



A Report for

PROJECT ORATSIMBA

Phase III Endline Socioeconomic Assessment

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2. Introduction

Across Madagascar, where 70.7% of the population live below the \$1.90 international poverty line (UNDP, 2018), small-scale fisheries play a significant role in food security and poverty alleviation (Barnes-Mauthe, Oleson, & Zafindrasilivonona, 2013). Lobsters are the target species for small-scale fisheries in the southeast region of Anosy; catch from this regional fishery accounts for the majority of the country's lobster catch and export (Sabatini, Salley, & Ramanamanjato, 2008). Lobster fishing is a livelihood with few barriers to entry and an important economic activity in Anosy, providing a vital income source for approximately 40 coastal communities (Long, 2017). Limited available empirical and anecdotal evidence suggest that the regional lobster stock is declining due to increased fishing effort, driven by rapid population growth and export market demand (Holloway & Short, 2014; Long, 2017; Sabatini et al., 2008). Despite declines in catch, the high economic value of lobsters, coupled with a lack of viable alternative livelihoods, compels fishers to continue fishing (Long et al., 2019).

SEED Madagascar (SEED) has been working in the Anosy region for more than 20 years across health, education, conservation and livelihoods projects. Since 2013, this has included Project Oratsimba, a community-based sustainable fisheries management project supporting communities to establish and manage Locally-Managed Marine Areas (LMMAs). Project Oratsimba Phase III, implemented from July 2018 to June 2021 and funded by the Darwin Initiative, aimed to strengthen the community-based fisheries management model piloted in Sainte Luce and extend it to incorporate the neighbouring communities of Elodrato and Itapera. The model includes election of Fisheries Management Committees responsible for managing the LMMA, the creation of fisheries *dina* (local customary law), and various management measures such as Periodic No Take Zones (NTZs).

During Phase III, progress towards community-based fisheries management varied. In Sainte Luce, the periodic NTZ remained operational, the Fisheries Management Committee was re-elected for the first time, and the *dina* was legally ratified into national law. In Elodrato, a Fisheries Management Committee was formed from a newly established Fishers' Association, a *dina* was designed and locally ratified, and the NTZ was closed for the first time during Phase III in May 2021. Progress in Elodrato was slower than anticipated and the first NTZ opening, and thus the associated economic benefits, are predicted to occur after Phase III. In Itapera, the community rejected the idea of an NTZ due to intra-community conflicts between users of different lobster fishing gear (pots versus freediving) and resident and long-term migrant fishers. Conflicts were mainly centred around the perceived potential impact of the proposed NTZ location on different gear users as the reported spatial distribution of pot fishing and freediving effort varies. This has highlighted the need to adapt the community-based model, successfully piloted in Sainte Luce, based on the local context, even between neighbouring villages. Lack of community cohesion undermines the effectiveness of community-based fisheries management (Alexander, Bodin, & Barnes, 2018) and would therefore also undermine the effectiveness on associated management measures (including NTZs). The approach taken with Itapera was adapted, at the community's request, to no longer promote an NTZ as a management measure but instead focused on increasing support for community-based fishery management.

This study presents the results of the endline socioeconomic survey conducted in target and control communities and compares this with baseline data to assess the impact of Project Oratsimba Phase III. Specifically, data was collected on livelihood practices, household poverty, zebu and *pirogue* ownership, gender and fisheries management involvement (target communities only), knowledge of national and local lobster fishery regulations, knowledge of governance and enforcement structures (Elodrato and Sainte Luce), and motivation and engagement with fisheries management (Itapera).

3. Methods

Prior to research, permission was sought from community leaders. This study adhered to SEED's Human Research Code of Ethics. Participation was voluntary and informed consent was obtained verbally due to low levels of literacy.

3.1. Study Sites

To assess the impact of project interventions, the same three target communities (Elodrato, Itapera and Sainte Luce) and three control communities (Ambanihazo, Antsotso and Baie d'Italy) surveyed at baseline were surveyed again at endline. For a detailed description of each community see Savage 2020.

3.2. Survey Design

The survey collected endline data to assess the impact of Project Oratsimba Phase III interventions in three target and three control lobster fishing communities in the Anosy region of southeast Madagascar. Demographic data was collected to give an insight into the community and individual participants. To measure progress towards project indicators, the survey collected quantitative data on livelihood practices, household poverty levels (using the Basic Necessities Survey methodology; see section 3.3), zebu and *pirogue* ownership, gender and fisheries management involvement (target communities only), knowledge of national and local lobster fishery regulations, knowledge of governance and enforcement structures (Elodrato and Sainte Luce), and motivation and engagement with fisheries management (Itapera).

