



MACUATA ISLAND

Crested Iguana Research 2006

CONTENTS

Reasons for Research	3
Aims and Objectives	4
Background Info	6
Area of Study	12
Iguana Survey	17
Grassland Survey	18
Plant Species	21
Results and Analysis	23
Summary	30
Conclusion	31
Bibliography	32

REASONS FOR THE RESEARCH

No proper scientific work done previously

The crested iguana are critically endangered species in our country

Crested Iguana has a severely restricted distribution and is limited to only a few islands in western Fiji (Gibbons, 1984)

In 1996, the IUCN listed the crested iguana as a critically endangered species, and it is the only endangered Fijian reptile listed in the Fiji Biodiversity Strategy and Action Plan (Watling and Zug, 1998).

Previously, there were scientific surveys or studies done on other islands like Yadua Taba and Monuriki in the 1980s but none on Macuata Island.

According to Gibbons (1984), several of the locality records of iguana on Macuata island were only based on second-hand reports from villagers and were never verified, until recently.



AIMS

- To find the Crested Iguana's density and distribution on Macuata island.
- To find any correlation with the vegetation type and the iguana distribution

OBJECTIVES

- To find the particular vegetation types and tree species preferred by the iguanas.
- To conduct a survey on the population using transect line technique and identify the number of males, females, adults and juveniles
- To assess the feasibility of the transect line technique used in the population surveys on the island, and for the monitoring of the iguana numbers during the recovery process for habitat restoration.

PRACTICAL ITEMS

- Line transect method
- Microsoft Excel program

EXPECTED RESULTS

- Increase in the Iguana population

HYPOTHESIS

- **Null hypothesis (H_0):** The Iguanas are distributed evenly throughout the vegetation type.
- **Alternative hypothesis (H_a):** The Iguanas' distribution depends on the different types of vegetation



FIJI'S CRESTED IGUANA

Background Information

INFORMATION - CLASSIFICATION

Kingdom	Animalia
Phylum	Chodata
Class	Reptilia
Order	Squamata
Family	Iguanidae
Genus	Brachylophus
Species	Vitiensis

INTRODUCTION AND BACKGROUND

- First discovered in 4th January 1979, by Gibbons
- Possibly arrived from Central America by sweepstakes method (by rafting-by chance)
- It is endemic to Fiji
- Found on certain islands:Yadua Taba, Monuriki and Macuata Island
- Macuata Island located within the Ra province, off the West coast of Viti Levu
- Iguana are herbivores
- Live on lots of tree, but feed on Vau (*Hibiscus tiliaceus*)
- Inhabits warm and dry beach forest on uninhabited islands
- Breed during the wet season

EVOLUTION OF CRESTED IGUANA

- When the sea level was low, Vanua Levu and Viti Levu was joined
- There was only one species: probably the banded iguana
- When the sea level increased the islands separated
- Iguanas speciated and formed the crested iguana

CRESTED IGUANA DESCRIPTIONS

What is an Iguana and where is it found?

The Fiji crested iguana is a reptile and can only be found on some of the drier islands of Fiji in the Pacific Ocean, for instance, Macuata Island.

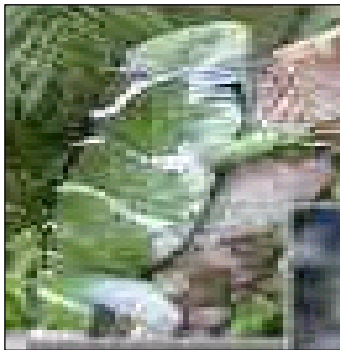
General Colour of Body	They are light green with two or three narrow white vertical bands crossing its back, which is less than 1cm in width and bordered by dark pigment. Both sexes are alike, helps to camouflage with the environment
Teeth	Razor sharp teeth
Eye colour	This is pinkish gold
Nostril scale	They have large, yellowish and elliptical with opening often off centre
Femoral Pores	Only the males have these structures, and these can range from 31 – 34 in number



CRESTED IGUANA DESCRIPTIONS CONT...

Ecology and behaviour

- The main tree species are (*Vavaea amicornum*, *Mallotus tiliifolius*, *Diospyros* sp.)
- The peak mating season is March – April, the males change color from green to black to impress their mates.



