

# Appendices



# Appendix A

## Information on the sampling sites

Table A1: **Detailed information of station codes.** Location of station codes, first and last sampling date and the total number of samples taken there.

Strata	Municipality	Station code	Location	Date of first sample	Date of last sample	Total number of samples
Atauro island	Dili	1	Adara / Atekru	29-10-2016	Ongoing	1231
		2	Beloi / Usu Bemasu	05-11-2016	Ongoing	1114
		3	Biqueli / Pala	24-11-2016	Ongoing	647
		6	Uaroana / Akrema	10-08-2017	Ongoing	8165
		11	Raiketa / Vila	07-06-2018	Ongoing	264
		13	Berao / Maquili	07-06-2018	29-11-2019	60
		15	Fatu'u / Doru / Iliana / Arlo	07-06-2018	Ongoing	1140
		18	Maquer	07-06-2018	26-12-2020	726
North coast	Baucau	4	Vemasse	07-11-2016	Ongoing	5323
	Bobonaro	10	Beacou / Sulilaran / Palaka	11-08-2017	Ongoing	3288
	Lautem	7	Com	02-07-2017	Ongoing	1198



		8	Tutu'ala	18-07-2017	31-07-2018	183
		9	Ililai	14-09-2017	11-09-2019	372
		30	Sentru / Liarafa / Sika / Rau Moko	18-05-2019	28-05-2019	3
	Liquica	26	Leopa / Do Tasi	02-05-2019	Ongoing	2184
	Manatuto	29	Comando	01-05-2019	Ongoing	1984
	Oe-Cusse	28	Oe-Cusse	03-05-2019	Ongoing	798
South coast	Ainaro	25	Bonuk / Fatumeta / Nunumera	02-05-2019	11-12-2020	298
	Covalima	22	We Hasan / We Inan	02-05-2019	Ongoing	1631
		23	Welateti	07-05-2019	Ongoing	1794
	Manufahi	20	Selihasan	08-06-2018	31-07-2019	19
		21	Betano	26-04-2019	Ongoing	1136
	Viqueque	5	Adarai	10-09-2016	11-07-2019	2073
		27	Beasu	03-05-2019	Ongoing	1839

## Appendix B

### Classification of functional groups

Table A2: Classification of the different functional groups.

Functional group	Species code	Species name (English)	Species name (Tetun)	Family
Cephalopods	41	Cuttlefish	Suntu	<i>Sepiidae</i>
	24	Octopus	Kurita	<i>Octopodidae</i>
Crustaceans	45	Crab	Kadiuk	-
Large demersal	12	Grouper	Garopa	<i>Serranidae</i>
	42	Javelin / Grunt	Talun	<i>Haemulidae</i>
	36	Moray	Samea / Tuna	<i>Muraenidae</i>
	15	Parrotfish	Niru	<i>Scaridae</i>
	10	Snapper / seaperch	Tanggalara / Kamera	<i>Lutjanidae</i>
	35	Sweetlips	Loloi	<i>Haemulidae</i>
	18	Unicornfish	Fafulu	<i>Acanthuridae</i>
Large pelagics	22	Barracuda	Alu-Alu / Taranu	<i>Sphyraenidae</i>
	44	Cobia	Badee / Gabus Laut	<i>Rachycentridae</i>
	46	Dolphinfish	Karonogo Metan	<i>Coryphaenidae</i>
	3	Jacks / Trevally / Other Scad	Sera Atan / Ikan Koku / Kombong Seluk	<i>Carangidae</i>

	20	Jobfish	Karungu / Talang-talang	<i>Lutjanidae</i>
	9	Long tom	Ikan Daun	<i>Belonidae</i>
	51	Remora	Ikan utu	<i>Echeneidae</i>
	43	Sailfish	Lanjara	<i>Istiophoridae</i>
	4	Tuna / Bonito / Other Mackerel	Tuna / Tongkol / Kasareta / Bulkumo / Sera seluk	<i>Scombridae</i>
	53	Wolf herring	Espada	<i>Chirocentridae</i>
Molluscs	50	Cockles	Sipu	<i>Cardiidae</i>
Shark and rays	34	Shark	Tubaraun	<i>Chaetodontidae</i>
	54	Stingray	Pari	-
Shrimp	38	Shrimp	Boek	-
Small demersal	47	Bannerfish	La pipi	<i>Chaetodontidae</i>
	30	Blackspot sweeper	Kadaheu	<i>Pempheridae</i>
	29	Bream	Bandeira / Kapapan	<i>Nemipteridae</i>
	39	Butterflyfish	Kalapepa	<i>Chaetodontidae</i>
	40	Cardinalfish	Ikan Serinding	<i>Apogonidae</i>
	13	Emperor	Uleu / Kapapan / Baduma	<i>Lethrinidae</i>
	31	Goatfish	Biz nga	<i>Mullidae</i>
	19	Mojarra / Silverbelly	Katarina	<i>Gerreidae</i>



	25	Moonfish	Baleu Belar Oan	<i>Menidae</i>
	26	Moontail bullseye	Kror Matan Fuan Boot	<i>Priacanthidae</i>
	28	Ponyfish	Bete-bete debe door	<i>Leiogthidae</i>
	55	Sicklefish	Kakehe	<i>Drepaneidae</i>
	8	Soldierfish	Karon	<i>Holocentridae</i>
	11	Spinefoot	Kitan	<i>Siganidae</i>
	14	Surgeonfish	Kafir	<i>Acanthuridae</i>
	33	Terapon	Bobi / Rongkado	<i>Terapontidae</i>
	16	Triggerfish	Papameta / Sungu	<i>Balistidae</i>
	52	Tripodfish	Ikan lisa	<i>Triacanthidae</i>
	21	Wrasse	Niru fatuk / Lamor	<i>Labridae</i>
Small pelagics	23	Chub	Spreo	<i>Kyphosidae</i>
	17	Flying fish	Ikan Manu	<i>Exocoetidae</i>
	5	Fusilier	Bainar	<i>Caesionidae</i>
	7	Garfish	Sardina kobi	<i>Hermiramphidae</i>
	27	Herring	Sardina kobi	<i>Elopidae</i>
	2	Mackerel scad	Kombon / Salar matan bo'ot	<i>Carangidae</i>
	48	Milkfish	Salmaun / Ikan be'e	<i>Chanidae</i>
	32	Mullet	Saltaun	<i>Mugilidae</i>



	6	Sardines / pilchards	Sardina	<i>Clupeidae</i>
	37	Sergeant	Blis	<i>Pomacentridae</i>
	1	Short-bodied mackerel	Bainar Mutin	<i>Scombridae</i>
	49	Threadfin	Kanase	<i>Polynemidae</i>
Unknown	300	Other	Seluk	-
	99	Unknown	La hatene naran	-

# Appendix C

## Data cleaning

### Dates

One trip was entered with the date “1922-11-04”. Using the trip ID number to compare it to the dates of other trips, the trip was given the date “2018-12-07”.

### Trip duration

The values of the trip duration were made absolute to remove negative values (one entry), and trips with a duration of zero hours were changed to one hour (10 entries). An upper limit of 13 hours was established, as the longest day-length of Timor-Leste is around 12 hours and 36 minutes. All entries with 14 trip hours or more were changed to the median trip duration for each stratum and boat type (125 entries; Table A7; fig. A1).