3.3. Basic Necessities Survey

The Basic Necessities Survey is a participatory approach to measure household poverty levels. It uses the definition of poverty as a lack of basic necessities and calculates a locally defined Poverty Index, based on ownership or access to items considered basic necessities by 50% or more of participants (Wilkie, Wieland, & Detoef, 2015). Potential basic necessity items contained in the survey were informed by baseline focus groups in each community (see Savage 2020), and also contained items that focus groups did not identify to encourage participants to think about what they considered a basic necessity. 33 potential basic necessity items were contained in the survey (Appendix A). During surveying, picture cards illustrating each item included in the list were shown in a pre-chosen random order. Participants were first asked if they owned or had access to the item, and then if the item was a basic necessity that *“every household in the community should have and no family should have to do without”* (Wilkie et al., 2015). Items selected as basic necessities by less than 50% of households across all six communities were deemed not to be basic necessities and excluded from further analysis. Weightings for each item were determined from the percentage of households selecting the item as a basic necessity. A Poverty Index score for each household was calculated by combining the weightings of the items actually owned by the household and dividing this by the weighting of all the basic necessity items combined, the maximum possible score. Poverty Index scores lie on a scale where 0% represents a household living in extreme poverty, as they have no access to any of the locally defined basic necessity items, and 100% represents a household being at or above the locally defined poverty line, as they have access to all of the basic necessity items (Wilkie et al., 2015). To enable baseline and endline data to be compared, baseline data was reanalysed using items identified as basic necessities at the endline.

3.4. Survey Distribution

The survey was piloted during the baseline (Savage 2020); for the endline survey some adjustments were made, including the addition of questions on knowledge of governance and enforcement structures, and changes to the gender and involvement questions. The survey was administered to lobster fishing and non-fishing households randomly in the six communities between October 2020 and February 2021. In communities with inland hamlets that are not involved in lobster fishing, surveys were only conducted in hamlets involved in lobster fishing as identified by community leaders. Surveys were conducted at various times of day to control against timing of

gender specific activities and minimise gender bias. The minimum age for surveying was 18, and where possible, heads of households were surveyed. If the head of the household was unavailable, another adult was chosen. Surveys were conducted using mobile data collection (Open Data Kit software).

4. Results

A total of 687 households were surveyed between October 2020 and February 2021 across three target communities (351 households, 51.1% of sample size) and three control communities (336 households, 48.9% of sample size). Sampling effort, in terms of the number of survey days, was similar between baseline and endline surveys, despite a larger sample size for the endline survey. In each community it was estimated that at least 17.7% of households were surveyed (Table 1).

Table 1. Household surveys conducted by community (n=687).

	Target communities			Control communities		
	Elodrato	Itapera	Sainte Luce	Ambanihazo	Antsotso	Baie d'Italy
Households surveyed	112	96	143	108	126	102
Proportion of sample (%)	16.3	14.0	20.8	15.7	18.3	14.8
Households in community surveyed (%) ¹	17.7	34.5	30.8	50.5	34.4	40.0

¹Using population estimates provided by community leaders in 2021, except for Baie d'Italy which used the 2019 estimate.

4.1. Participant Demographics

The average participant was a male head of household, not an active fisher, 36.2 years of age and had been educated for 3.9 years. Participant demographics disaggregated by community are given in Table 2.

Table 2. Participant demographic characteristics disaggregated by community (n=687).

	Target communities			Control communities		
	Elodrato	Itapera	Sainte Luce	Ambanihazo	Antsotso	Baie d'Italy
Head of household (%)	60.7	70.8	76.2	58.3	70.6	95.1
Female (%)	48.2	42.7	25.2	55.6	65.1	20.6
Active fisher (%)	37.5	56.3	72.7	24.1	26.2	74.5
Age (mean±sd)	34.4±14.5	33.3±12.3	34.9±13.0	40.2±17.5	36.7±15.9	38.1±14.2
No formal education (%)	29.5	29.2	11.2	27.8	23.8	54.9
Years of formal education (mean±sd)	3.9±3.7	3.6±3.3	5.4±3.1	3.7±3.2	3.9±3.2	1.9±2.8

4.2. Community Demographics

Population estimates provided by community leaders varied considerably between communities and were significantly lower for Ambanihazo, Elodrato, Itapera, and Sainte Luce compared to baseline. Mean household size for control communities was similar at endline compared to baseline, whereas this decreased for target communities. The endline mean number of children per household increased in all communities since baseline, except for Itapera, where the mean decreased (Table 3).

Table 3. Community demographic characteristics (n=687).

		Target communities			Control communities		
		Elodrato	Itapera	Sainte Luce	Ambanihazo	Antsotso	Baie d'Italy
Population estimate ¹	endline	2,600	1,307	2,044	898	1,684	N/A
	baseline	4,200	1,600	4,800	2,400	1,500	1,300
Household size	mean±sd	4.1±1.7	4.7±1.8	4.4±1.7	4.2±1.8	4.6±2.2	5.1±2.3
	change since baseline	-0.5	-1.2	-0.7	-0.2	-0.1	0
Children	mean per household±sd	2.6±0.7	2.7±0.7	2.5±0.7	2.6±0.7	2.8±0.9	2.9±1.0
	change since baseline	0.6	-0.4	0.4	0.8	0.6	0.3

¹ Provided by community leaders at time of surveying. Endline population estimate was not provided in Baie d'Italy.

