Report 2015 on the activities of the research and scarlet macaw (*Ara macao*) nests site protection project in Barra Honda National Park and the surrounding area.

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Introduction

The foothills of Barra Honda National Park are home to what appears to be the last native population of scarlet macaws in the Peninsula of Nicoya. The initially small population (2010) is estimated at a total of 10 to 11 individuals, it has been seriously threatened by the constant theft of chicks and habitat loss mainly.

The organization Projects Abroad in coordination with the administration of Barra Honda National Park and the Costa Rican Red Cross began in 2011 to do research and care of the macaw nest site in the current campaign and along the entire breeding season, in order to preserve the species and raise public awareness of the surrounding towns to Barra Honda National Park.

A. macao (Linnaeus, 1758) is distributed from the west of Mexico to the Amazon region of Colombia, Venezuela, Bolivia, Brazil, Ecuador, French Guiana, Guyana, Peru and Suriname; As well as Trinidad and Tobago. In Costa Rica it is believed that once inhabited the length and breadth of the land, today it is rare resident lowlands North Pacific sometimes up to 1000 m in the foothills of the mountain ranges of Guanacaste and Tilarán, as well as the mountains of the Nicoya Peninsula; it is becoming less common in the central valley reaching Grecia. Some reintroduction projects have been successful repopulating the central Pacific and south from Punta Burica to the lowlands of Atenas, with reports ranging up to 75 individuals in the area of Golfito.

Apparently two subspecies of *A. macao* throughout its range are recognized; *A. m. cyanoptera* and *A. m. macao*. The first distributed from Mexico to central Nicaragua and the second from Panama to Brazil, making believe that the two subspecies could be in Costa Rica, although phylogenetic studies are not sufficient to assert that theory. The subspecies found in the Nicoya Peninsula could be *A. m. cyanoptera*, which would be of great importance in terms of population management.

From this knowledge our team conducted the study of behavior and nests monitoring corresponding to 2015 from the third week of April to the last week of August, two to three times a week alternating days. It is the fifth consecutive year that actions are taken in our campaign for the conservation of the species serving as clear and successful example of *in situ* conservation as a key to a better genetic-population management.

From May to August 2015 a study of adult behavior took place while they were near the nest, observations of both individuals consisting of grooming (cleaning made by an individual himself) nest defense against any threat, deployments (except flights of arrival and departure), pigeon movements, reciprocity (interaction between individuals) and complaints (sounds of any individual).

The objectives of this project are; 1) Define the population size and the flight patterns of the species *Ara macao* in Barra Honda National Park and surrounding area (starting in 2016). 2) Take care of pigeons against potential theft by individuals. 3) Study the seasonal breeding behavior of individuals of *A. macao*. 4) Perform actions in conjunction with the various stakeholders in education to neighboring communities about the conservation of this species. 5) Determine the subspecies of *A. macao* present at the site by genetic studies (initiated in 2015 hoping to generate the first results in 2016).

Results

In the present project we have worked directly with two nests located on a nearby farm to the National Park in the community of Barra Honda. The first one to be located in 2011 generated a positive result in terms of hatching. By 2012 one hatched chick (of the 11 eggs that the couple lay at the time), which flew two months and 22 days later. The couple in the second nest did not lay any eggs that year. Both nests did not generate positive results in terms of hatching chicks until 2015 (although in previous years if there were eggs in two nests).

In 2015 we found 4 eggs in nest number one, but none of them hatched. In the nest number two were found 5 eggs and two of them hatch. Both chicks developed well though the growth time in the nest until their flight period (which was greater than what was presented in 2012). Both chicks left the nest four months after hatching and continued to visit it and investigating around for more than 3 weeks.

Image 1. Review the nest two by Oscar Rosales

Note: In the picture is observed a bag where we placed feathers for the study of DNA.

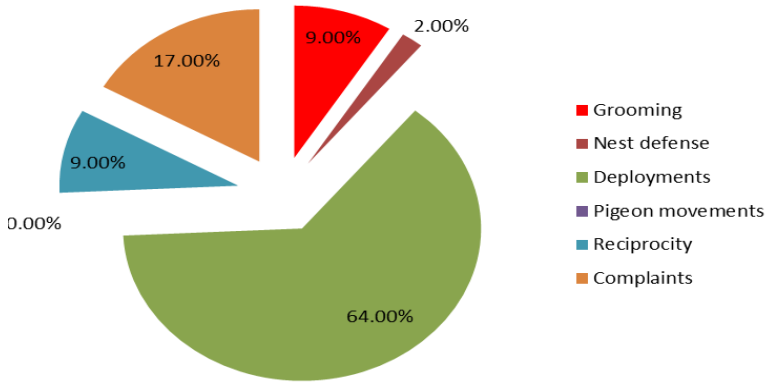
The variable that was presented the most during the behavioral study (See Chart 1) were the deployments (flight) while the variable recorded the fewest times was pigeon movements (outside the nest), which are not registered in any time until early September, outside the stipulated time of study. The records were taken with the 0-1 method, where 0 represents no activity and 1 positive activity (see Table 1, category "Average").

Table 1. Summary Measures of behavioral observations of individuals of *A. macao* April-August 2015

Variable	n	Average	S.D.	S.E.
Grooming	37	0.11	0.31	± 0.05
Nest defense	37	0.03	0.16	± 0.03
Deployments	37	0.81	0.40	± 0.07
Pigeon movements	37	0.00	0.00	± 0.00
Reciprocity	37	0.11	0.31	± 0.05
Complaints	37	0.22	0.42	± 0.07

Note: The above table shows the degree of significance of the variables. Legend: n; represents the number of observations made from May to August 2015, SD; standard deviation, SE; standard error. In the category "average", values become less meaningful to form away from the value assigned one, ie the closer the mean value is greater than 1 was the frequency with which the pair performed the activity.

Figure 1. Distribution of behavioral variables *A. macao* April-August 2015



Note: The above chart shows in percentage terms clearly the distribution of the variables studied.

Annex 1. Couple from the nest 2 in flight during the first visits to the nest

Note: Thursday, April 23, 2015. Father and Mother of the chicks from the nest two begin to lose some breast feathers because of the constant arrival and departure of the nest.