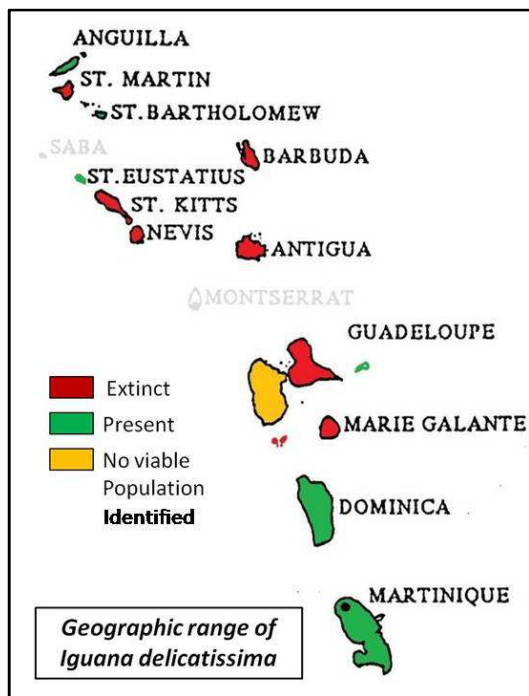


Iguana delicatissima Population Survey, Chancel Islet: March 2013

Introduction

The Lesser Antillean iguana (*Iguana delicatissima*), is an endemic and iconic species from Lesser Antilles. It is likely that 70% of the original population has disappeared since Europeans settled in the Lesser Antilles islands. Development of farming was the main cause of its habitat destruction.



The Lesser Antillean iguana historically ranged across the Lesser Antilles Islands from Anguilla to Martinique. It started to decline with the development of farming when Europeans settled in the West Indies (Breuil, 2002). Now it is extinct in Saint Martin and Sint Marteen, St Kitt & Nevis, Antigua & Barbuda, Les Saintes, Grande Terre (Guadeloupe mainland), Marie Galante, and is now almost extinct in Basse Terre (Guadeloupe Mainland) as so far, any viable population has been identified (Breuil et al., 2007; Breuil Pers. comm. 2011; Angin, pers. Comm 2012). Now this unique species occurs from North to south on Anguilla, St Barthélemy (including Fourchue and Fregate Islet), St Eustatius, Petite Terre (Guadeloupe), La Désirade (Guadeloupe), Dominica and Ramier and Chancel Islet (Martinique). Some individuals in mixed population (*I. iguana* + *I. delicatissima*) still remain on Basse Terre. Evidences exist that some scarce and fragmented population remain in Northern Martinique, about which very little is known (ONCFS, unpublished data). It is necessary to improve our knowledge of the spatial repartition of both species of iguana found in this area, get estimates of the size, dynamics and structure of the remaining populations, as well as understand their behavior, in order to efficiently draw measures for its conservation. The current range of the species is estimated at no more than 3,000 Km² (Knapp & Iverson, In Press). Moreover, the remaining population is scarce and fragmented and the Guadeloupean (mainland) population ran almost extinct in 15 years. *Iguana delicatissima* is listed as "Endangered" on the International Union for the Conservation of Nature (IUCN) Red list of threatened species (IUCN, 2010).

While habitat destruction was probably the main cause to its decline in the past, nowadays, the main threats on the fragile population from Guadeloupe and Martinique, are competition and hybridization with its congener the non-native green iguana (*Iguana iguana*) (Knapp et al., In press). The viable *Iguana delicatissima* population from Guadeloupe mainland has completely disappeared within 15-20 years of time (Breuil, Pers. Comm. 2011). Surviving populations are restricted to small islets. One could therefore infer how a possible introduction of green iguanas on those areas jeopardizes the survival of local *Iguana delicatissima* populations. This would mean compromising the conservation of the global population. France has a predominant responsibility in the conservation of remaining population, as 9 out of the 12 territories where *Iguana delicatissima* individuals can be found, are part of the French West Indies. Moreover, Petite Terre islets are likely to be house of one of the 2 biggest populations.

Further to Grenelle Environment round table, held in France in 2007, it has been decided that a National Action Plan for *Iguana delicatissima* conservation (NAP) would be written. It has been validated in June 2010 and published in 2011. The goal of this NAP is to coordinate in the French West Indies population surveys and researches on this species, recovery and conservation actions, and local people education programs in order to facilitate the integration of this flagship species protection in policies and human activities.