4.3. Livelihoods

Livelihood activities were listed by participants, and ranked in terms of the amount of household income generated. Livelihood activities were then grouped into nine categories as identified at baseline, including: lobster fishing and buying, other sea fishing, freshwater fishing, farming, small business, weaving, casual work, formal employment, and SEED. Subsistence only activities were excluded. Only two households reported no involvement in any livelihood activity. Lobster fishing in Baie d'Italy and Sainte Luce, lobster fishing and other sea fishing in Itapera, and weaving in Ambanihazo and Antsotso remained the most widely practiced livelihood activities. In Elodrato farming was the most widely practiced livelihood activity compared to weaving at baseline (Table 4)

Table 4. Household involvement (%) in livelihood activities (n=687) with the most widely practiced livelihood in bold.

	Target communities			Control communities		
	Elodrato	Itapera	Sainte Luce	Ambanihazo	Antsotso	Baie d'Italy
Lobster fishing and buying	74.1	79.2	93.7	44.4	59.5	84.3
Other sea fishing	67.0	79.2	89.5	4.7	36.5	78.4
Freshwater fishing	6.3	9.4	23.1	0.9	5.6	17.6
Farming	93.8	47.9	33.6	38.0	66.7	85.3
Small business	19.6	18.8	56.6	15.7	24.6	53.9
Weaving	89.3	33.3	70.6	63.9	69.0	32.4
Casual work	0.9	0.0	1.4	6.5	2.4	6.9
Formal employment	18.8	2.1	2.8	8.3	6.3	1.0
SEED	0.0	0.0	0.0	0.0	0.0	0.0
None	0.0	0.0	0.0	0.9	0.8	0.0

Most households participated in more than one livelihood activity; only 78 households participated in just one livelihood activity, compared to 43 at baseline. In Elodrato, Sainte Luce, Antsotso and Baie d'Italy, the mean number of livelihood activities had increased from baseline, but in Itapera and Ambanihazo this had decreased (Table 5).

Table 5. Mean income generating activities per household (endline n=687, baseline n=553).

	Target communities			Control communities		
	Elodrato	Itapera	Sainte Luce	Ambanihazao	Antsotso	Baie d'Italy
Mean ($\pm$ standard deviation)	3.9 $\pm$ 1.4	2.8 $\pm$ 1.1	3.9 $\pm$ 1.4	1.9 $\pm$ 0.8	1.9 $\pm$ 1.5	4.7 $\pm$ 2.1
Minimum	1.0	1.0	1.0	0.0	0.0	1.0
Maximum	10.0	6.0	8.0	4.0	9.0	11.0
Change in mean since baseline	1.0	-1.1	0.6	-1.0	1.5	1.6

4.3.1. Lobster Fishing Household Livelihoods

At endline, for the majority of lobster fishing households across all communities, lobster fishing remained the most important livelihood activity in terms of income generated, ranging from 57.0% of households in Elodrato to 91.7% of households in Sainte Luce (Figure 1). Since baseline, the percentage of participants that identified lobster fishing as the most important income generating activity decreased in Elodrato and Baie d'Italy, but increased in all other communities (Jessica Savage, 2020). This suggests that lobster fishing has remained a primary income generating activity during Project Oratsimba Phase III.