- Egg Laying – normally they lay three or four large white eggs (which are about 3.6 cm in length) These are placed breadthwise in a line in horizontal burrow and then buried (Bach, 1999)

An aerial photograph of Macuata Island, a large, triangular island covered in dense green forest. The island is surrounded by clear, turquoise water, with a small sandy beach visible on the right side. In the background, other islands and mountains are visible under a clear sky.

AREA OF STUDY

Macuata Island

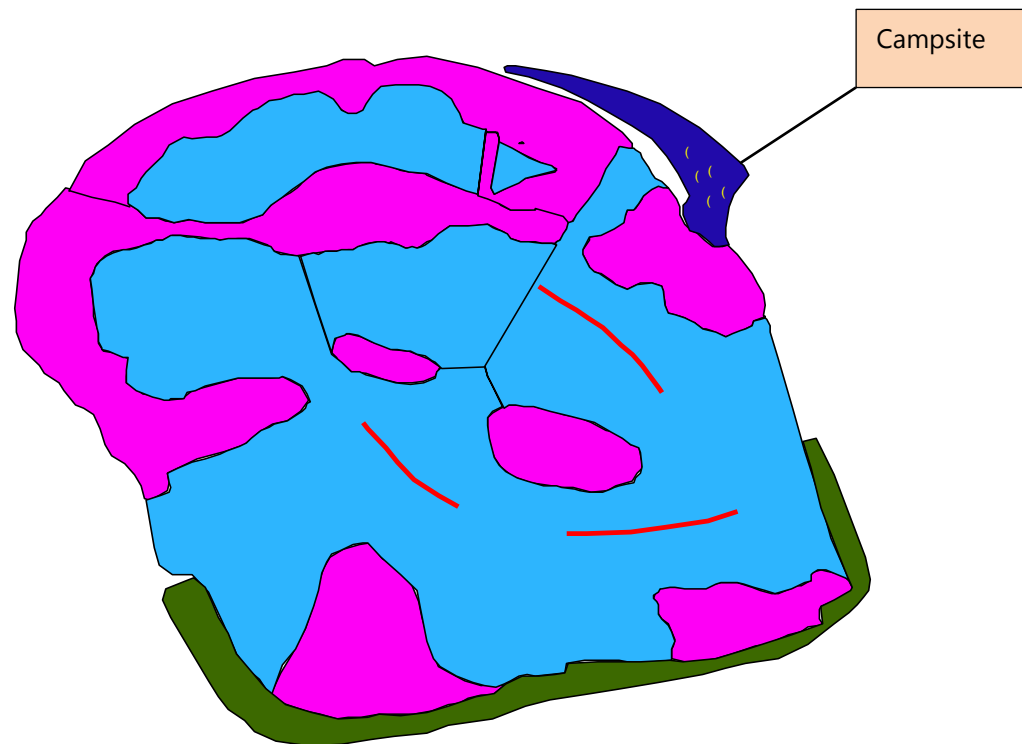
LOCATION

- Macuata Island is located in the northwestern part of Fiji
- 17° 21.5' S and 178° 02.5'E
- 40.4 hectares of land
- About 100m above sea level
- Cone Shaped
- Steep and slopes
- Dry Forest, Mangrove Forest & Grassland Vegetation
- Volcanic rocks











Map of Macuata Island



Key

-  Studentscamp.shp
-  Beach.shp
-  Transectline.shp
-  Mangrove.shp
-  Forest.shp
-  Grassland.shp

METHODS AND MATERIALS

Subject – groups used

- Conservation Biology students
- Vunitogoloa villagers

Materials – used to obtain data

- Spring balance
- Tape Measure
- Survey sheets

PROCEDURES

First Day: Mon 4th Sept	Setting up of transect line number one of 150meters long Southern region (side facing the main land)
<hr/>	
Second Day: Tues 5th Sept	Set up two transects of 150m each on the northern region of Macuata Island Split into two groups <ul style="list-style-type: none"> - Phil's group – Transect #3 (North east direction) - Dr Morley's group – Transect #2 (South west direction)

