

Appendix 2. Section 1: Lessons learned from LEK questions from pilot survey; Section 2: Pilot survey; Section 3: Questions about local ecological knowledge (LEK) in the household survey; Section 4: Explanation of how total LEK score was calculated; Section 5: Social network analysis section from the household survey.

Section 1

Our pilot survey can be found, starting on the following page. The local ecological knowledge questions that were tested can be found in section IV. The questions were designed to ask about aspects of knowledge and practice. Below, we describe what we learned from three of these marine related pilot questions and the changes that were made for the final survey.

1. *Do you plan your fishing activities according to:*

Weather?

Moon phase?

Flowering plants?

Other:

In this question, almost every fisher mentioned at least one method, and it was thus difficult to determine a method to assess this question. We created a new question to assess practice in which we asked respondents whether or not they teach fish names to younger generations and why they do or do not partake in this practice.

2. *How many types of parrot fish can you name?*

In this question, we presented respondents with photos of different species of parrotfish, including some photos of the same species but in different phases. We found that most people only had 2-3 names for parrotfish as a species complex. We revised this question to include species from several different families that had documented names in some dialects.

3. *Have you noticed changes in the timing of fish reproduction? [probe: migration, egg production, spawning]*

We learned that many respondents had a hard time understanding what we were even asking about. We learned that it is somewhat common knowledge that some fish aggregate, but most of our respondents were unaware of the biological processes occurring during aggregations. From this experience, we made many changes to the spawning questions, including adding a description of fish aggregations. After we explained aggregations, we asked if the respondent knew of this behavior. If they did not, we did not ask further questions. If they did, we asked about the three species complexes and then an open-ended question in which we asked if they knew the timing of any other species or had anything else about spawning that they wished to share. The majority of the respondents knew about spawning times for groupers (likely due to a recent national campaign) and were clear in that they did not know about times for other species.

Investigating the complexities of coral reef social-ecological systems

Household Surveys

Interviewer:	
Interviewee:	
Name of house:	
Village name:	
Date:	

I. LIVELIHOOD OPTIONS

Check all sources of income from which your household derives salary. [Must ask all]. Next, give interviewee 20 beans and ask them to distribute them among income sources to reflect each source's contribution (score) to total income. All sources that are checked must also have a score.

Income source	Score
<input type="checkbox"/> Fishing (<i>saltwater</i> finfish, shellfish)	
<input type="checkbox"/> Fishing (<i>freshwater</i> finfish, shellfish)	
<input type="checkbox"/> Farming	
<input type="checkbox"/> Copra	
<input type="checkbox"/> Sea cucumbers	
<input type="checkbox"/> Handicrafts (weaving, baskets, mats, masi, sasa, fans, etc.)	
<input type="checkbox"/> Wages/salary from employment	
<input type="checkbox"/> Remittances	
<input type="checkbox"/> Land lease	
<input type="checkbox"/> House rent	
<input type="checkbox"/> Own business	
<input type="checkbox"/> Other (specify): _____	
<input type="checkbox"/> Other (specify): _____	
<input type="checkbox"/> Other (specify): _____	
TOTAL SCORE (should add to 20)	

II. AGRICULTURE

Check all crops that are grown by members of this household. For every checked crop, ask how many varieties of the crop are grown. Also indicate if the crop is used for subsistence, sale, or to give away (can check more than one). If the crop is sold, indicate the location of sale.

crop	Number of varieties (list)	subsistence	sale	takitaki	If resource sold, market location
<input type="checkbox"/> Eggplant					
<input type="checkbox"/> Banana					
<input type="checkbox"/> Bele					
<input type="checkbox"/> Sugarcane					
<input type="checkbox"/> Cassava					
<input type="checkbox"/> Chillies					
<input type="checkbox"/> Coconut					
<input type="checkbox"/> Copra					
<input type="checkbox"/> Taro					
<input type="checkbox"/> Citrus					
<input type="checkbox"/> Ota					
<input type="checkbox"/> Pawpaw					
<input type="checkbox"/> Pumpkin					
<input type="checkbox"/> Rourou					
<input type="checkbox"/> Plantain					
<input type="checkbox"/> Kava					
<input type="checkbox"/> Sweet Potato					
<input type="checkbox"/> Yam					
<input type="checkbox"/> Breadfruit					
<input type="checkbox"/> Ivi					
<input type="checkbox"/> Vutu					
<input type="checkbox"/> Other:					
<input type="checkbox"/> Other:					
<input type="checkbox"/> Other:					

2a. Do you use chemical: (check if yes) fertilizers? pesticides? herbicides?