This population survey is part of the National Action Plan (Aim 1: improvement of our knowledge of the population of *Iguana delicatissima* Population survey), and fits the second aim of the 2012-2014 ONCFS' agreement of results (Knowledge improvement for reliable expertise in wildlife).

Attendant

This survey as were the 2 previous surveys are undergone as a participative research, involving Martinican and Guadeloupian volunteers as well as professionals working on *Iguana delicatissima* or other iguanas species from different Agencies of the Caribbean region. This network functioning has been highlighted in the NPA as an important part of the whole *Iguana delicatissima* conservation process.

Attendants were:

- Pamela Alfred, Saint Lucia Forestry Department, Ste Lucia
- Julien Athanase, Garde Reserve Naturelle, association Ti Tè, Guadeloupe
- Enora Becheler, IFREMER, Volontaire, Martinique
- Myriam Bouaziz, IFREMER, Volontaire, Martinique
- Pius Haynes, Saint Lucia Forestry Department, Ste Lucia
- Mary James, Saint Lucia Forestry Department, Ste Lucia
- David Laffitte, Office National de la Chasse et de la Faune Sauvage, Antilles françaises
- Jean-Claude Lallane, Garde Reserve Naturelle, association Ti Tè, Guadeloupe
- Gregory Moulard, Association Alsophis, Collectivité de St Barthélemy
- Jean-Baptiste Quere, La Meynard, Volontaire, Martinique
- Chloé Rodrigues, Office National de la Chasse et de la Faune Sauvage, Antilles françaises
- Veronique Siousarram, Volontaire, association Ti Tè, Guadeloupe

David Belfan, Association Le Carouge, Martinique was initially planned, but informed us a few days before beginning the field session, that it was impossible for him to come. Enora Becheler was able to come after being asked.

All the "Ordres d'accueils" are attached as annex 2.

Method

Population size estimate and structure

We applied a traditional Mark-Recapture method.

Chancel Islet (Fig.1) was divided into 6 areas of similar difficulty (regarding roughness of the terrain, number of big trees, estimated density of iguanas) referenced as Zone 1 to Zone 6. Each day, each area has been covered randomly and as exhaustively as possible by a team of two people. The Islet was checked for iguanas from about 08:00 am to 16:00 - 17:00 during 5 consecutive days. Each iguana spotted was captured by hand or with the noose, has been checked for Pit Tags or was tagged (Pit Tags: 11.5x2.12 mm; 0.1g, trovan ID-100 unique, Trovan®, Ltd., EID, U.S.). Then Many biological and environmental data were taken (cf. Field data sheet, annex 1).

Fig. 1. Chancel Islet - Satellite Map



Population morphology and physiology

Some morphological measurements have been taken during animals handling:

The Total Length (TL): from the snout to the tip of the tail, the iguana was stretched, and ground was as flat as possible. If the tail was broken or crooked, it was indicated. (unit: cm).

The Snout Vent Length (SVL): from the snout to the vent, rounded up to the closer 0.5cm. (Unit: cm)

The Body mass: to the nearest 10g. (Unit: g)

The females were palpated for check of pregnancy status. Coloration of the cheeks of males and females at capture time was noted.

Population health state

The general health state assessment was based on general distant and close examination of the body condition, general exhibited behavior, absence/presence of disabling wound and parasitic load.

An individual was considered in a good health state if its body condition was good, it was observed (prior to the capture) performing a normal behavior of its species or a normal escape pattern, it showed no disabling wound and no sign of sickness that would prevent it to meet all its needs and wants as discussed in Dawkins (1990), and in Hugh and Duncan (1988). When a need arises, the motivational state will elicit behavioral and physiological responses that aim to meet the need, so that the individual is able to cope with its environment (Fraser and Broom, 1990). In other words, it was free of any wound or disease that would obviously compromise its welfare, but the presence of a lesion which did not interfere with its behavioral or physiological ability to meet its needs was not a contraindication to refer the individual as in good health state.

A medium Health state was indicated if the animal was skinny, and/or exhibited wounds or signs of disease which would affect its welfare, and make it unable to meet its ethological needs or its wants, and/or exhibited abnormal behaviors (like lethargy in reaction to the capture), but the short term survival was not compromised.

A poor health state was assessed if probability of short-term or mid-term survival was compromised (very disabling wounds, lethal wounds, cachexia, signs of advanced terminal staged disease).