Night time tasks

The iguana surveys were done in the first and second night by using both hand-held and head torches (same two groups as in the vegetation survey groups)

Phils Group	Searched the coastal areas for iguanas
<hr/>	
Dr Morley's Group	Surveyed on the southern region (side facing the main land)

IGUANA SURVEY

- Along the transect line (above string) as well as 10m away on either sides of the line, every tree, shrub and vine mat within sights were searched for Iguana by each student.
- Sighted iguanas were lowered down from the vegetation and were measured with a measuring tape
- When an iguana was sighted, the following were data was recorded:
 - sex and life stage of the animal
 - weight of iguana (spring balance)
 - height of the tree above ground (estimated)
 - perpendicular distance from the transect (measuring tape)
- Plant sampling
 - Plant specimens of the trees iguanas were found on were collected (samples)
 - To determine and identify vegetation type

GRASSLAND SURVEY

How survey was carried out:

- The perimeters of each patches were recorded (100 m rope and 50m measuring tape)
- The recordings were calculated using digitized map - to determine the area of the whole grassland on Macuata Island

Third Day: Wed 5th Sept

Carried out by eight groups

-
1. to determine the area covered by grassland)

 2. 8 patches of grassland was identified on Macuata Island
(refer to map)

 3. 8 groups of 5 or more student s (each was assigned to work on one of
the 8 grassland patches)
-

RESULTS

Area of the Grassland

Formula:

Distance across the island on Google Earth Map (online) = approximately 900m.

Distance across the island on Google Earth Map printed out = 23cm

Scale:

23cm : 900m

1cm : $900/23 = 39.13$

Scale: 1cm : 40m or $1\text{cm}^2 : 1600 \text{ sqm}$

Use "Dot Matrix method":

Area = number of dots x 1600 sqm



TABLE 1.1 GRASSLAND MEASUREMENTS

Grass Patch Groups	Perimeter (meters)	Area (sqm)
1	1,129.9	48,000
2	1,195	41,600
3	-	81,600
4	373.26	4,800
5	-	4,800
6	302	9,600
7	230.37	7,200
8	-	205,600
Total grassland area needed to be restored		205,600 sqm

PLANT SPECIES

Macuata Island

PLANT SPECIES

FABACEAE (Pea family)	Note: <i>Maniltoa fabaceae</i> . Assumed as a legume family-not mentioned in list Family- Fabaceae Genus- Maniltoa
MELIACEAE (Mahagonay family)	<i>Vavaea amicorum</i> Benth Sandlewood Indigenous. Fiji and Tonga. Moderately Common One of the common plants that the crested iguana lives and feeds on
RUBIACEAE (Coffee family)	Family: Rubiaceae <i>Species: Canthium babartum</i>
CAESALPINIACEAE (Senna family)	<i>Maniltoa vestita</i> A.C. Sm Endemic and seemingly rare. Viti Levu, Vanua Levu and Yasawas. Few individuals seen.
EBENACEAE (Ebony Family)	<i>Diospyros elliptica</i> (J.R. & G. Forst.) P.S. Green var. <i>elliptica</i> island ebony Syn. <i>Maba elliptica</i> J.R. & G. Forst.; <i>Diospyros ferrea</i> (Willd.) Bakh. Fiji, Tonga, Samoa, Niue and Wallis and Futuna. Occasional too common in dry forest.
APOCYNACEAE (Dog-bane Family)	<i>Alyxia stellata</i> (Forst.) Roem. & Schultes var. <i>stellate</i> <i>Yadua</i> Name: vono Other Fijian Names: vono, vono buli Indigenous. Widely distributed in the South Pacific. Liana. Common in dry forest.
SAPINDACEAE (Sapindaceae Family)	<i>Species: Sapindus vitiensis</i> Common name: Soapberry <i>Note: Not much study has been done on this plant A native plant which is also found in Samoa</i>