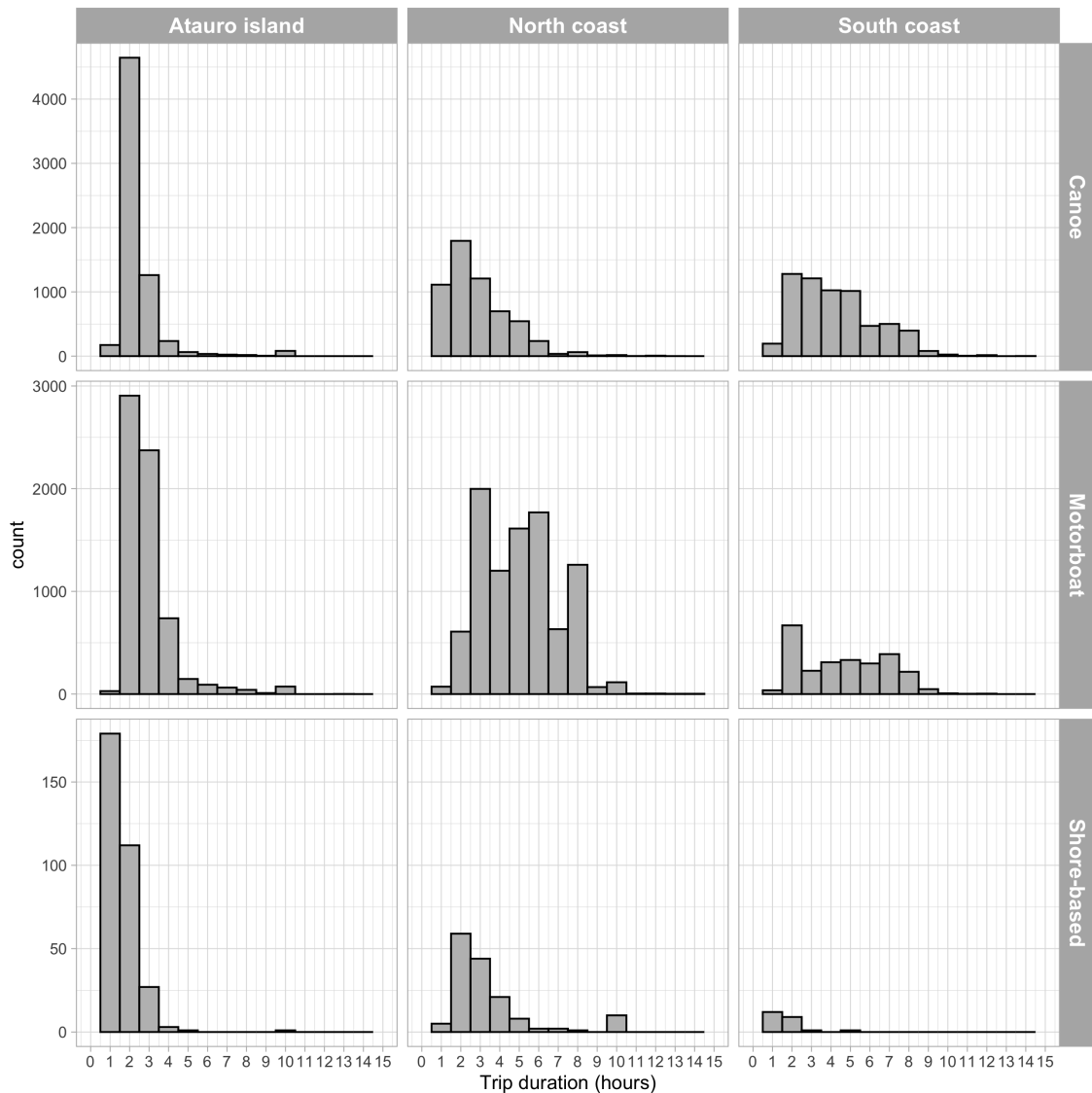


Figure A1: **Frequency plot of the trip duration (hours)** before data cleaning for canoes, motorboats, and shore-based fishery in Atauro island, north coast and south coast.



### Number of fishermen

Entries with zero fishermen recorded were changed to one fisherman (26 entries). An upper limit of 10 fishermen for canoes and 10 fishermen for motorboats was established, and all entries above this limit were changed to the median number of fishermen for each stratum and boat type (189 entries; Table A8; fig. A2).

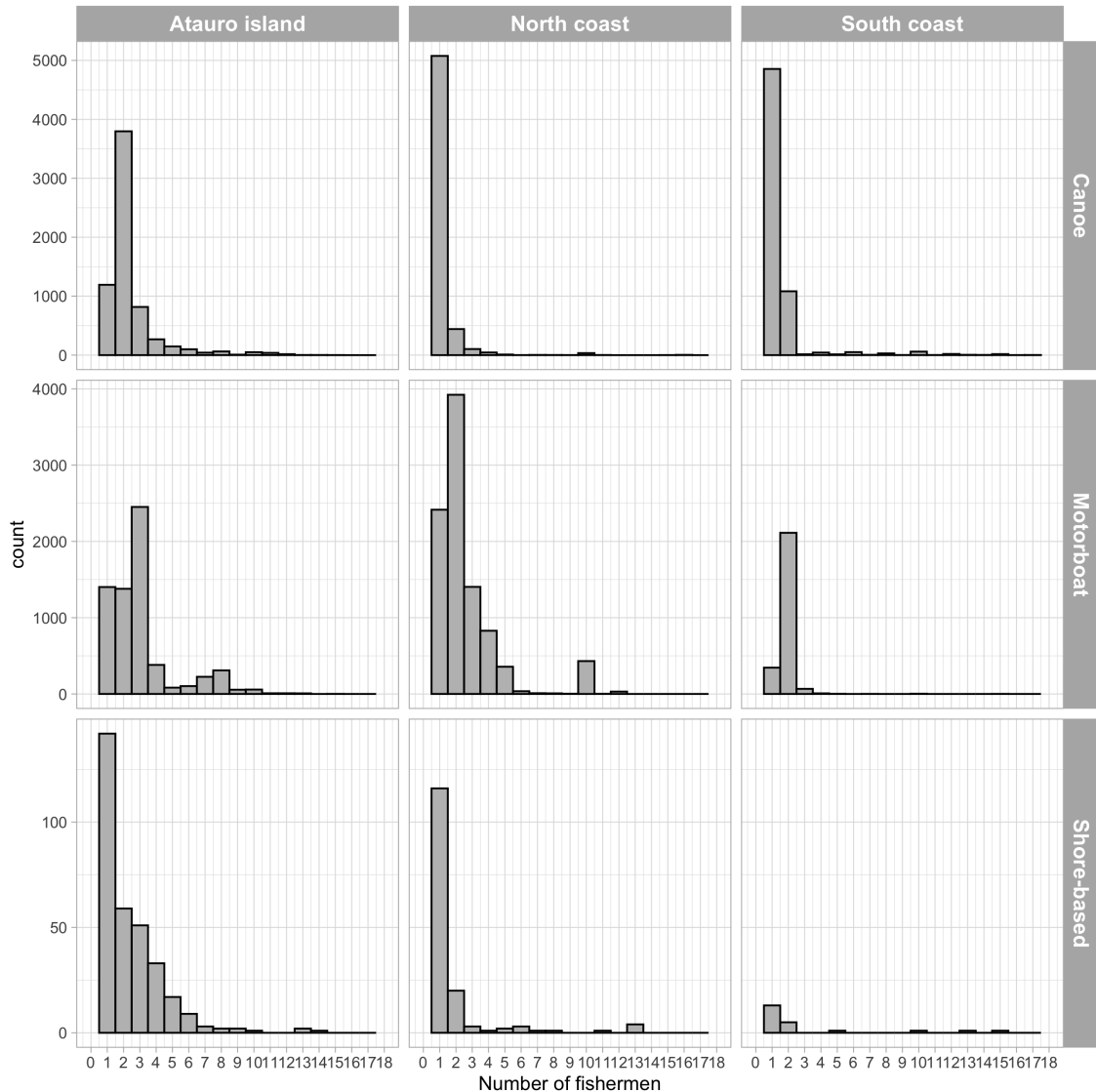


Figure A2: **Frequency plot of the number of fishermen** before data cleaning for canoes, motorboats and shore-based fishery on Atauro island, north coast, and south coast.

### Abundance (number) of catch

Multiple changes were made concerning the number of fish caught and the weight of the catch. All entries were made absolute to remove negative values (two entries), and an upper limit was set of 10,000 fish caught in one trip. Trips where more fish were caught (9 entries), the abundance and the weight were changed to NA's.