III. FISHING

Check all fishing activities performed by members of this household. For every checked method, ask the frequency of the activity and, as done previously, indicate what the harvest is used for.

Fishing method	frequency	subsistence	sale	takitaki	If resource sold, market location
<input type="checkbox"/> Hand line	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				
<input type="checkbox"/> Spear fishing (snorkeling)	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				
<input type="checkbox"/> Gill net	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				
<input type="checkbox"/> Cast net	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				
<input type="checkbox"/> Fish basket	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				
<input type="checkbox"/> Other:	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				
<input type="checkbox"/> Other:	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				
<input type="checkbox"/> Other:	<input type="checkbox"/> More than once a week <input type="checkbox"/> Once every 1-2 weeks <input type="checkbox"/> About once a month <input type="checkbox"/> Less than once a month				

3a. How often do you fish to contribute to an event (church, feast, relatives, etc):

Once a week Once a month Less than once a month Never Other:

3b. Do you plan your fishing activities according to:

Weather? Moon phase? Flowering plants? Other:

IV. LOCAL KNOWLEDGE

How many varieties of taro can you name?	1. 2. 3. 4.	5. 6. 7. 8.	9. 10. 11. 12.
How many uses of [<i>important plant</i>] can you think of?	1. 2. 3. 4.	5. 6. 7. 8.	9. 10. 11. 12.
Can you name the types of trees that grow in or around your taro?	1. 2. 3. 4.	5. 6. 7. 8.	9. 10. 11. 12.
How many types of parrot fish can you name?	1. 2. 3. 4.	5. 6. 7. 8.	9. 10. 11. 12.

4b. What do you do to your plantation after harvest:

- Let it lay fallow. If so, how long? _____
 Till remaining plant matter into soil
 Plant a cover crop
 Burn
 Other: _____

4c. Have you planted any new crops or varieties in the last 10 years that are more resistant to salt, cyclones, or drought? Yes No

If yes, which ones? _____

4d. Have you noticed changes in the timing of plant maturation? [probe: budding, flowering, fruiting]

- Yes. Explain: _____
 No.

4e. Have you noticed changes in the timing of fish reproduction? [probe: migration, egg production, spawning]

- Yes. Explain: _____
 No.

V. MARKET ACCESSIBILITY

5a. How often do you buy things from the market?

- More than once
 a week Once a week More than once a month Other:

5b. How often do you buy things from the village canteen?

- Once a week Once a month Less than once a month Other:

5c. How do you travel to the nearest market? (check all that apply)

- Bus Carrier Boat Other:

5d. How long does it take to reach the nearest market?

- Less than 1 hour 1-2 hours 2-4 hours More than 4 hours

5e. How much does it cost to travel to the nearest market? (one way)

Transportation method:	Cost:
Transportation method:	Cost:
Transportation method:	Cost:

VI. MATERIAL ASSETS

Check all that apply for the household.