MACUATA IGUANAS
RESULTS AND ANALYSIS

TABLE OF RESULTS

Perp. Distance (m)	No.of Iguanas	Height (m)	Body Length (cm)	Body Weight (g)	Males	Females	Adults	Juveniles
2.5	1	5	65.2	235	-	1	-	1
23	1	2	70.4	315	-	1	1	-
15.6	1	4.6	67.1	230	1	-	1	-
7.5	1	6.7	77.5	280	1	-	1	-
17	1	7	12	-	-	-	-	-
0	1	10	-	-	-	-	-	-
2	1	10	-	235	-	1	1	-
1.4	2 (1)	5.5	53.8	235	-	-	1	-
-	(1)	5.5	70.7	265	1	-	-	-
25	1	10	-	-	-	-	-	-
4	1	10	56	345	1	-	-	-
10	1	6	42	50	1	-	-	1

ANALYSIS BASED ON RAW DATA

- Total Population count = 12
- No. of captured = 10
- No. of recaptured = 2
- Total No. of Males = 5
- Total No. of Females = 3

NB: 4 Iguanas: Their sexes were not determined due to height difficulties).

- Total No. of Juveniles = 2
- Total No. of Adults = 6

NB: 4 Iguanas: Their life stages were not determined due to height difficulties.

- Average Perpendicular distance = 9.12m
- Average height (above ground) = 7.03m
- Average body length = 62.84cm

NB: 4 Iguanas: Their weights were not obtained- could not be reached.