### Weight of catch

There were 1803 entries where no information on the weight of the catch was given. These were calculated using the following formula from Bohnsack and Harper (1988):

$$W = a * L^b * N \quad (1)$$

where  $W$  equals weight of catch (in gram),  $L$  equals fish size (in cm),  $N$  equals number of fish caught (of that species and length) and  $a$  and  $b$  equal constants per fish species. The constants  $a$  and  $b$  of most species were collected from Froese and Pauly (2021). For the shrimp, the  $a$  and  $b$  constants were collected from Gautam et al. (2014).

For some species groups (crab, cockles (*Cardiidae spp.*), and cuttlefish (*Sepiidae spp.*)) the  $a$  and  $b$  constants could not be found in the literature. For these species a length-weight relationship was plotted using the length and weight values that were present in the catch data, which was then used to derive the mean weight of the species for several length groups (fig. A3; fig. A4; fig. ??)

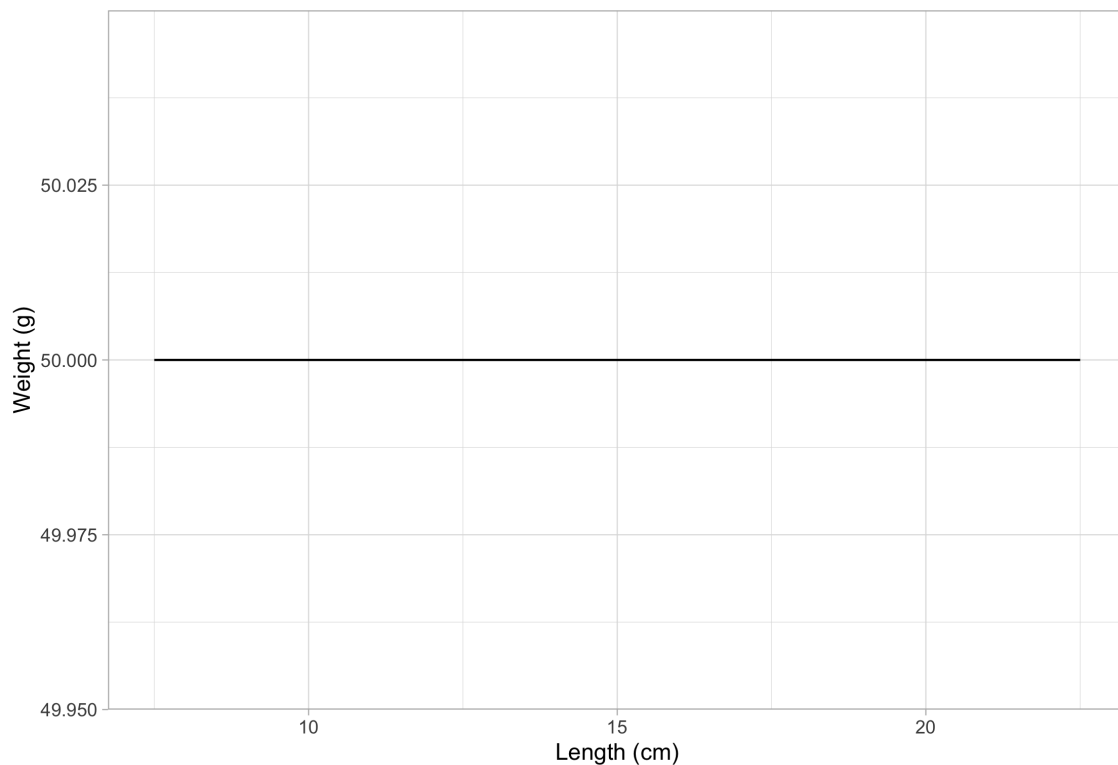


Figure A3: **Length-weight relationships of crab** using the length and weight values given in the catch data.

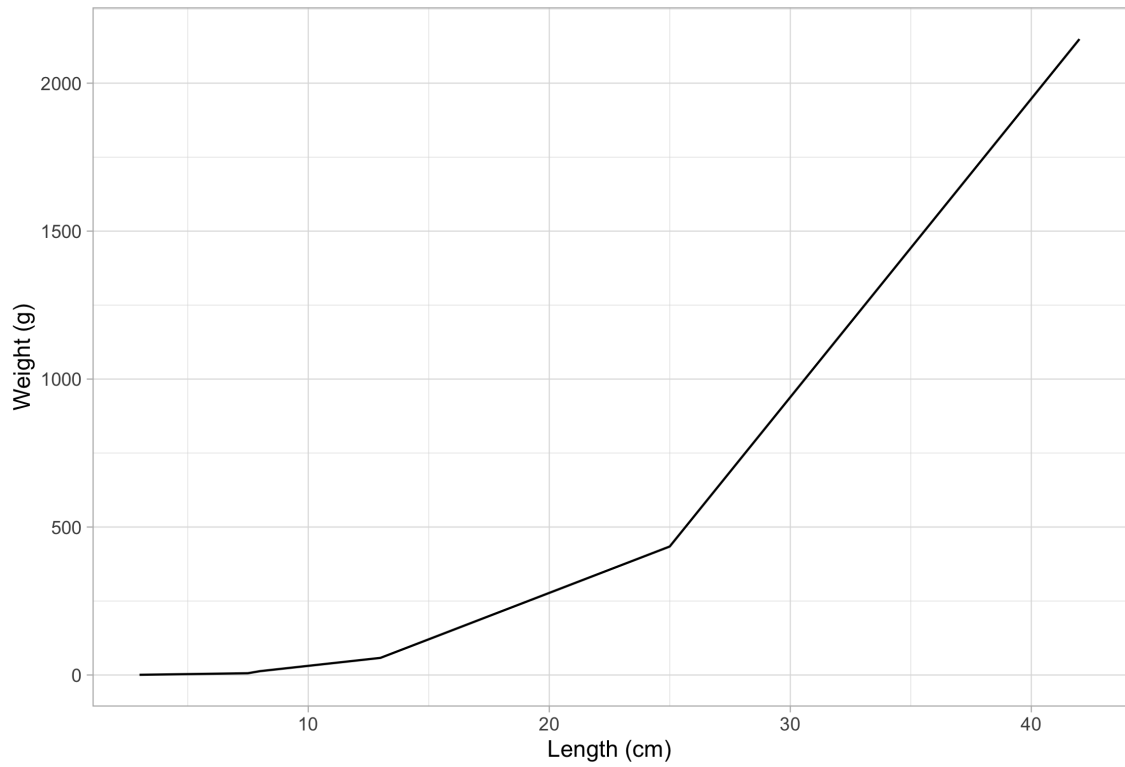


Figure A4: **Length-weight relationships of cockles (*Cardiidae spp.*)** using the length and weight values given in the catch data.