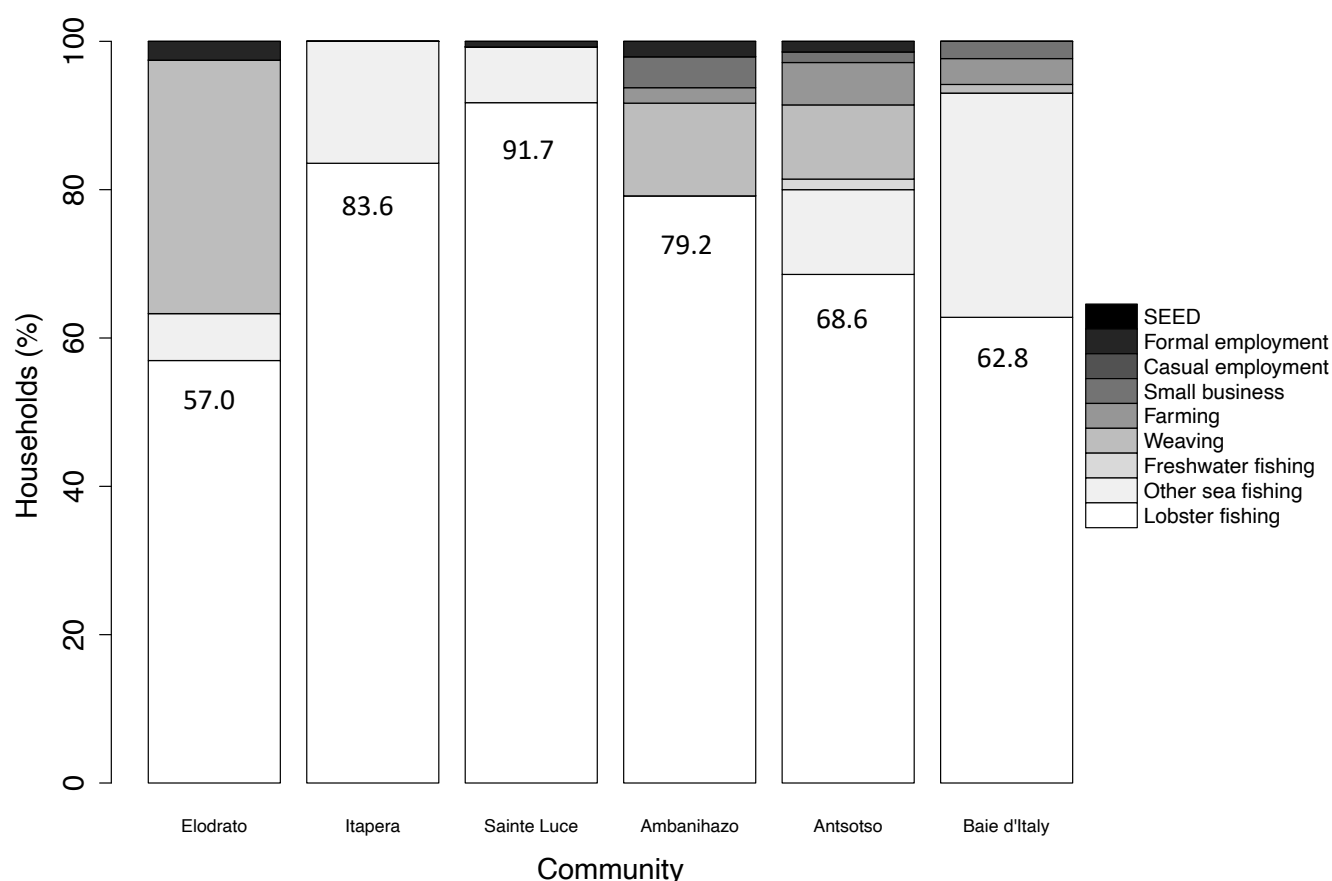


Figure 1. Highest income generating livelihood activity for lobster fishing households disaggregated by community (n=490).

4.3.2. Active Lobster Fishers

The mean number of active lobster fishers per fishing household at endline was similar between all communities, and remained approximately constant from baseline in all communities, increasing or decreasing by 0.1, except for Baie d'Italy where the mean decreased by 0.4 (Table 6).

Table 6. Active lobster fishers per lobster fishing household (endline n=490, baseline n=415).

	Target communities			Control communities		
	Elodrato	Itapera	Sainte Luce	Ambanihazoz	Antsotso	Baie d'Italy
Mean ($\pm$ standard deviation)	1.3 $\pm$ 0.6	1.5 $\pm$ 0.9	1.4 $\pm$ 0.7	1.2 $\pm$ 0.4	1.3 $\pm$ 0.6	1.2 $\pm$ 0.5
Change since baseline	0.1	-0.1	-0.1	-0.1	-0.1	-0.4

4.4. Unsustainable Livelihood Practices

Household participation in unsustainable livelihoods detrimental to marine, freshwater and terrestrial biodiversity was assessed by surveying households about their involvement in the sale of shark meat and/or fins, sale of charcoal, firewood or timber, mosquito net fishing, and the consumption of bushmeat. Increases since baseline in reported involvement in unsustainable livelihood practices were only observed for mosquito net fishing in Ambanihazoz, bushmeat consumption in Baie d'Italy, and the sale of shark meat and/or fins in Sainte Luce. Reported involvement in other unsustainable livelihood practices in these communities and in all practices in Antsotso, Elodrato and Itapera decreased since baseline (Table 7).

Table 7. Reported household (%) participation in unsustainable livelihood activities disaggregated by community (endline n=687, baseline n=526).