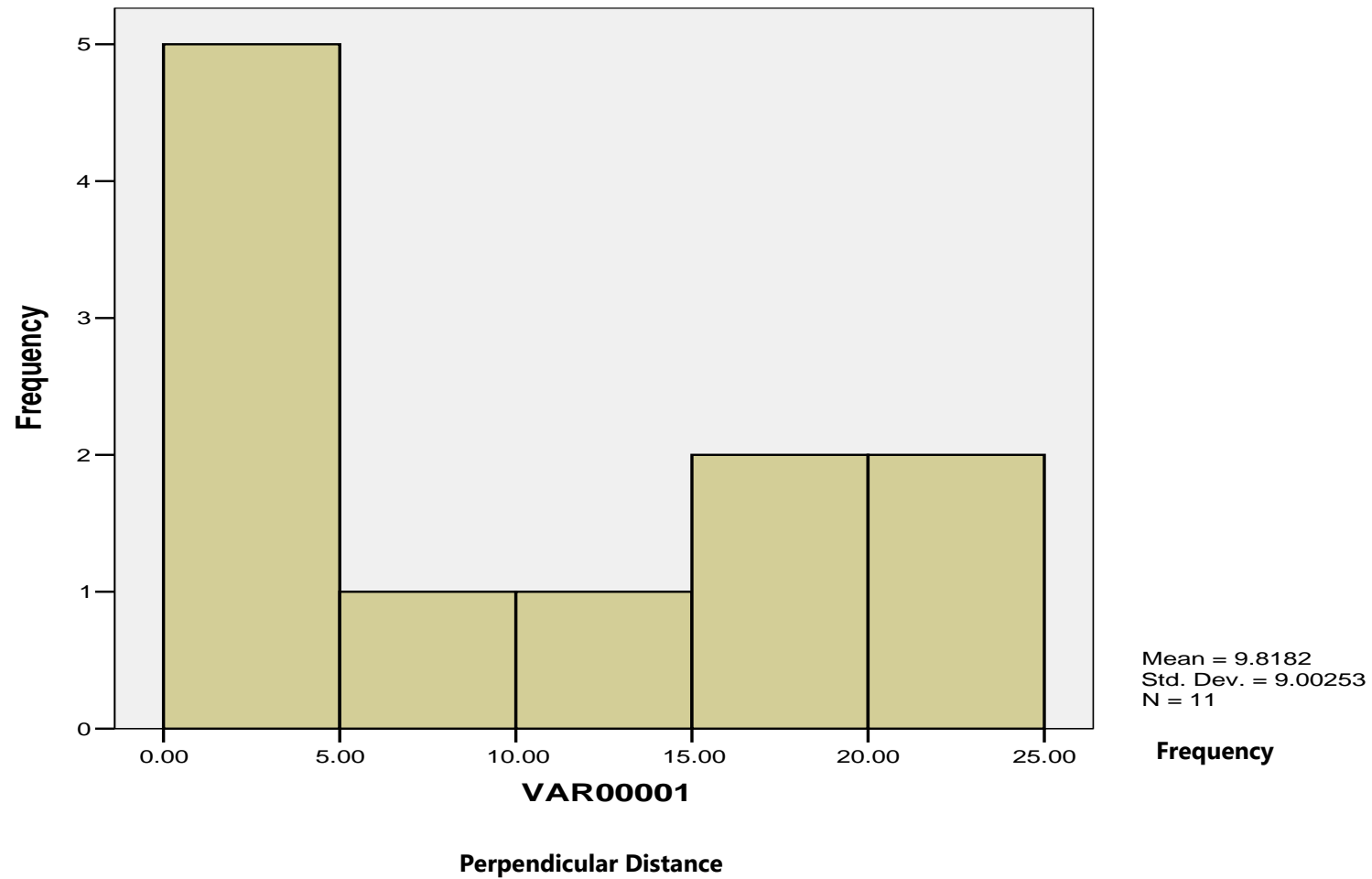
POPULATION COUNT

Table of Results

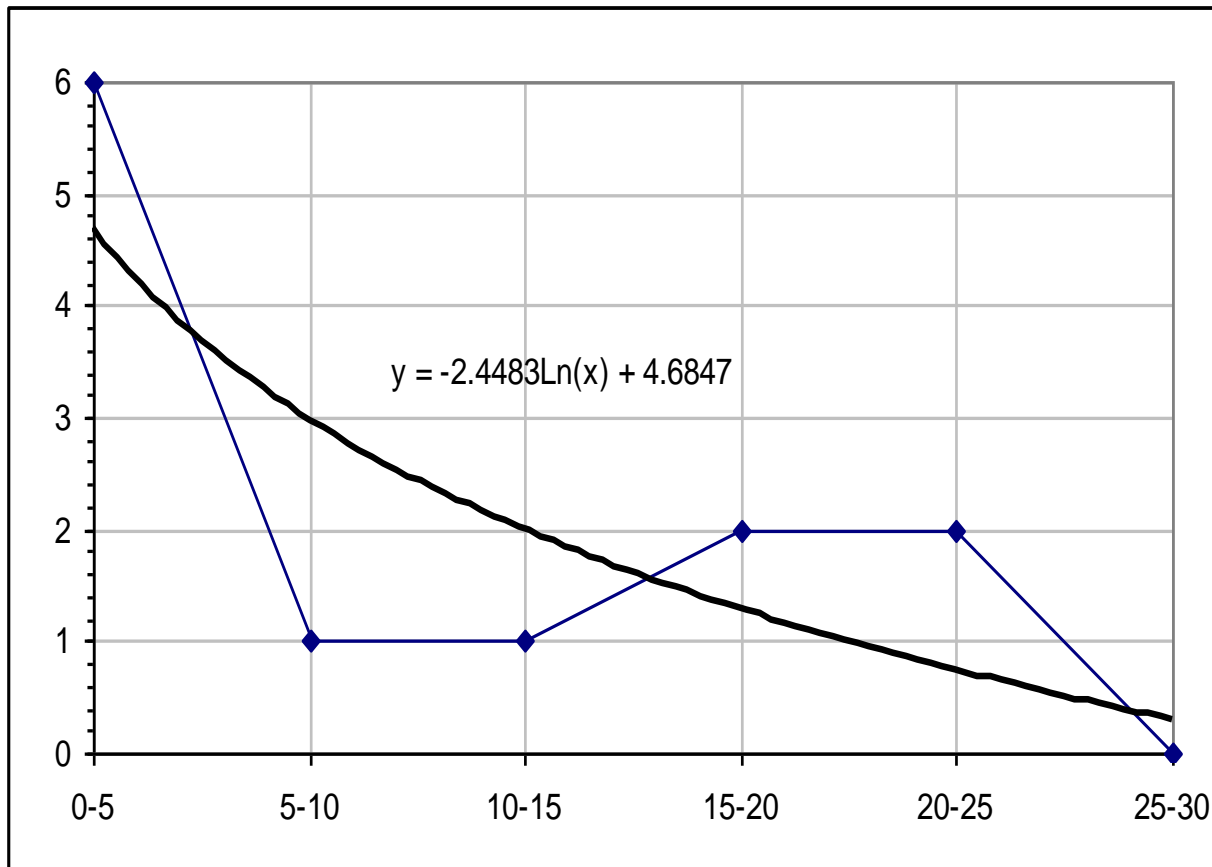
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17	1	12	*	*	*	*	*	*
0	1	7	*	*	*	*	*	*
2	1	10	*	*	*	*	*	*
1.4	2 (1)	5.5	53.8	235		1	1	
	(1)	5.5	70.7	265	1		1	
25	1	10	*	*	*	*	*	*
4	1	10	56	345	1		1	
10	1	6	42	50	1			1