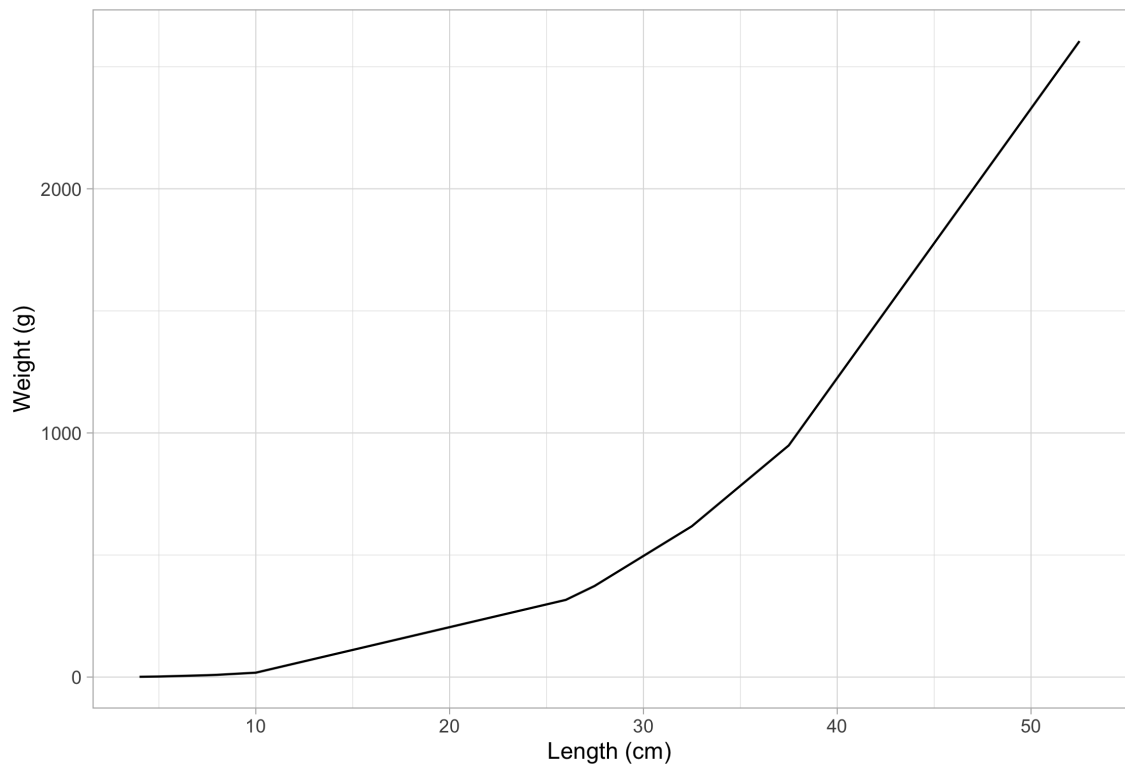


Figure A5: **Length-weight relationships of cuttlefish (*Sepiidae spp.*)** using the length and weight values given in the catch data.

### Market value

Market value was given an upper limit of 2000 USD. Everything above this limit was changed to “NA” (3 entries).

### Merging datasets

When merging the dataset which had the effort information for each trip with the dataset that included the catch information, a total of 121 entries were lost. This means that 121 trips did not have any information documented on the landings of those trips.

### Subsetting data for modelling

For the modelling the gear types cast net, manual collection, beach seine, seine net and trap were removed, along with the station codes 5, 9, 13, 20 and 30 and the shore-based fishing

# Appendix D

Frequency plots of the dependent variables untransformed and log-transformed

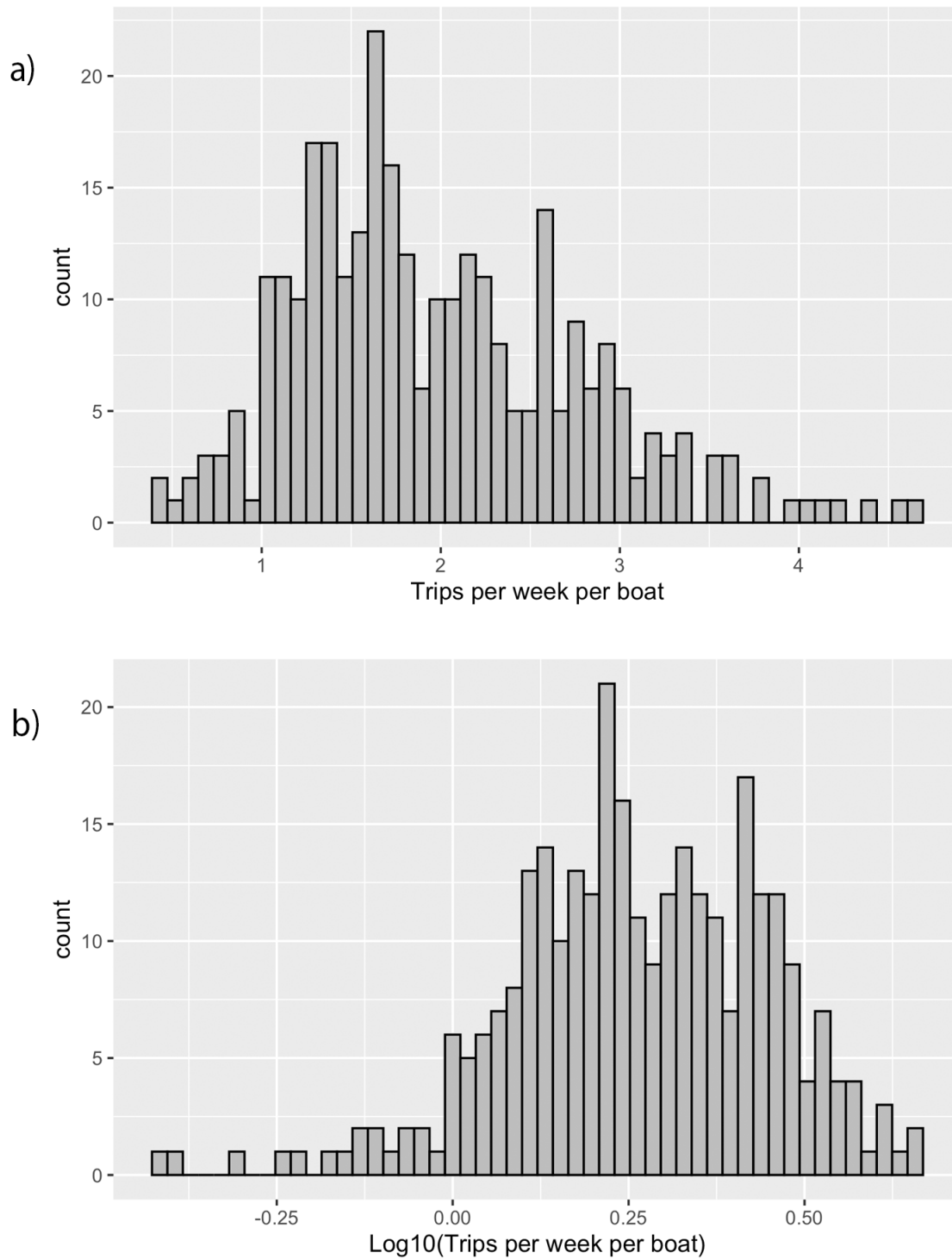


Figure A6: **Frequency plots of the fishing trips taken per week per boat (a) before log-transformation and (b) after log-transformation.**