		Target communities			Control communities		
		Elodrato	Itapera	Sainte Luce	Ambanihazoz	Antsotso	Baie d'Italy
Involvement (%)	Sale of shark meat or fins	7.1	25.0	75.5	10.2	21.4	60.8
	Sale of wood products ¹	4.5	9.4	18.9	13.0	7.9	27.5
	Mosquito net fishing	0.9	27.1	24.5	28.7	29.4	17.6
	Bushmeat consumption	0.0	1.0	1.4	0.9	0.0	1.0
Percentage point change since baseline	Sale of shark meat or fins	-27.3	-29.2	15.7	-26.1	-39.7	-5.5
	Sale of wood products ¹	-17.7	-22.5	-18.2	-4.5	-33.2	-7.3
	Mosquito net fishing	-19.1	-18.7	-15.7	6.2	-4.3	-13.9
	Bushmeat consumption	-3.3	-3.2	-4.8	-2.9	-7.4	1.0

¹Charcoal, firewood or timber, excluding subsistence only.

4.4.1. Unsustainable Livelihood Practices and NTZ Closures (Sainte Luce)

In Sainte Luce, household participation in unsustainable livelihood practices during NTZ closures was also assessed by asking households if they participated in the activity more or less during closures. The majority of households reported practicing unsustainable livelihood activities less during NTZ closures, which was an increase since baseline (Table 8).

Table 8. Frequency of household participation (%) in marine, freshwater and terrestrial unsustainable livelihood practices during NTZ closures (endline n=143, baseline n=67).

		Endline	Percentage point change since baseline
Sale of shark meat or fins	Less	96.9	44.9
	Same	1.0	-3
	More	2.1	-41.9
Sale of charcoal, firewood or timber	Less	65.4	36.8
	Same	3.8	0.2
	More	30.8	-37.1
Involvement in mosquito net fishing	Less	85.7	70.0
	Same	2.9	-0.2
	More	11.4	-69.9

4.5. COVID-19 and Household Income

To assess the impact of the COVID-19 pandemic on household income, participants were asked how their household income had changed in the last year, since COVID-19 reached Madagascar. Almost all participants across all communities reported that their household income had decreased (Table 9).

Table 9. Reported change in household income (% of households) since COVID-19 reached Madagascar (n=687).

	Target communities			Control communities		
	Elodrato	Itapera	Sainte Luce	Ambanihazao	Antsotso	Baie d'Italy
Increased	0.0	0.0	0.0	3.7	1.6	0.0
Decreased	99.1	97.9	97.2	86.1	98.4	97.1
Stayed the same	0.0	1.0	2.8	7.4	0.0	2.0
Unsure	0.9	1.0	0.0	2.8	0.0	1.0

4.6. Basic Necessities Survey

4.6.1. Basic Necessity Item Identification

Out of the 22 items identified as basic necessities at baseline, only 16 of these were identified as basic necessities again at endline (Table 10). From the 33 item list used in the survey (Appendix A), no items that were not identified as basic necessities at baseline, were identified as basic necessities at endline. The items identified as basic necessities at endline were largely consistent between communities, however the percentage of participants identifying items varied between communities (Table 11), and between lobster fishing and non-fishing households (Appendix B). For 11 out of the 16 endline basic necessity items, the percentage of participants identifying the item as a basic necessity decreased since baseline (Table 10). Whilst the items that decreased were largely consistent between communities, the percentage point decrease varied between communities (Table 12) and between lobster fishing and non-fishing households (Appendix C).

Table 10. Endline basic necessity item identification from the baseline basic necessity list for communities combined and percentage point change since baseline (n = 687, n=534). A percentage point decrease of <2.0 is shown in light grey and of ≥2.0 in dark grey.

Basic necessity item	Participants identifying item as basic necessity (%)	Percentage point change since baseline
<i>Mahampy</i> mat, hand woven reed mat	99.3	1.5
Metal spoon	98.8	-0.6
Metal cooking tripod	98.5	0.2
Tin plate	98.0	-0.5
Cooking pot for rice	97.5	-1.2
Plastic bucket	95.9	-1.3
Fleece blanket	92.6	9.1
Lobster pot (wooden)	72.5	-15.3
Shoes	72.1	-17.2
Money to visit a doctor	66.7	-24.1
<i>Antanosy pirogue</i> , wooden dugout canoe native to Anosy	60.6	-18.6
Money to send all school age kids to school	60.0	-32.3
Zebu, dry adapted indicine cattle	58.8	-17.8
Enough money to be able to save money	57.1	-33.0
Water from a well or tap in the community	56.8	-36.3
Bed	55.2	-13.2
Baseline Basic Necessity Items not identified at endline		
Glass cup	47.6	-26.9
Lobster pot (metal)	38.6	-24.5
Latrine	34.5	-25.4
Large cooking pot for celebrations	31.1	-25.5
Life jacket	11.6	-52.3
Radio	4.9	-58.6

Table 11. Endline basic necessity item identification disaggregated by community (n = 687). Items identified by <50.0% of participants are shown in grey.

