistence hunting. This is still the case, but population increases in the last decades

have meant growing levels of all these activities. In addition, in the past decade, tourism has become a major new economic player in the area; the NCI is now joint owner of a popular and innovative ecotourism.

Macaws in Infierno

These dynamics are making complex and at times conflicting demands on the community and its biodiversity - not least, the macaws, whose brilliantly photographable plumage and winning behaviour make them avian gold in ecotourism dollars.

Six species of macaws inhabit the forests surrounding the NCI: Scarlet (*Ara macao*), Red and Green (*A. chloroptera*), Blue and Gold (*A. ararauna*), Chestnut-fronted (*A. severa*), Red-bellied (*Orthopsittaca manilata*), and the rare Blue-headed (*Propyrrhura couloni*). Most species of macaws are threatened throughout their ranges by a confluence of habitat loss, illicit pet trade, and hunting. While macaws in the Tambopata region are lucky enough to live adjacent to a vast pristine sweep of jungle, they remain vulnerable due to their slow rates of reproduction and nesting requirements.

Unlike many regions, it appears that in Infierno, illicit capture for the pet trade is not a major problem for the macaw



Red-and-green Macaws at a clay lick near Posada Amazonas in the Native Community of Infierno.

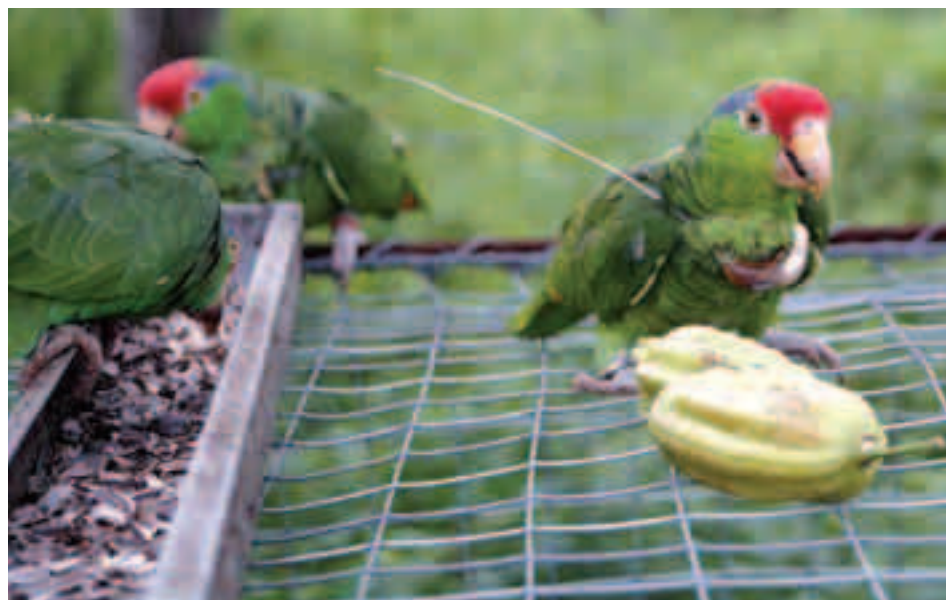
Photo: Eric Outwater

populations. But while the days of which Don Santiago spoke are gone, macaws are still occasionally shot for food. They have also historically been killed by brazil nut collectors, who view these skilled seed-eaters as competitors for a valuable economic good. Perhaps the most pressing threat is to their reproductive success. Despite the legendary diversity of rainforest flora, it turns out that there are only a few types of trees that form the spacious durable cavities macaws need as nests - and the overwhelmingly preferred nest trees, ironwood (*Dipteryx species*), are also ideal for making charcoal and flooring. These enormous centuries-old trees, found throughout community lands, are often sold at scandalously low prices to the prospective loggers. Once gone, they represent an irreplaceable loss.

That human activities have had a deleterious effect on the macaw population density in the NCI is suggested by extensive anecdotal and comparative evidence from community members and researchers. That the community has an interest from an economic standpoint in maintaining and improving the health of their avian population is a fact. The NCI, therefore, offers an excellent opportunity to

1 investigate the dynamics of a low-density population,

2 put to the test artificial nesting techniques



Red-crowned Parrots feeding on local foods at the supplementary feeding station.



The high school class (and a few extras) from the Native Community of Infierno and the macaw nest boxes they helped build.

Photos: Donald Brightsmith

developed elsewhere, and

3 work to strengthen the conservation-minded outlook among community members towards their incredible natural resources.

Since 2001, we have been working with the community of Infierno on these three fronts to understand and conserve its macaw population.

Primary forest

Six hours upriver from Infierno takes you into primary forest that provides a picture of what the macaw population may have once resembled. Here, at the Tambopata Research Center, macaws congregate at one of the largest clay licks known in the Amazon; on a good morning, over 1,000 parrots appear in a riot of colour and noise. You cannot walk into the forest for more than 5 minutes without hearing or seeing a flash of macaw red or gold. Studies at places like TRC and Manu National Park have shown that available nest sites seem to be the limiting factor on the population; it is estimated that less than 30% of potential reproductive pairs lay eggs in a given season. Nest demand, in other words, exceeds supply. It may be for this reason that artificial nest boxes at TRC have occupancy rates of approximately 80%. Reproductive success has been monitored and design improved since the first successful box was hung here in 1994. What we haven't known, however, is how artificial nests would be received among a population of lower density. Do the macaws in Infierno face a housing shortage as well? This question has important implications for conservation and management efforts.