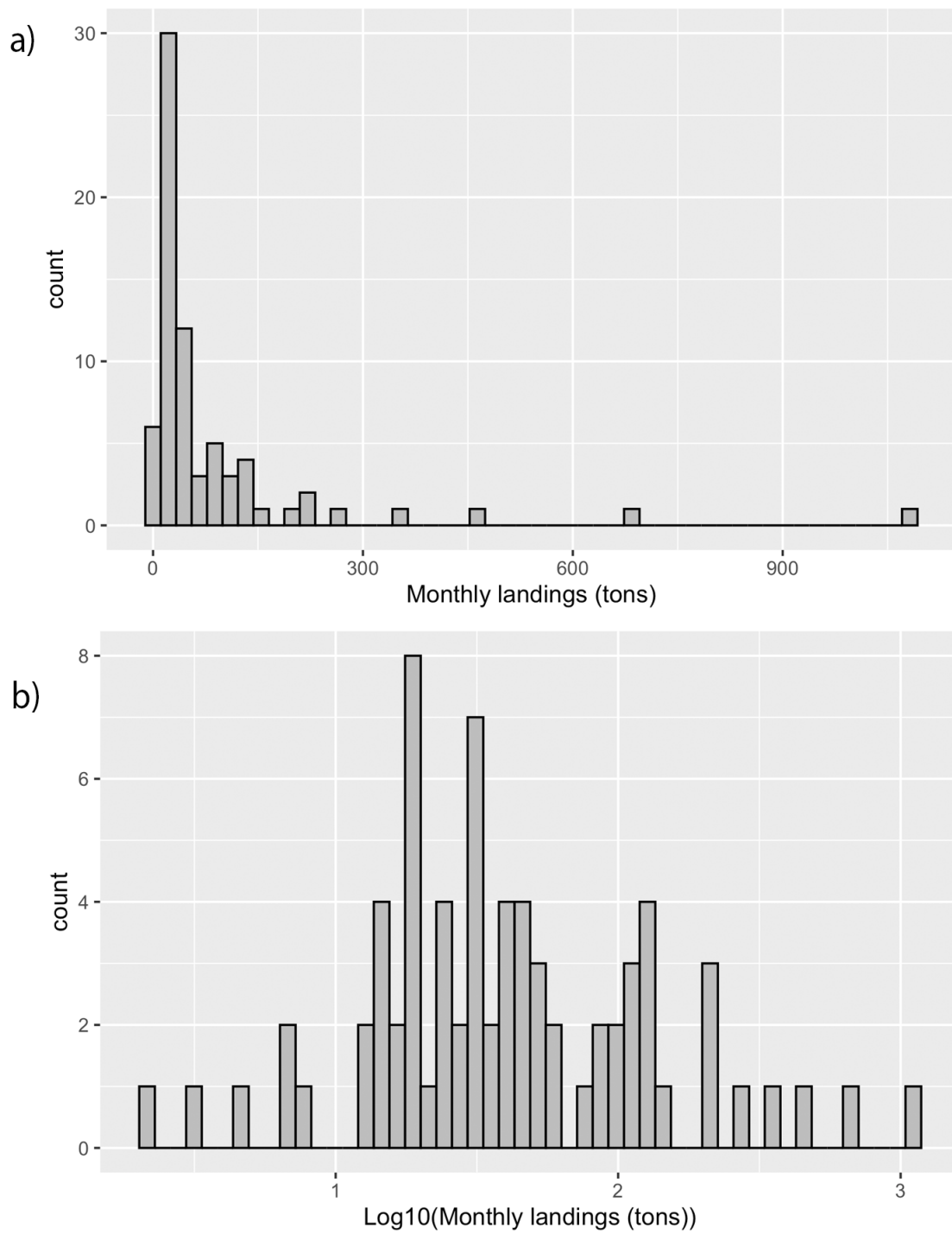


Figure A7: **Frequency plots of the estimated monthly landings (tons)** (a) before log-transformation and (b) after log-transformation.

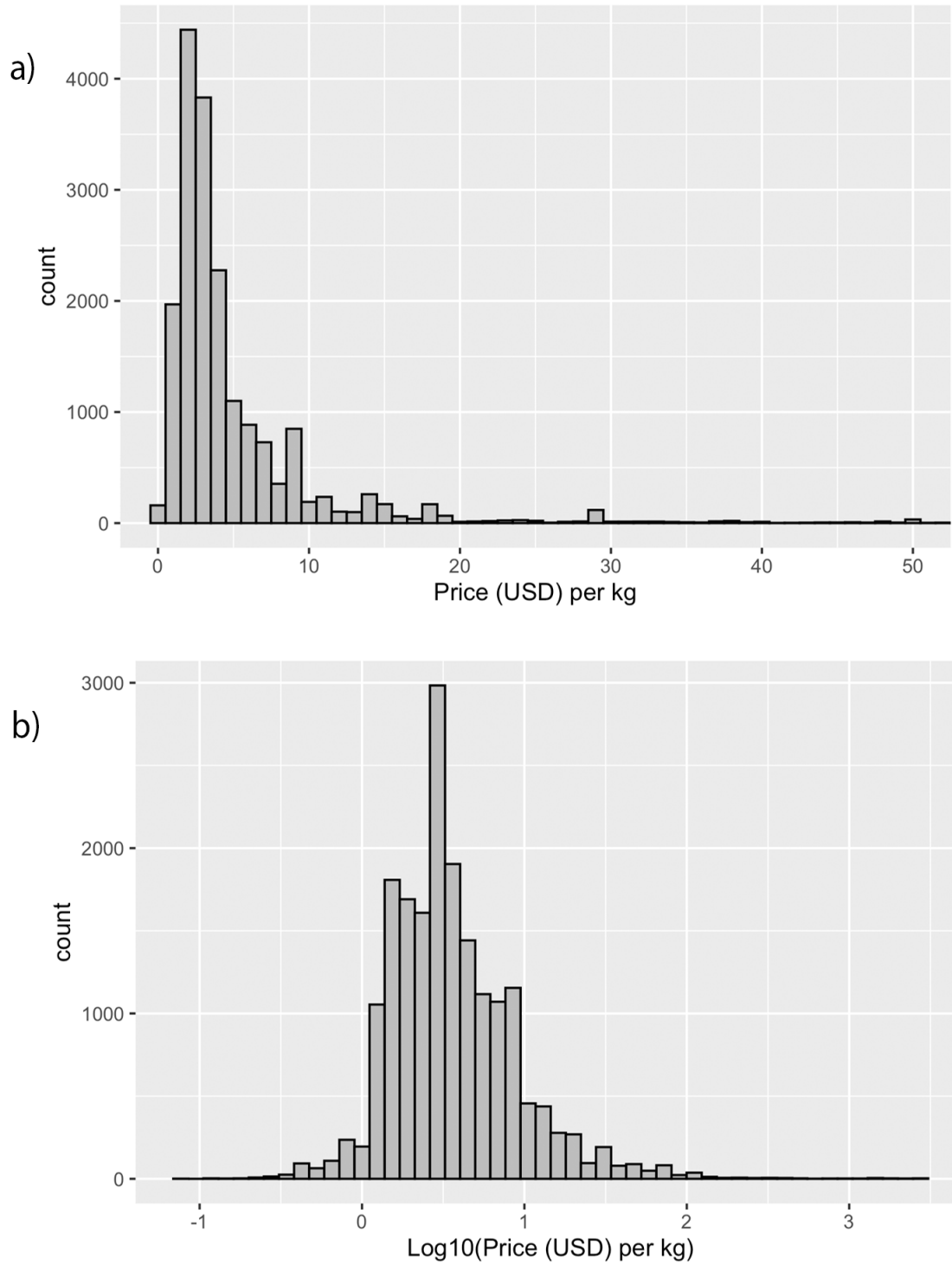


Figure A8: **Frequency plots of the value (USD) of the catch per kg (a) before log-transformation and (b) after log-transformation.**