Basic necessity item	Target Community			Control Community		
	Elodrato	Itapera	Sainte Luce	Ambanihazo	Antsotso	Baie d'Italy
<i>Mahampy</i> mat	100.0	97.9	99.3	99.1	99.2	100.0
Metal spoon	98.2	100.0	97.9	99.1	100.0	98.0
Metal cooking tripod	99.1	96.9	98.6	99.1	99.3	98.0
Tin plate	94.6	99.0	96.5	99.1	99.2	100.0
Cooking pot for rice	100.0	96.9	98.6	98.1	98.4	92.2
Plastic bucket	98.2	79.2	97.9	99.1	99.2	99.0
Fleece blanket	91.1	85.4	98.6	100.0	93.7	83.3
Lobster pot (wooden)	83.0	87.5	84.6	50.0	52.4	78.4
Shoes	59.8	52.1	74.8	83.3	82.5	75.5
Money to visit a doctor	67.9	88.5	80.4	51.9	50.8	60.8
<i>Antanosy</i> pirogue	80.4	86.5	79.7	50.9	26.2	40.2
Money to send all school age kids to school	59.8	84.4	74.1	43.5	50.8	46.1
Zebu, dry adapted indicine cattle	60.7	95.8	60.1	71.3	42.1	27.5
Enough money to be able to save money	62.5	67.7	69.9	37.0	50.8	52.0
Water from a well or tap in the community	60.7	59.4	72.0	27.8	37.3	83.3
Bed	54.5	32.3	65.0	64.8	68.3	37.3

Table 12. Percentage point change since baseline in participant identification (%) of basic necessity items (n=687). Items with a percentage point decrease are shown in grey.

Basic necessity item	Target Communities			Control Communities		
	Elodrato	Itapera	Sainte Luce	Ambanihazoz	Antsotso	Baie d'Italy
Mahampy mat,	1.1	0.6	1.7	-0.9	3.3	2.9
Metal spoon	-0.7	1.4	-2.1	-0.9	1.0	-2.0
Metal cooking tripod	1.2	-1.7	-1.4	0.3	-0.7	2.9
Tin plate	-3.3	1.7	-2.5	-0.9	2.3	0.0
Cooking pot for rice	2.2	-3.1	-0.2	-0.7	-0.6	-5.8
Plastic bucket	0.3	-20.8	-1.1	0.3	1.2	7.8
Fleece blanket	-2.6	8.4	1.0	11.0	4.9	25.5
Lobster pot (wooden)	6.2	-3.0	-10.6	-30.5	-38.4	-14.7
Shoes	-30.7	-35.7	-15.6	-6.9	-8.3	-10.8
Money to visit a doctor	-28.9	-11.5	-6.3	-38.3	-40.0	-21.6
Antanosy pirogue Anosy	3.6	16.2	-15.5	-35.7	-50.3	-31.4
Money to send all school age kids to school	-37.0	-15.6	-17.5	-49.2	-38.0	-40.2
Zebu	-25.6	33.6	-25.4	-8.0	-36.5	-39.2
Enough money to be able to save money	-33.3	-29.6	-19.3	-55.7	-37.0	-28.4
Water from a well or tap in the community	-35.1	-40.6	-25.6	-53.9	-46.4	-16.7
Bed	-35.0	-32.6	-19.3	-7.2	2.0	0.0

4.6.2. Basic Necessity Item Access and Ownership

Despite being identified as basic necessities, for the majority of items in all communities, household ownership or access was reported by less than 100.0% of households. The exceptions to this were a cooking pot for rice and a mahampy mat in Elodrato, a cooking tripod in Itapera, a spoon and plate in Antsotso, and a cooking pot for rice and bucket in Baie d'Italy. There was no basic necessity item owned or accessed by all households in all communities, and ownership and access varied by community (Table 13), and by household involvement in lobster fishing (Appendix D). Basic necessity item ownership/access decreased since baseline for the majority of items overall, as well as in Itapera, Sainte Luce, Ambanihazoz, and Antsotso, although the percentage point decrease varied by community (Table 14). Between lobster fishing and non-fishing households, the items for which ownership/access decreased were similar, as was the percentage point decrease for the majority of items in all communities (Appendix E).

Table 13. Endline ownership and access of basic necessity items for all communities combined and disaggregated (n=687).