With such thoughts in mind, we began our work with the community by putting Infierno's secondary school students to work! The kids helped to construct 14 artificial nests, which were then hung throughout the community's lands. We placed six in the trail system at Posada Amazonas, the ecolodge jointly owned and operated by the community, and eight on the lands of willing community members. During the 2001 and 2002 breeding



Girls from the high school in the Native Community of Infierno helping to build nest boxes.



Richard Amable (project assistant from nearby Puerto Maldonado) helping high school students build wooden macaw nest boxes.

seasons, the boxes were monitored every 7-10 days from November through January. We have found Blue-headed Parrots, Kinkajous, and all variety of stinging insects nesting inside, but thus far no macaws have shown interest. There are a variety of potential explanations for this. It may be that the birds simply haven't discovered the nests yet, or observed other macaws successfully utilizing them. It may be that the nests are placed too close to areas of human traffic, and that birds in the NCI lands are more skittish around people after generations of familiarity with hunters' guns. It may also be that these nests are unnecessary for a population of this density: simply put, that the birds of Infierno do not suffer from a housing shortage. There may be a sufficiently large number of inviting natural holes from which to choose.

Natural nest monitoring

Studying natural nesting holes has been another prong of our investigations into the reproductive dynamics of the macaw population in the native community. We wanted to discover where birds were nesting, and encourage the local people to take an interest in guarding these birds from hunting and their nest trees from felling. Thus in 2001 we began offering monetary incentives to community members who showed us macaw nests: \$25 was paid for an active nest, and \$25 more is paid if the chick successfully fledges from the nest. This strategy is effective on several levels: not only is it an inroad to local knowledge, but it has maximized project contact with community members. We rely upon their information, we pass

through their farms, we communicate regularly about the status of nests on each person's land. In addition, on a simple but important level this incentive payment makes clear to people that the macaw population - and local knowledge about it - is valuable as something other than a source of food. Anecdotal evidence from other sites where poaching is high tells us that poachers will show nests to researchers and then go back, after reaping the compensation, to steal the chicks. Fortunately, we have no evidence of this occurring during our work in Infierno.

In the 2001 and 2002 seasons, community members showed us a total of 12 cavities, of which 8 turned out to be active macaw nests; of these, 4 were of Red and Green Macaws, and 4 Scarlet Macaws. We were able to monitor the success of all but one of the eight nests (one was defended not only by angry parents, but also by a nest of Africanized honey bees). In two of the nests, predators took the eggs and the parents never relaid. Of the remaining five nests, a total of nine chicks hatched, seven of which either fledged or remained healthy and almost ready to fly at the termination of the field season.

All but one of these nests were natural cavities in large *Dipteryx* trees, holes up to 5 meters deep in canopy emergents that reach 40 meters and more in height. In one incredible nest that fledged a Scarlet Macaw chick, the climber had to lower herself 3 meters down into the trunk to check on the chick. Our experience confirms that *Dipteryx* are indeed a keystone for macaw reproductive success, and that concerted efforts to prevent their

felling should be a part of future management efforts.

One of the most rewarding aspects of this monitoring has been sharing it with community members. Although macaws are not a novelty to people in Infierno, most have never seen the birds up close, or thought about them as much other than a potential food source or Brazil nut competitor. The experience of seeing and handling young macaws, or climbing into a nest cavity that has been shaped over hundreds of years, changes peoples' perspectives. On several occasions, we have been able to bring children out to visit active nests; seeing the look on their faces as the gawky chicks emerge from the nest is confirmation that experiential education works. We have also had the pleasure of working with 7 community members as paid field assistants over the past two years, providing wages and training that makes them more employable by ecotourism lodges or other field research projects in the future.

In the long-term, the macaw population of Infierno is in the hands of the school children. Significantly, Posada Amazonas will also be in their hands in a very direct way: in 15 years, according to the agreement between joint operators Rainforest Expeditions and the NCI, the Posada lodge will pass into full ownership of the community. The next generation will decide how to run things, and we would like them to fully understand how



Local children joined the macaw research team when they went to visit a nest of Green-wing Macaws.



Green-wing Macaw chick from a nest in the Native Community of Infierno.

Photo: Adriana Bravo.

integral their community's biodiversity is to the success of their ecotourism efforts. Thus we are working to develop a relationship with the Infierno schools. We give educational presentations each season, discussing macaw ecology and reproduction - and why this matters to the people of the community.

Finally, we are attempting to keep a high profile in the community, attending assembly meetings, giving updates on our

work in public forums, carrying on conversations about parrots at every opportunity. Not only is it a responsibility of the project to report back to the community in which the work is done, but keeping macaws on peoples' minds encourages a new way of valuing the birds and their conservation. For people who have grown up with macaws in their backyard, like enormous fluorescent chickadees, it sometimes takes an outside perspective to emphasize just how impressive they are - and how much they are potentially worth, alive and flying. Despite calculations suggesting that a single macaw can be worth thousands of dollars in tourism income over its long lifespan, many people in the community still tell you that a 500-year old *Dipteryx* tree sold for \$100 to make charcoal is worth more.

Changing attitudes

Is our work making a difference? Two years in, it's hard to evaluate with any certainty. In community conservation, success is measured not by instantaneous solutions, but in small moments when change begins to take hold. To be sure, hunting and tree-felling continues. On the other hand, we begin to hear stories like those of Jesus Macias. Jesus, whose brother has worked for the project, led us out one morning to a prospective nest. Streamside under a massive *Dipteryx* that must have been standing when Pizarro first landed on the coast of Peru, he pointed out a hole high above. "I came by the other day and saw a pair of Scarlet Macaws sitting here," he tells us. "I almost shot them, but then I thought - no. My brother is looking for these nests, better that I hold off and show the project."