Further analysis will be conducted. General Population morphological measurements analysis and Population dynamics will be analyzed and results will be given in a further report (General assessment of the conservation of *Iguana delicatissima* population of Chancel Islet, Martinique).

First Results

Field effort

515 Captures have been counted, with a total number of 402 individuals, including 205 Females, 194 males and 3 juveniles. 37 males and 54 females were recaptured during this session, totalizing 114 recapture events. 74 individuals have been recaptured once, 12 individuals twice, 4 individuals three times and 1 individual has been recaptured four times. (cf. Table 2)

Number of captures per day ranged from 89 (day 2) to 116 (day 3), and the average number of iguanas captured per team per day was about 17 (cf. table 1).

Table 2. Capture Effort					
	day 1	day 2	day 3	day 4	day 5
Total number of capture	93	89	116	105	110
N° capture/team (μ)	15.5	14.8	19.3	17.5	18.3
Average number of capture/day/team (entire session)					17.1

Capture (θ_c) and recapture rates (θ_r) of the capture event i can be defined as following:

$\theta_{ci} = \text{N}^\circ \text{ of captures}_i / \text{N}^\circ \text{ non-marked individuals}_i$ (after the total population size estimated on the data set).

$\theta_{ri} = \text{N}^\circ \text{ of recaptures}_i / \text{N}^\circ \text{ of marked individuals}_{i-1}$

Table 3. Capture and Recapture rates per day for female and male subpopulations					
	Jour 1	Jour 2	Jour 3	Jour 4	Jour 5
Taux de Capture Femelles	0.14	0.13	0.19	0.17	0.15
Taux de Recapture Femelles		0.12	0.17	0.11	0.15
Taux de Capture Mâles	0.10	0.10	0.12	0.12	0.11
Taux de Recapture Mâles		0.12	0.12	0.11	0.14

168 new individuals (i.e. non pit tagged individuals) have been found and 234 were tagged already (58%) (In January, the percentage of recapture was 48% = 78/163 and in July it was 50% = 159/321).

Population size estimate on mating period

This analysis was performed in MARK software, using CAPTURE. 513 capture events were included in the analysis for 399 individuals. Population was divided into two groups: Males (adults and subadults) and Females (adult and subadults). Juveniles were excluded from the analysis, as they represented only 0.4% of the total population captured.

Table 4. Population size estimate, March 2013 Mark Recapture survey, Chancel Islet

	N° of captured individuals	N° of Capture events	abundance estimates	SE	sex ratio (M:F)	95% confident interval	selected model	selected estimator
subpopulation								
Male	194	245	475	30.8644		421-542	M(h)	Jackknife
female	205	268	397	37.3204	1.20	337-484	M(0)	null
Total population	399	513	924	43.2994		846-1015	M(h)	Jackknife

Sex Ratio seems to be biased towards males (1.20:1). This result is not surprising considering males' activity in this specific period.

Population Health state

The population is healthy, with a large majority of iguanas considered as showing a good health state as defined above, and the parasitic load was weak. A large number of iguanas carried mites and ticks though.

Comparing survey periods

Four surveys have been performed since 2010 in different periods of the biological cycle of the iguanas. The aim was to select the most adapted period of the year in order to get most representative results with little disturbing on the population.

2 surveys have been performed in a time of the year where no sexual activity is shown (November and January). November is the start of the non sexual activity period and January, the end of this period, with earliest male entering their mating period.

1 survey was performed in late July, middle/end of the egg-laying period, with mating period already ended.

1 survey was performed in late March, middle of the mating period, with earliest females having started to lay eggs.

Results showed that in November and January, the total population is likely to be underestimated as well as the female population under different models. Results were similar: n° of iguanas captured/team per day is almost identical; male population was always found to be explained by a M(0) Model; female population has been estimated under a M(0) model in November (with an unacceptable standard error), and by a M(t) model in January maybe highlighting the fact that people became more habituated to spot them over the capture period.

In July, the female population was explained by a M(0) ($p = 1.00$) Model or a M(h) ($p = 0.96$) model. The male population was explained with a M(bh) Model. The very short interval between the two 2012 surveys could explain the trap dependence effect. This effect disappeared in March 2013.

In March, results are very similar concerning the female population, and the best model fitting this population was clearly the M(0) model. Concerning Male population there was heterogeneity in the capture, but this was expectable as we worked during the mating period.

Population dynamics

To get insight of the population dynamics is one of the main aims of the Mark-Recapture survey.