Basic necessity item	Target Communities			Control Communities			
	Elodrato	Itapera	Sainte Luce	Ambanihazao	Antsotso	Baie d'Italy	All
Mahampy mat	100.0	96.9	95.1	95.4	99.2	99.0	97.5
Metal spoon	98.2	99.0	97.9	98.1	100.0	99.0	98.7
Metal cooking tripod	95.5	100.0	98.6	98.1	99.2	94.1	97.8
Tin plate	96.4	96.9	97.9	99.1	100.0	99.0	98.3
Cooking pot for rice	100.0	90.6	98.6	96.3	97.6	100.0	97.4
Plastic bucket	98.2	96.9	98.6	97.2	97.6	100.0	98.1
Fleece blanket	90.2	84.4	95.7	97.2	91.3	78.4	90.1
Lobster pot (wooden)	58.0	79.2	74.8	45.4	47.6	78.4	63.6
Shoes	87.5	77.0	92.3	85.2	75.4	71.6	82.1
Money to visit a doctor	54.5	10.4	42.0	24.1	21.4	52.9	34.6
Antanosy pirogue	10.7	18.8	23.8	31.5	11.1	27.5	20.4
Money to send all school age kids to school	41.1	11.5	39.2	13.0	20.6	42.2	28.5
Zebu	32.1	19.8	26.6	54.7	20.6	38.3	31.6
Enough money to be able to save money	48.2	5.2	42.7	16.7	21.4	46.1	30.9
Water from a well or tap in the community	62.5	56.3	71.3	5.6	23.8	89.2	51.4
Bed	75.9	44.8	72.7	65.7	57.1	24.5	58.2

Table 14. Change in ownership /access of endline basic necessity items since baseline for all communities combined and disaggregated (endline n=687, baseline n=534).

Basic necessity item	Target Communities				Control Communities		
	Elodrato	Itapera	Sainte Luce	Ambanihaz	Antsotso	Baie d'Italy	All
Mahampy mat	2.1	-0.4	-3.9	-3.4	0.2	1.9	-0.7
Metal spoon	-0.7	0.4	-1.1	-1.9	1.0	-1.0	-0.6
Metal cooking tripod	1.8	6.8	-0.4	-0.7	-0.8	9.8	3.0
Tin plate	-2.5	-3.1	-1.1	-0.9	3.1	1.0	-0.4
Cooking pot for rice	1.1	-9.4	0.6	-3.7	-2.4	2.9	-1.5
Plastic bucket	1.4	2.3	0.6	0.9	-1.4	21.6	4.4
Fleece blanket	1.8	3.3	7.5	5.7	1.5	40.2	11.3
Lobster pot (wooden)	6.4	-0.5	1.3	-18.0	-34.0	-4.9	-8.7
Shoes	-4.1	-13.5	-2.8	-9.9	-17.5	-19.6	-10.7
Money to visit a doctor	28.2	-13.9	25.3	7.0	-5.1	47.0	15.4
Antanosy pirogue	-3.0	2.6	-16.4	-6.3	-8.3	-8.8	-7.3
Money to send all school age kids to school	22.2	-0.7	25.5	-22.4	-14.1	28.4	7.2
Zebu	-18.4	-0.5	-2.8	-20.9	-33.5	-4.8	-14.0
Enough money to be able to save money	22.9	-19.1	26.0	-5.3	-4.1	43.2	11.9
Water from a well or tap in the community	20.4	-35.6	-10.1	-5.4	-17.0	-9.8	-10.3
Bed	4.3	-16.0	-5.7	-7.5	-3.1	-5.9	-3.8

4.6.3. Poverty

Poverty index scores lie on a scale where 0% represents a household in extreme poverty, having access to none of the items defined as basic necessities, and 100% represents a household being at or above the minimum locally defined poverty level, having access to all of the items defined as basic necessities (Wilkie et al., 2015). Mean endline poverty index scores were similar between target and control communities for all households combined, lobster-fishing households individually, and non-fishing households individually. Mean endline poverty index scores in all communities were higher for lobster fishing households compared to non-lobster fishing households (Table 15, Figure 2).

Table 15. Endline mean poverty index (%) and change since baseline disaggregated by community and by household involvement in lobster fishing (endline n=687, baseline n=553).

		Target communities			Control communities		
		Elodrato	Itapera	Sainte Luce	Ambanihazoz	Antsotso	Baie d'Italy
All	Baseline *	67.9	69.6	71.6	70.6	71.4	64.4
	Endline	77.1	69.0	78.4	70.7	69.2	76.4
	% change	13.5	-0.9	9.5	0.1	-3.1	18.6
Fishing	Baseline *	70.9	71.2	72.7	74.1	72.5	66.0
	Endline	77.3	70.8	79.3	76.3	72.4	78.4
	% change	9.0	-0.6	9.1	3.0	-0.1	18.8
Non-fishing	Baseline *	64.3	62.2	66.2	65.4	66.7	53.4
	Endline	76.6	63.0	67.3	66.3	65.1	66.2
	% change	19.1	1.3	1.7	1.4	-2.4	24.0

*using endline 16 item list and baseline weightings.