# Appendix E

## Gear composition over time of municipalities in the north and south coast

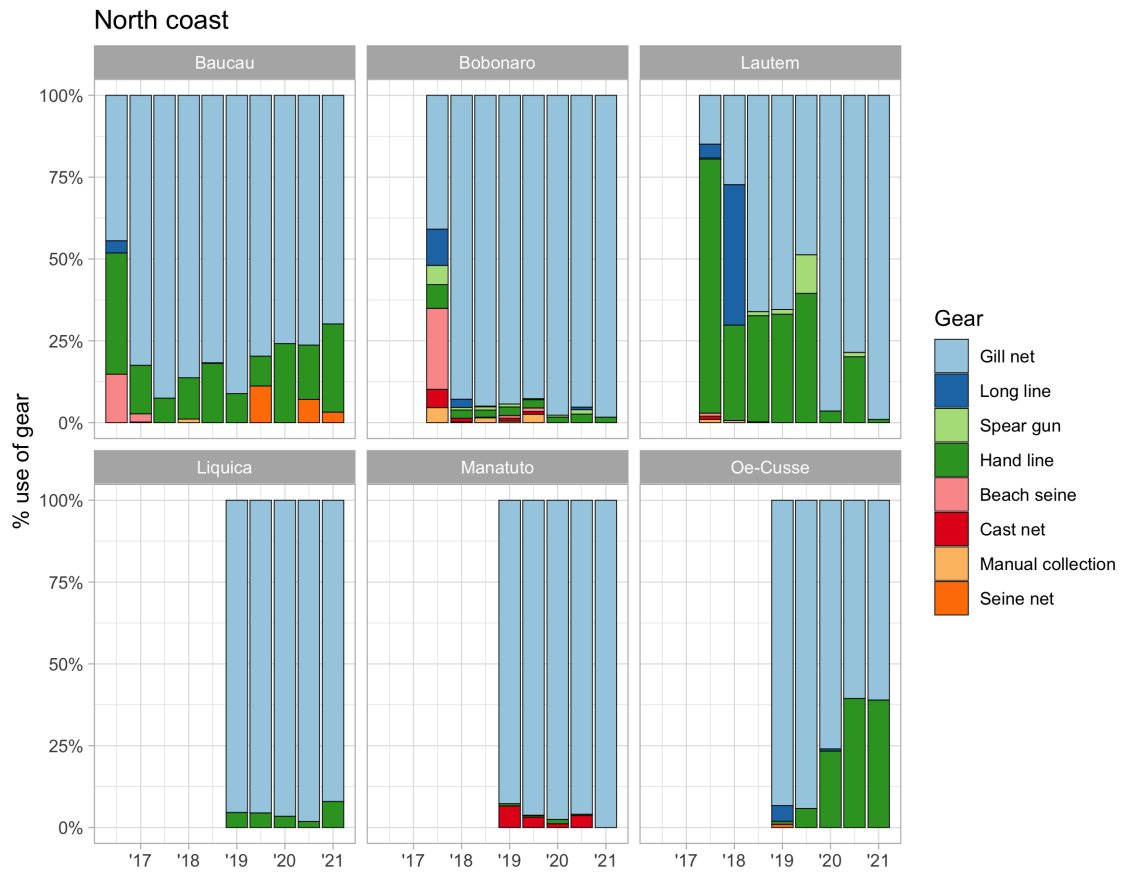


Figure A9: **Gear composition on the north coast over time.** The gear composition per 6 months of the municipalities on the north coast for the period of September 2016 to April 2021 (the last bar only consists of 4 months). The y-axis shows the percentage of times a gear has been used.



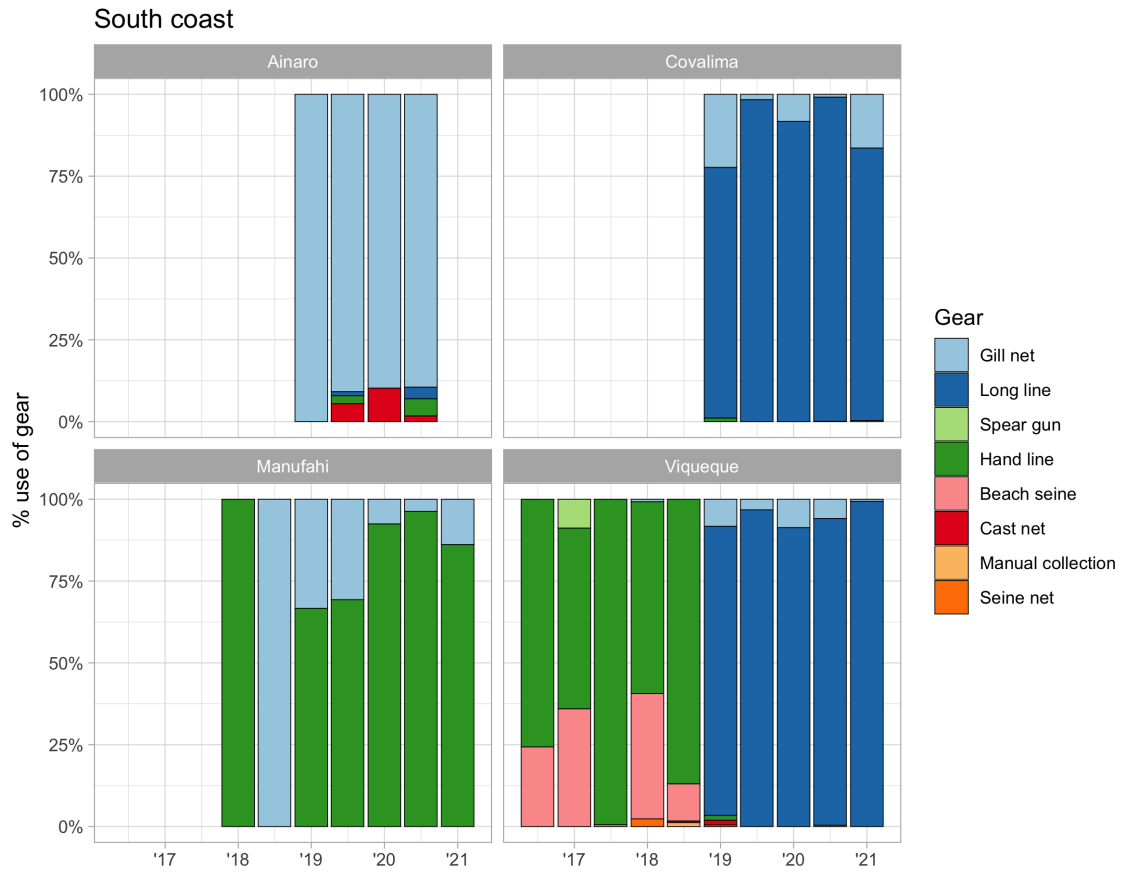


Figure A10: **Gear composition on the south coast over time.** The gear composition per 6 months of the municipalities on the south coast for the period of September 2016 to April 2021 (the last bar only consists of 4 months). The y-axis shows the percentage of times a gear has been used.

# Appendix F

## Species composition of the catch within the functional groups

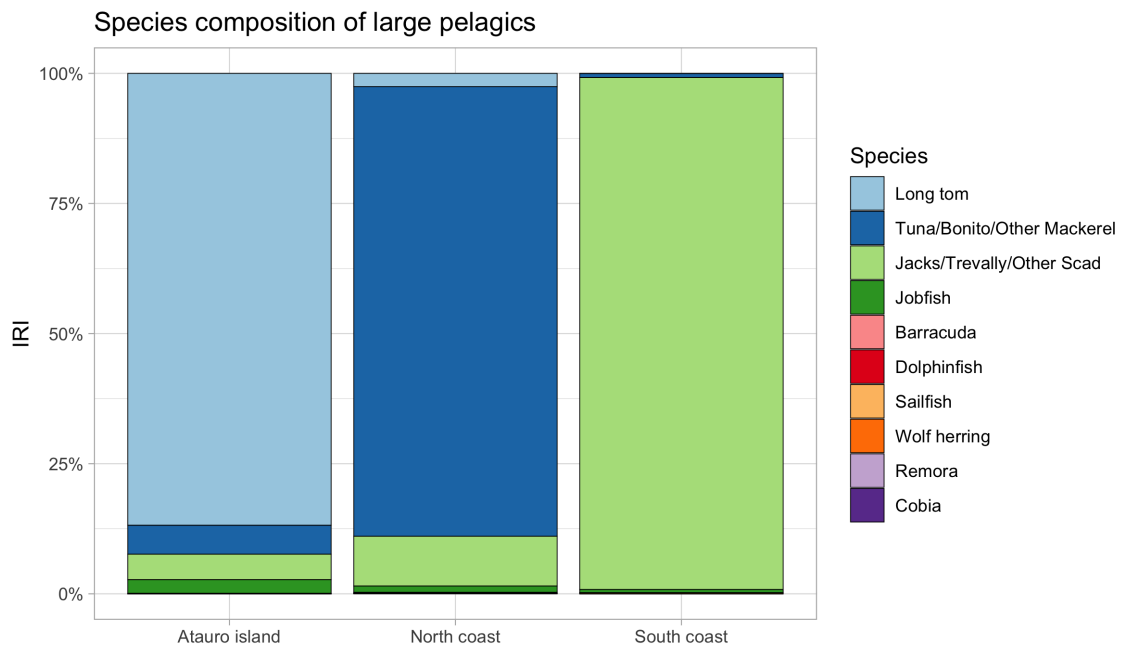


Figure A11: **Species composition of the catch of large pelagic species.** Species composition of the catch of large pelagic species on Atauro island, north coast and south coast. The y-axis shows the Index of Relative Importance (IRI), which is calculated using the weight, number, and frequency of occurrence of a species.

