#### Article

# Local Ecological Knowledge on Mangroves in Mayotte Island (Indian Ocean) and Influencing Factors

### Esméralda Longépée 1,2,\*, Anliati Ahmed Abdallah 2,3, Matthieu Jeanson 1,2 and Claire Golléty 2,4

- <sup>1</sup> ESPACE-DEV, Univ Montpellier, IRD, Univ Antilles, Univ Guyane, Univ Réunion, Montpellier, France; matthieu.jeanson@univ-mayotte.fr (M.J.)
- <sup>2</sup> Centre Universitaire de Mayotte (CUFR), 97660 Dembéni, Mayotte, France; anliati.ahmed\_abdallah@etu.sorbonne-universite.fr (A.A.A.); claire.gollety@univ-mayotte.fr (C.G.)
- <sup>3</sup> PRODIG, CNRS, Université Paris 1 Panthéon Sorbonne, AgroParisTech, Paris Sorbonne Université, IRD, Université de Paris, Paris, France
- <sup>4</sup> MARBEC, Univ Montpellier, CNRS, IFREMER, IRD, Montpellier, France
- \* Correspondence: esmeralda.longepee@univ-mayotte.fr (E.L.)

Received: date; Accepted: date; Published: date

#### Supplementary Figure S1. Extract of the interview guide that dealt with LEK

### LEK on Ecosystem Services

We tried different questions to help people mentioning ecosystem services:

- Do you think that the mangrove is useful for something ? If yes, in what is it useful?
- If there is no mangrove, what would be the changes?
- What are the advantages and disadvantages of the mangrove? The positive and negative aspects?

## LEK on Ecology and Geomorphology

- Do you think that the mangrove is marine, terrestrial or both?
- The interviewer asked questions on the following subthemes:
  - o animals (name in local languages or in French), stock evolution (amount and quality)
  - mangrove trees: number of species, name in local languages or in French, localisation of mangrove trees depending on the sea or the land, particularity of mangrove trees compared to terrestrial trees, surface evolution
- back mangrove trees: name in local languages or in French
- origin of knowledge

Supplementary '	able S1. Characteristics of analysis variables on LEK of the survey que	stionnaire.

Variable <sup>1</sup>	Type of Answers	Number of Respondents	Analysis of Differences
Type of ecosystem (sea, land, intertidal) <sup>2</sup>	categorical variable, one answer	437	Chi square
Differences between mangrove trees and other trees <sup>2</sup>	categorical variable, one answer	437	Chi square
Criteria used to recognize mangrove trees	categorical variable, several answers	341 (if yes) <sup>3</sup>	-
Number of mangrove tree species <sup>2</sup>	categorical variable, one answer	437	Chi square
Name of mangrove tree species	open answer	251 (if a number was given) <sup>3</sup>	-
Knows whether mangroves provides ecosystem services <sup>2</sup>	categorical variable, one answer	437	Chi square
Type of service	categorical variable, several answers	390 (if yes) <sup>3</sup>	-
Mangrove state today <sup>2</sup>	categorical variable, one answer	437	Chi square
Mangrove state 10–20 years ago	categorical variable, one answer	257 (if lived in the village for at least 10 years) <sup>3</sup>	Chi square
Reason explaining mangrove state today	categorical variable, several answers	437	-
Reason explaining mangrove state 10–20 years ago	categorical variable, several answers	257 (if lived in the village for at least 10 years) <sup>3</sup>	-
Surface area evolution of mangrove	categorical variable, one answer	257 (if lived in the village for at least 10 years) <sup>3</sup>	Chi square
Deeren (en in energy en la energy	open answer	30 (if increase) <sup>3</sup>	-
Reason for increase or decrease		146 (if decrease) <sup>3</sup>	-
Origin of knowledge on mangrove	categorical variable, several answers	437	-

<sup>1</sup> Follow the order in the questionnaire. <sup>2</sup> Variables used for the multiple component analysis. <sup>3</sup> Question asked depending on previous answer.

#### Supplementary Figure S2. Additional description of the choice of influencing factors on LEK

The influencing factors on LEK were chosen based on previous studies on mangroves showing their influence on answers, but also on other considerations because of the scarcity of mangrove studies using this type of analysis. Most studies on LEK on mangroves analyzed the influence of the various selected mangroves or villages on answers, but only few of them applied a test of independence [18,21,22]. The few studies examining the influence of factors on LEK answers took into consideration age, education, occupation, duration of living period, distance to the mangrove, visiting the mangrove, and having harvesting practices [18,19,23,33]. We selected these variables for our studies except the one regarding occupation.