House construction:	<input type="checkbox"/> Tin <input type="checkbox"/> Wood <input type="checkbox"/> Brick <input type="checkbox"/> Traditional materials <input type="checkbox"/> Other: _____
Toilet facility:	<input type="checkbox"/> Pit <input type="checkbox"/> Water seal <input type="checkbox"/> Flush <input type="checkbox"/> Other: _____
Appliances:	<input type="checkbox"/> Radio <input type="checkbox"/> Television <input type="checkbox"/> DVD player <input type="checkbox"/> Mobile phone <input type="checkbox"/> Laptop/tablet <input type="checkbox"/> Other: _____
Lighting:	<input type="checkbox"/> Kerosene <input type="checkbox"/> Lamp (battery/rechargeable) <input type="checkbox"/> Electrical lights <input type="checkbox"/> Candles <input type="checkbox"/> Other: _____
Cooking energy:	<input type="checkbox"/> firewood <input type="checkbox"/> kerosene <input type="checkbox"/> gas <input type="checkbox"/> Other: _____
Own transportation:	<input type="checkbox"/> bilibili <input type="checkbox"/> non-motorized boat <input type="checkbox"/> boat with outboard engine <input type="checkbox"/> vehicle <input type="checkbox"/> Other: _____

VINAKA VAKALEVU!!! ☺☺☺

Section 3

Below are questions about local ecological knowledge (LEK) from the household survey. Note, this is an English translation of these questions. The actual survey was translated into the Fijian language and conducted in Fijian by native speakers.

Traditional Ecological Knowledge

For these questions, we do not aim to document your specific detailed knowledge, we are just trying to get a sense of what types of knowledge exist in this village. As with all of our questions, there are no right or wrong answers. If you do not know something, do not be ashamed to say "I don't know;" we are not here to judge you.

1. Do you usually go fishing? YES NO

2. We have several photos of fish found in Fiji. [Give respondent first set of cards] How many can you name? Please provide whatever name you know of- we are aware that names may be different throughout the country, so please give a local name if that's what you know.

[Write down names with the number that corresponds with the number on the fish card]

Respondents were presented photos of the following species:

Family	Genus and species
Acanthuridae	Acanthurus xanthopterus
Belonidae	Tylosurus crocodilus
Carangidae	Carangoides ferdau
Chaetodontidae	Chaetodon lunula
Gerreidae	Gerres erythrorus
Gerreidae	Gerres oblongus
Haemulidae	Plectorhinchus chaetodonoides
Labridae	Cheilinus fasciatus
Labridae	Cheilinus undulatus (adult)
Labridae	Cheilinus undulatus (juvenile)
Lethrinidae	Lethrinus nebulosus
Lethrinidae	Lethrinus olivaceus
Lethrinidae	Monotaxis grandoculis
Lutjanidae	Lutjanus argentimaculatus
Lutjanidae	Lutjanus bohar
Scaridae	Bolbometopon muricatum
Scaridae	Chlorurus bleekeri
Serranidae	Cephalopholis argus
Serranidae	Epinephelus merra
Serranidae	Plectropomus leopardus

3. Have you taught these names to anyone in a younger generation?
YES NO

Why or why not?

You may know that fish come together, in groups, to reproduce.

4. Do you know the *time of year* when this occurs for any fish species?

[If yes] What about for: [note response and circle number that corresponds to level of knowledge]

Groupers? _____
0 1 2

Parrotfish? _____
0 1 2

Emperorfish? _____
0 1 2

Any other species? _____
0 1 2

5. As you probably know, different fish eat different things. Do you know what the following fish eat?

Groupers? _____
0 1 2

Parrotfish? _____
0 1 2

Emperorfish? _____
0 1 2

Section 4

Scoring:

Fish identification [Question 2]:

- 1 point for every answer that corresponded to the correct species name
- 0.5 points for every answer that corresponded to the correct general/family name
- 0 points given to answers that were known to apply to different species

Transmission [Question 3]:

- 1 point for YES
- 0 points for NO

Timing of fish spawning [Question 4]:

- Because timing of spawning may vary spatially and temporally:
- 1 point for any response
- 0 points for “do not know”

Fish diets [Question 5]:

- 0 points if respondent did not know any diet items
- 1 point for every correct diet item mentioned
- 0.5 points subtracted for every incorrect item mentioned (only subtracted from scores greater than zero).

Total LEK score:

$$0.2 * \text{Transmission} + 0.4 * \text{Fish identification} + 0.4 * (\text{Timing of fish spawning} + \text{Fish diets})$$