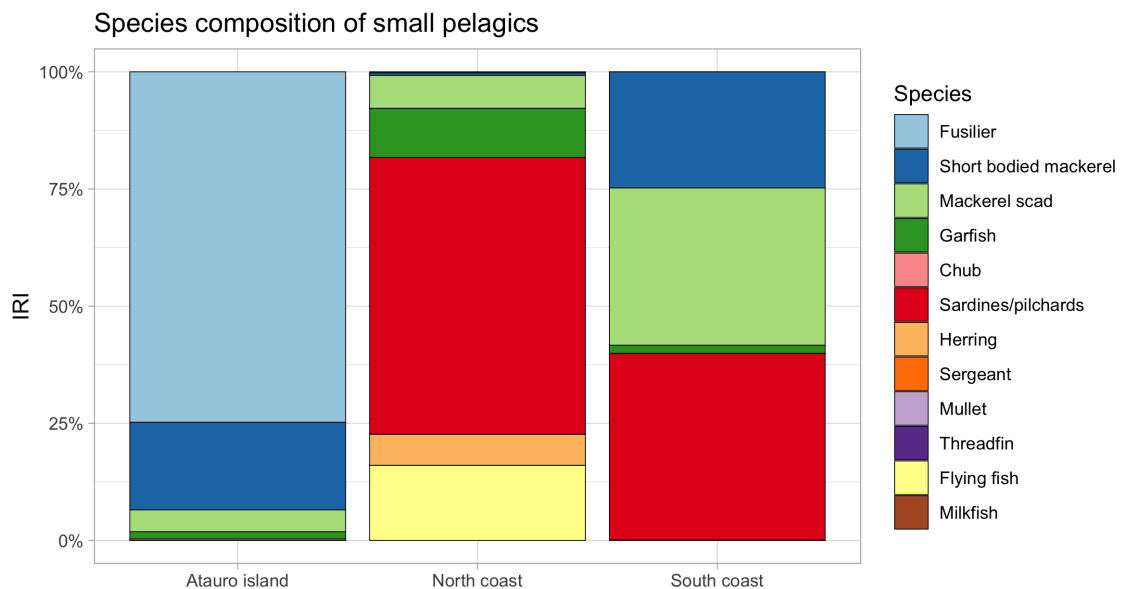


Figure A12: **Species composition of the catch of small pelagic species.** Species composition of the catch of small pelagic species on Atauro island, north coast and south coast. The y-axis shows the Index of Relative Importance (IRI), which is calculated using the weight, number, and frequency of occurrence of a species.



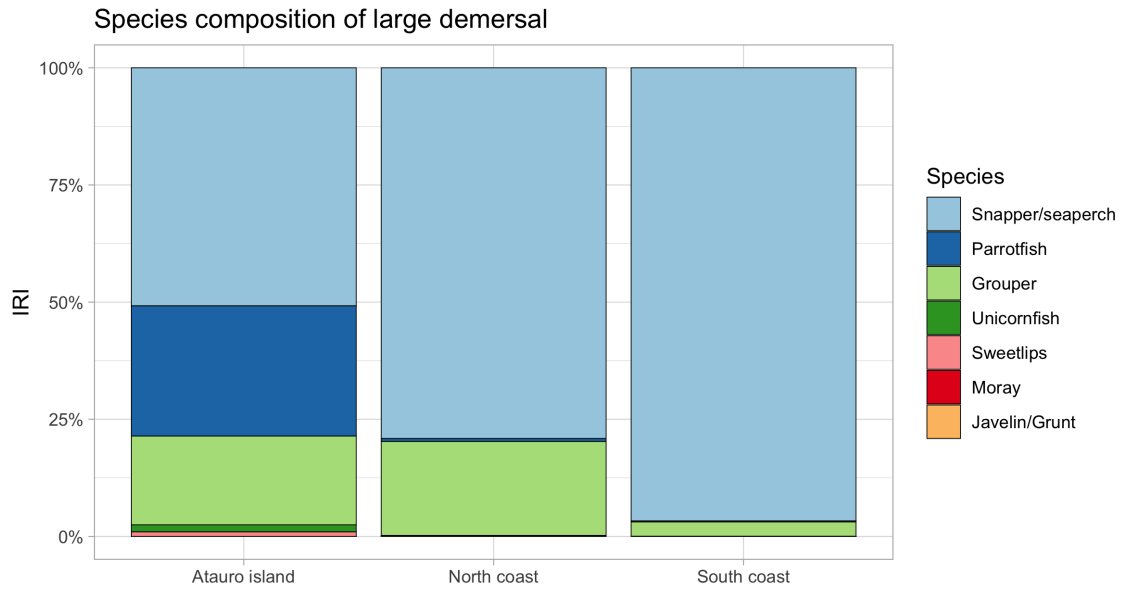


Figure A13: **Species composition of the catch of large demersal species.** Species composition of the catch of large demersal species on Atauro island, north coast and south coast. The y-axis shows the Index of Relative Importance (IRI), which is calculated using the weight, number, and frequency of occurrence of a species.

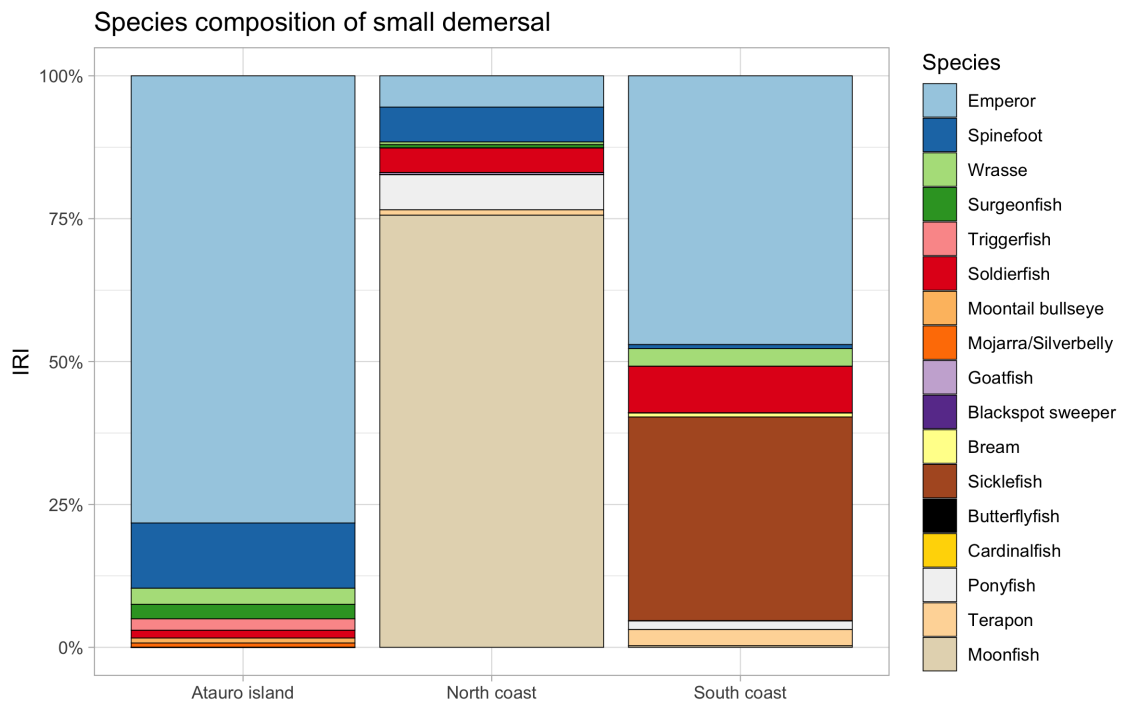


Figure A14: **Species composition of the catch of small demersal species.** Species composition of the catch of small demersal species on Atauro island, north coast and south coast. The y-axis shows the Index of Relative Importance (IRI), which is calculated using the weight, number, and frequency of occurrence of a species.