In Mayotte, similar to what had been observed in the field, harvesting practices were few compared to recreational activities. Surveyed people were only questioned on legal harvesting practices: salt production (mainly in Bandrélé), medicinal use and fishing activities for consumption or bait. Because very few of them had at least one of these practices when questioned or in the past, we produced a new variable combining the answer for these four questions. In this variable, people having at least one of these four harvesting practices during the survey or in the past were considered as harvesters. We also selected a variable informing whether people went inside the mangrove: they could be harvesters, people with recreational activities, or crossing the mangrove to go to their field. Among the diversity of recreational activities identified, we selected one of them, nature walks. Indeed, we find similar significant influences than for variables such as walks, canoe practice, friendly moments, and rest. Other recreational variables—collecting shellfish, love date—were not practiced enough to perform the Chi square test. The influence of the attachment to the mangrove on LEK was also tested based on previous findings [83,84].

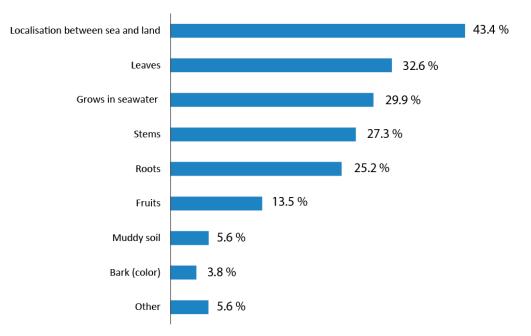
Variables	Answers	%
Cam lan 1	Woman	52.4%
Gender <sup>1</sup>	Man	47.6%
	15–29	44.6%
Age class <sup>1</sup>	30–49	37.5%
-	over 50	17.8%
	Employed <sup>2</sup>	27.2%
	Homemaker	20.6%
Main activity 1	Pupil or student	16.5%
Main activity <sup>1</sup>	Unemployed <sup>2</sup>	17.4%
	No occupation	16.0%
	Retired <sup>2</sup>	2.3%
	No education	24.7%
Education level	Primary school	13.7
Education level	Secondary school	44.9%
	University	16.7%
Resident time	Less than 10 years	16.1%
Resident time	More than 10 years	83.9%
	Surveyed villages	43.7%
	Another village in Mayotte	15.1%
Childhood location	Comoros	30.7%
	France outside Mayotte	6.6%
	Other countries	3.9%
Crosses in a stille so a discout to a more spore	Yes	58.8%
Grew up in a village adjacent to a mangrove	No	41.2%
At least on a homeostic a nearting (to does on in the neart)	Yes	25.2%
At least one harvesting practice (today or in the past)	No	74.8%
	Yes, today	27.2%
Nature walks	Yes, in the past	25.6%
	No, never	47.2%
	Yes, today	30.2%
Penetrates in mangrove	Yes, in the past	44.6%
~	No, never	25.2%
	Yes, very attached	51.0%
	Yes, attached	24.3%
Attachment	No, not really attached	7.3%
	No, not attached	13.0%
	No opinion	4.3%

Supplementary Table S2. Some characteristics highlighting the profiles of surveyed people.

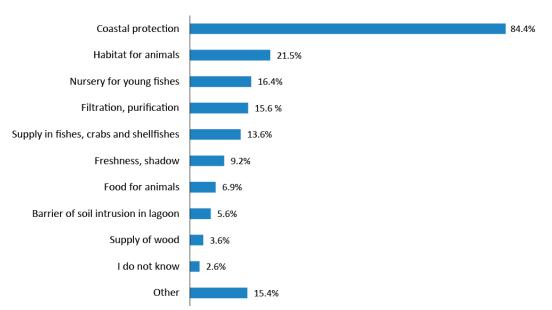
<sup>1</sup> The three variables used to establish the quota sample. <sup>2</sup> Regarding the main activity, like investigators of the National Census, we wrote down what surveyed people declared. They could declare to be employed, unemployed or retired without being officially registered as such in regards to the French administration. Unemployed people proved difficult to meet. These national categories of activities used by the French office of census are not well suited to Mayotte. We have reason to believe that the predominance of the unemployed category is an important bias induced by investigators helping people to fill in the National Census forms and to answer this study. Future surveys in Mayotte using the quota sample technique, should instead use the more reliable level of education.

