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The use of hand-raised psittacines for reintroduction: a case study of scarlet macaws (*Ara macao*) in Peru and Costa Rica

Donald Brightsmith [a,*], Jenifer Hilburn [b,c,1], Alvaro del Campo [d,2], Janice Boyd [e], Margot Frisius [c], Richard Frisius [c], Dennis Janik [b], Federico Guillen [b]

[a] *Department of Biology, Duke University, Durham, NC 27712, USA*
[b] *Fundación para la Restauración de la Naturaleza – Zoo Ave, La Garita, Alajuela, CR, USA*
[c] *Amigos de las Aves Apartado 2306-4050, Alajuela, CR, USA*
[d] *Rainforest Expeditions, Selva Reps, Aramburú 166 – 4B, Lima 18, Peru*
[e] *Amigos de las Aves USA, 317 Thames Dr., Slidell, LA 70458, USA*

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Abstract

This study reports on three scarlet macaw (*Ara macao*) reintroduction projects using hand-raised birds in Peru and Costa Rica. The habitats at the release sites ranged from pristine tropical forest to forest fragments in an agricultural matrix. The combined first-year survival was 74% and the annual post first-year survival was 96%. Survival rates were very high despite a wide range in predator communities. Number of birds released explained 70% of the variation in survival with birds from larger releases having higher survival rates. Behavioral evidence suggests that birds established at the site facilitated survival of later releases. Breeding attempts were recorded at all three sites and hand-raised birds with wild mates successfully fledged young in Peru. Supplemental feeding post-release played an important role in keeping the birds near the release site and facilitating social interactions. This work shows that properly socialized hand-raised macaws can survive and breed in the wild but that ex-pets are not good release candidates.

Keywords: Reintroduction; Macaw; Psittaciformes; Supplemental feeding; Peru; Costa Rica; Captive breeding; Disease; Hand-raised; Socialization

1. Introduction

Captive breeding and reintroduction are important management tools for endangered species (Balmford et al., 1996; Noss, 2001). However these projects are expensive, have a high risk of failure and are usually not properly documented, making it impossible to learn from the successes and mistakes of others (Griffith et al., 1989; Beck et al., 1994; Biggins et al., 1999). The role of captive breeding and reintroduction has been hotly debated especially in the field of parrot conservation in part because parrots are susceptible to various lethal, contagious diseases that may lie dormant for years (Clubb, 1992; Derrickson and Snyder, 1992; Wiley et al., 1992; Balmford et al., 1996; Snyder et al., 1996, 1997; Gippoliti and Carpaneto, 1997). The family Psittacidae contains the highest proportion of species at risk of extinction of any large avian family yet many are kept and bred in captivity (Clubb and Clubb, 1992a; Johnson, 1992; Bennett and Owens, 1997; Collar, 1997). This provides many opportunities for reintroduction by private and public institutions (Clubb and Clubb, 1992b; Snyder et al., 1994; USFWS, 2002; Collazo et al., 2003; Juniper, 2003). Captive-raised animals usually perform poorly in comparison to wild-caught individuals but studies must continue to evaluate the potential of captive-raised birds because translocation is not an option when wild populations are endangered or extinct (Griffith et al., 1989; but see Sanz and Grajal, 1998; Collazo et al., 2003).

The scarlet macaw (*Ara macao*) is widely distributed throughout tropical America (Forshaw, 1989). The bird

* Corresponding author.
E-mail address: Djb4@duke.edu (D. Brightsmith).
[1] Present address: WCS Wildlife Survival Center, St. Catherines Island, 182 Camellia Road, Midway, GA 31324, USA.
[2] Present address: 843 S. Miller Street, Chicago, IL 60607, USA.

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was formerly quite common but habitat loss, hunting and capture for pets have caused drastic declines and extinction in many areas, most notably Central America (Wiedenfeld, 1994; Juniper and Parr, 1998; Renton, 2000). This study compares three scarlet macaw release projects to document the techniques used and determine what factors correlate with high survival rates.

2. Study areas

Curú National Wildlife Refuge is a working farm located on the Nicoya Peninsula, in western Costa Rica (09°47′N, 84°56′W, elevation:sea level). It covers 1492 ha: 70% is natural forest and 30% human-created habitats (Schutt and Vaughan, 1995). Rainfall is strongly seasonal and totals 2000 mm per year. The site is a mix of tropical dry and tropical most forest (Holdridge, 1967). There are no large raptors able to kill adult macaws. Wild scarlet macaws disappeared in the late 1960s.

The San Josecito Valley Center for Release is in a 200 ha valley approximately 16 km north of Golfito, Costa Rica (08°37′N, 83°15′W, elevation:sea level). Rainfall is aseasonal and totals about 6000 mm per year. This site will be referred to as Golfito. The valley floor is second growth forest ringed on three sides by low mountains covered in primary tropical wet forest. Golfo Dulce borders the fourth side. Adjacent to the valley is Piedras Blancas National Park (15,000 ha). Scarlet macaws were extirpated in the late 1950s (Janik et al., 2003). There are no large eagles at the site and *Spizatus* hawk-eagles occur at very low densities.

Tambopata Research Center (13°07′S, 69°36′W, elevation: 250 m) is located in SE Peru on the border between the Tambopata National Reserve (275,000 ha) and the Bahuaja-Sonene National Park (537,000 ha) over 20 km from the nearest permanent human settlement (Foster et al., 1994). Rainfall totals 3200 mm and is weakly seasonal (Brightsmith, in press). Primary tropical moist forest, *Guadua* bamboo patches and riparian successional forest of differing ages surround the site (Griscom and Ashton, 2003). The area has populations of large macaws (*Ara ararauna*, *A. chloroptera* and *A. macao*) and large raptors (*Harpia harpyja*, *Morphnus guianensis*, *Spizatus tyrannus*, *Spizatus ornatus* and *Spizastur melanoleuca*, Foster et al., 1994).

3. Methods

3.1. Rearing

Release candidates were captive-raised from native stock in Alajuela Costa Rica at Zoo Ave (Golfito) and Amigos de las Aves (Curú) or rescued from nests of wild birds (Tambopata, Table 1). Hand-raised birds were hatched in incubators or raised by their parents up to 2 weeks before being removed for hand raising. Seven Golfito birds were raised to fledging by their parents. At Amigos de las Aves no attempt was made to isolate the birds from casual human contact. At Zoo Ave the chicks were isolated from most human contact and visited only during feeding. The birds at both facilities were weaned off of hand feeding around 100 days when they were

Table 1
Summary of methods used in three scarlet macaw releases in Latin America

	Curú, CR	Golfito, CR	Tambopata, Peru
General			
Source of birds	Captive breeding	Captive breeding	Wild nests
Age at release	1.7–3.7 years ($x = 2.7$)	?	90–100 days
Pre-release methods			
In flight cages pre-release	Yes	Yes	No
Predator conditioning pre-release	No	No	No
Disease screening pre-release	Yes	Yes	No
Disease detected	[a]	No	*Salmonella*
Kept with conspecifics during rearing	Yes	Yes	Yes
Feeding			
Hand fed pre-weaning	Yes	Yes	Yes
Hand fed post-weaning	No	No	Yes
Fed wild local foods pre-release	Yes	Yes	No
Supplemental feeding post-release	Yes	Yes	Yes
Interactions with people			
Isolated from contact during rearing	No	Yes	No
Given affection pre-fledging	Yes	No	Yes
Given affection post-fledging	No	No	Yes
Approach people post-release	No	No	Yes

[a] See text for discussion of *Chlamydiophila* [*Chlamydia*] *psittaci* testing here.