# Appendix G

## Set-up and template for the focus discussion groups

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### Set-up FDG Timor-Leste

Sarah Jørgensen Veillat

*Type of interviews:*

Focus Discussion Groups

*Locations:*

3 places:

North coast – Manatuto

South coast – Covalima

Atauro Island

*People:*

2 fishers and 2 traders

*Duration:*

+/- an hour

### *INSTRUCTIONS FOR ENUMERATORS*

#### Background info

We're researching how the COVID-19 pandemic has affected fisheries in Timor-Leste. This part of the project seeks to understand the experiences of the fishermen and traders, including how COVID-19 impacted their fishing and marketing practices using focus group discussions (FGD) and a timeline activity. It will be focussed on the experiences of the last year during the pandemic. The findings will be used to better understand existing (quantitative) data on the fisheries gathered in catch surveys and from the tracking devices installed on some of the fishing boats.

#### Before the FDG

1. Go through the instructions beforehand to make sure you understand everything.
2. Fill in the major events/restriction section yourselves first (step 2 of the timeline activity), with your knowledge on what has happened the last year.
3. Do this in the output template given by me. This needs to be a separate document from the document that will be filled in with the information given by the participants.
4. The reason for this is so you can cross-reference the participants' answers with yours.



5. Prepare the activity for the participants (check the template for how it should look):
6. Gather several big sheets of paper (4x A3) and tape them together
7. Draw the timeline on it (as shown in the template), excluding the already given events.
8. Below the timeline, write down the different sections (as shown in the template).

### Structure FDG

Open the FDG by giving the participants the background information and the reason they are here.

#### Script

Welcome! First of all, thank you all for your participation. This discussion group will last around an hour and we will be discussing your experiences of the last year during the COVID-19 pandemic. We will be doing one timeline activity, which we will explain in more detail once we begin, followed by some general discussion questions. The reason we are doing this is because we are doing a research into how the pandemic has affected the fisheries in Timor-Leste. The information we will gain from this discussion group will be used to better understand data we already have gathered from catch surveys and tracking devices installed on some of the fishing boats.

### ***Start with main activity (timeline):***

The main activity will be filling out a timeline of the last year (since 28 March 2020) with the experiences concerning their business and other aspects of their lives.

### Structure of activity

We will go through the activity sequentially with the participants. Start by explaining one section, then do that section. Then explain the next section, then do that section... etc.

Step by step:

1. **Get out the drawn timeline and explain the general idea of the timeline activity**



Script:

*As we talked about before, we want to understand how COVID-19 affected you and your fishery since March 2021. We'd like you to fill out this timeline with the major events you remember, and how these impacted your fishing practices and market access throughout the year (or how they impacted you and fishers you know). We'll talk through this together and fill out this timeline together. We will talk about what happened since March 2020, and we'd like you to describe the key events and what impact they had on fisheries, markets and your livelihoods.*

## 2. Start with the major events section

Go through the timeline periodically. Start with the first State of Emergency in March 2020.

Intro script

*We are going to start by listing and discussing the events and restrictions related to COVID-19 that have taken place over the last year. We will start in March 2020 and work our way towards the present day. Some events have already been added to the timeline, and those we will discuss in more depth, but mostly we are going to recall the events and restrictions ourselves. These can be nation-wide restrictions and events, or just applicable for your community locally. We will illustrate how this works by starting with the first State of Emergency, put in place by the government in March 2020.*

Now start asking the participant these questions:

- (a) Can you recall the event/restriction?
- (b) Can you describe the event/restrictions?
- (c) Did the restrictions apply to your community?
  - *For example: government brought in social distancing rules, but they were not enforced here*

After every discussed event, ask the question:

What is the next major event/restriction related to COVID-19 you can recall?

- If the next event is recalled by them, ask them question **b and c**
- If the next event is an event given by me or by you, ask them question **a, b and c**

Continue to do this until you have reached the end of the timeline. is okay to jump back and forth on the timeline if the participants start remembering events/restrictions later on.

## 3. Next, start with the fishing activities section



Intro script:

*We're now going to talk about how these different events and restrictions we discussed impacted your and your communities' fishing activities. We'll start at the beginning of the timeline again.*

Questions to ask the participants:

- (a) Did the restrictions and events that took place in March have an effect on...
- ...the number of times you went fishing in a week compared to normal? Why?
  - ... the amount of time you went out fishing on each trip compared to normal? Why?
  - ... the way you fished? (going out at different times of the day than usual, fishing in different spots than usual, being with more or less people on the boat than usual). Why?
- (b) How long did these changes last?

Continue asking these questions for the rest of the timeline, by replacing March with the next month, or a period of several months if that is more in line with the events that take place.

4. Next, the market access section

Intro script:

*We're now going to talk about how these different events and restrictions we discussed impacted your communities' market access and activities. We'll start at the beginning of the timeline again.*

Questions to ask the participants:

- (a) Did the restrictions and events that took place in March have an impact on...
- ...the number of costumers at the markets compared to normal? Why? (specify which markets)
  - ... the number of traders at the markets compared to normal? Why? (specify which markets)
  - ... the amount of fish sold compared to normal? Why?
  - ...the supply of fish compared to normal? (e.g. more fish than possible to sell) Why?

- ... the demand for fish compared to normal (low or high demand)? Why?
- ... the amount of fish you brought home for own consumption instead of selling compared to normal? Why?

(b) How long did these changes last?

Continue asking these questions for the rest of the timeline, by replacing March with the next month, or a period of several months if that is more in line with the events that take place.

## 5. Next, the livelihood section

Intro script:

*We're now going to talk about how these different events and restrictions we discussed impacted your and your communities' livelihoods. We'll start at the beginning of the timeline again.*

Questions to ask the participants:

- (a) Did the restrictions and events that took place in March have an impact on...
- ... how you brought food into the house compared to normal? Why?
  - ... how you brought money into the house compared to normal? Why?

(b) How long did these changes last?

Continue asking these questions for the rest of the timeline, by replacing March with the next month, or a period of several months if that is more in line with the events that take place.

## 6. Next, the food security section

Intro script:

*We're now going to talk about how these different events and restrictions we discussed impacted your and your communities' food security. We'll start at the beginning of the timeline again.*

Questions to ask the participants:

- (a) Did the restrictions and events that took place in March have an impact on...





- ... the type, variety and quantity of food you ate at home compared to normal? Why?

(b) How long did these changes last?

Continue asking these questions for the rest of the timeline, by replacing March with the next month, or a period of several months if that is more in line with the events that take place.

## 7. Lastly, notes that don't fit the above themes

Intro script:

*Lastly, we'd like you to add anything that we haven't discussed yet, but what you think is important for us to know.*

Question to ask the participants:

- (a) Was there anything that happened or changed in March that we haven't discussed that you would like to add?

Continue asking these questions for the rest of the timeline, by replacing March with the next month, or a period of several months if that is more in line with the events that take place.

### ***Start with activity 2: General discussion questions***

Go through the last couple of questions listed below.

Write down the consensus of the answers, and anything else you think is important to note.

1. *Would you say you have invested more or less in your business than what you would usually do in a year? (e.g., the maintenance and/or upgrading of your boat and fishing gear). Why?*
2. *Have you or your community turned to any other techniques to find markets? If so, which ones?*
3. *Do you and your community agree with the measures taken by the government to prevent COVID-19? Why, why not?*
4. *How do you feel that you and your community coped with everything that happened last year?*
5. *Is there anything else you'd like to add?*

### ***Outputs:***

- The document with the events/restrictions filled in by the enumerators before the start of the FDG



- A translated version (English) of the filled-out table of the timeline activity by the participants in an excel document following the format given
    - Notes on observations made (e.g., there was a disagreement about...), also filled in the document following the format given
  - A summary of the answers to the general discussion questions, translated to English, following the template.
    - Notes on observations made (e.g., there was a disagreement about...), also filled in the document following the format given
  - Optional: photos of original (non-translated) filled-in timeline activity.
-