NB: * These were not determined due to height difficulties, thus could not be reached.

HISTOGRAM REPRESENTATION

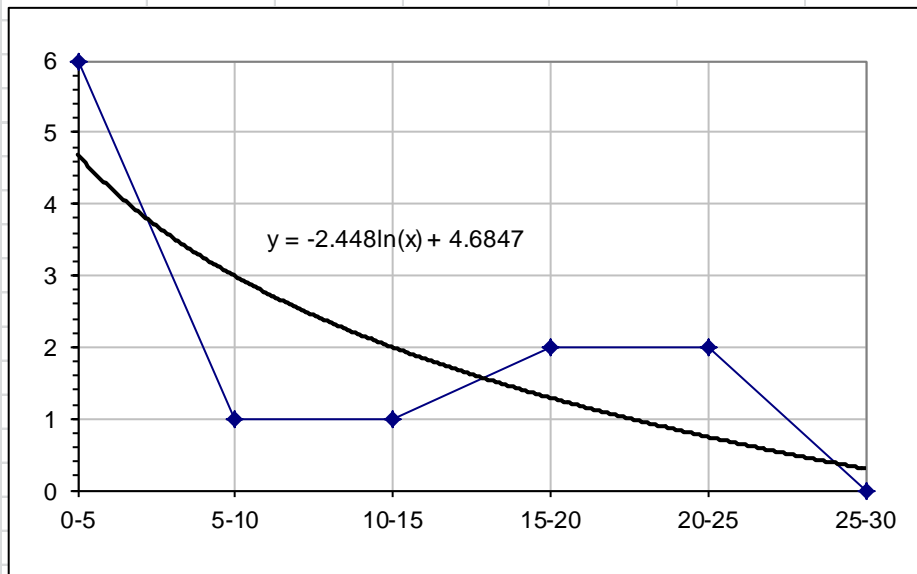


POPULATION ESTIMATION



POPULATION ESTIMATION

	0-5	5-10	10-15	15-20	20-25	25-30														
	1	4	12	3	2															
	6			5	10															
	7																			
	8																			
	9																			
	11																			
count	6	1	1	2	2	0	Total	Corrected total												
							12	25.5												



	5-10	10-15	15-20	20-25	25-30					
a	4.7	3	2	1.4	0.7					
b	1	1	1	1	1					
c	3	2	1.4	0.7	0.3	area under	area above	above/under		
$ba+b(c-a)/2$	3.85	2.5	1.7	1.05	0.5	9.6	20.4	2.125		

SUMMARY

- Since "N" < 30, Confidence intervals cannot be assumed that the deviation of the sample means is normally distributed. So, t-distribution is used to calculate the intervals
- Small size (n) – t-distribution becomes wider (longer tails)
- 12 Iguanas recorded on 3 transects
- 8 – within the 10meters perpendicular distance from the transect line
- Iguanas were sighted out to 25m from the transect line, with the mean of "1.1 and Standard error of 0.09.
- Standard deviation of 0.30
- Degree of freedom (df) is 11
- Alpha value is 0.025
- So t-value is 2.201

CONCLUSION

Theoretical Significance

- More specimens = need more work to be done on the island
- Methodological Significance - Adequate methods

Value of Experiment

- Good for Conservation Biology
- Confirmed sighting of a rare Iguana (now on 3 islands)
- The island of Macuata should be designated a wildlife reserve
- It helped us gain a good perspective of an endangered population

Future Improvements

1. More equipment
2. Train more participants
3. Train people for specific tasks
4. Find more samples---> more trips to Macuata Island to improve methods, gain accuracy and validity

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