Variables	Answers	%
	Marine	29.%
Type of ecosystem	Terrestrial	11.2%
	Between sea and land	59.5%
Differences between menerous trees and other	Yes	78.0%
Differences between mangrove trees and other trees	No	18.8%
	I do not know	3.2%
	1–3	35.9%
	4–6	10.5%
Number of mangrove tree species	7–9	2.7%
	More than 10	8.2%
	I do not know	42.6%
	Yes	89.2%
Knows whether mangroves give services or	No	2.7%
benefits	I do not know	8.0%

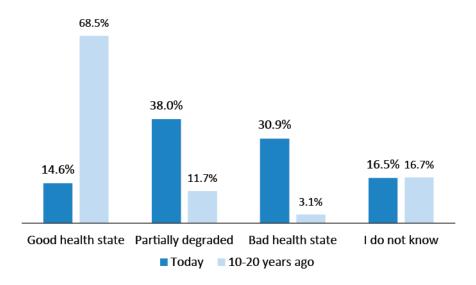
**Supplementary Table S3.** LEK on type of ecosystem, mangroves trees and knowledge of ecosystem services (n = 437).



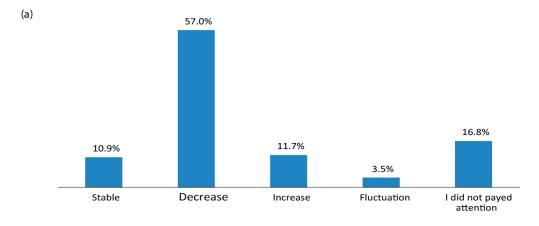
**Supplementary Figure S3.** Criteria used to differentiate between mangrove trees and other trees by surveyed people (*n* = 341).

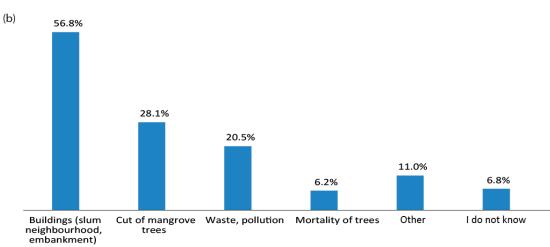


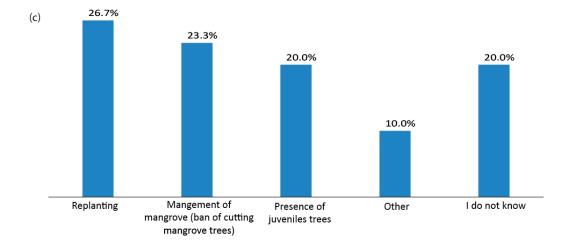
**Supplementary Figure S4.** Mangrove ecological services and benefits known by surveyed people (n = 390, on average,  $1.9 \pm 1.3$  answer).



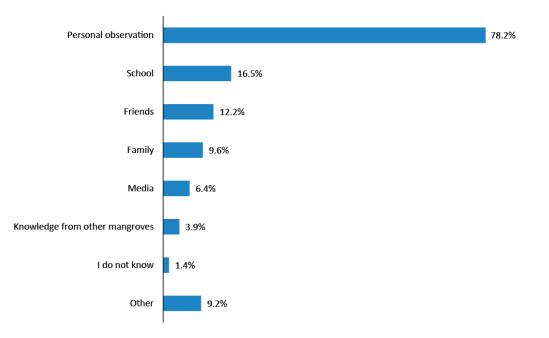
**Supplementary Figure S5.** Assessment of mangrove health today (n = 437) and 10 to 20 years ago (n = 257) by surveyed people.







**Supplementary Figure S6.** (a) Assessment of surface evolution of the mangrove for 10 to 20 years by surveyed people (n = 257), (b) Reported reasons for mangrove decrease (n = 146), (c) Reported reasons for mangrove increase (n = 30).



**Supplementary Figure S7.** Sources of LEK of surveyed people (n = 437, on average, 1.4 ± 0.7 answer).

**Publisher's Note:** MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



© 2020 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (http://creativecommons.org/licenses/by/4.0/).