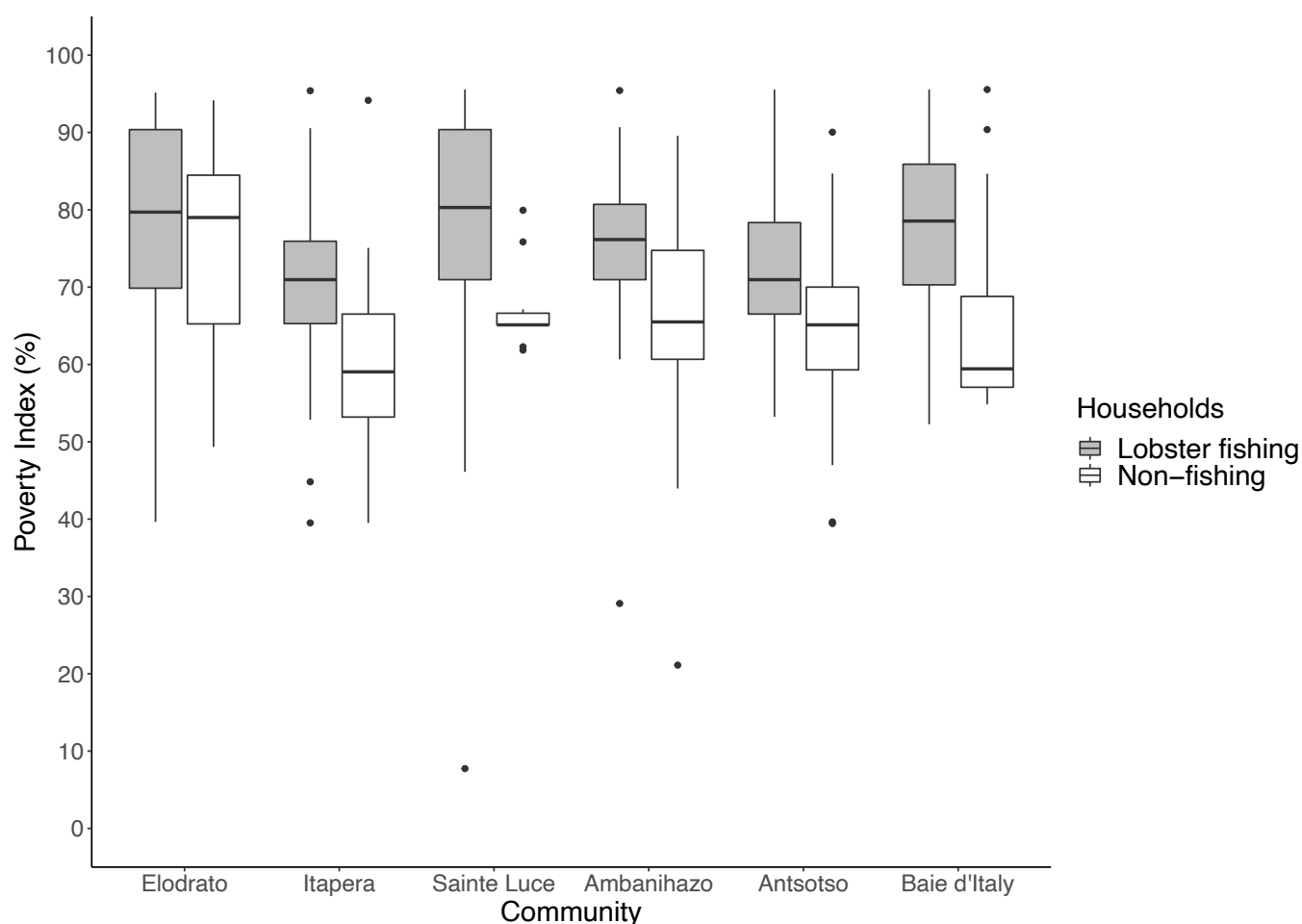


Figure 2. Endline poverty index (%) disaggregated by community and household involvement in lobster fishing with outliers removed (n=687).

Changes in poverty index scores from baseline to endline varied between communities and between lobster fishing and non-fishing households. Poverty index scores increased the most in Baie d'Italy, a control community, for households overall (18.6%), lobster fishing households (18.8%) and non-lobster fishing households (24.0%). Poverty index scores increased since baseline in Elodrato, Sainte Luce and Baie d'Italy for all households, lobster fishing households and non-fishing households. In Itapera, poverty index scores increased for non-fishing households, but decreased slightly for all households and lobster fishing households. In Ambanihazo, poverty index scores increased for lobster fishing households and non-fishing households separately but remained approximately constant for all households. In Antsotso, poverty index scores remained approximately constant for lobster fishing households, but decreased for all households and non-fishing households (Table 15, Figure 3, Figure 4). At baseline, no household had a poverty index score of 100.0%, meaning that 100.0% of households were living below the locally defined poverty level. At endline, 2.0% of households had a poverty index score of 100.0%, consisting of one fishing and two non-fishing households in Elodrato, one fishing and one non-fishing household in Itapera, six fishing households in Sainte Luce, three fishing households in Baie d'Italy, and no households in Ambanihazo or Antsotso.

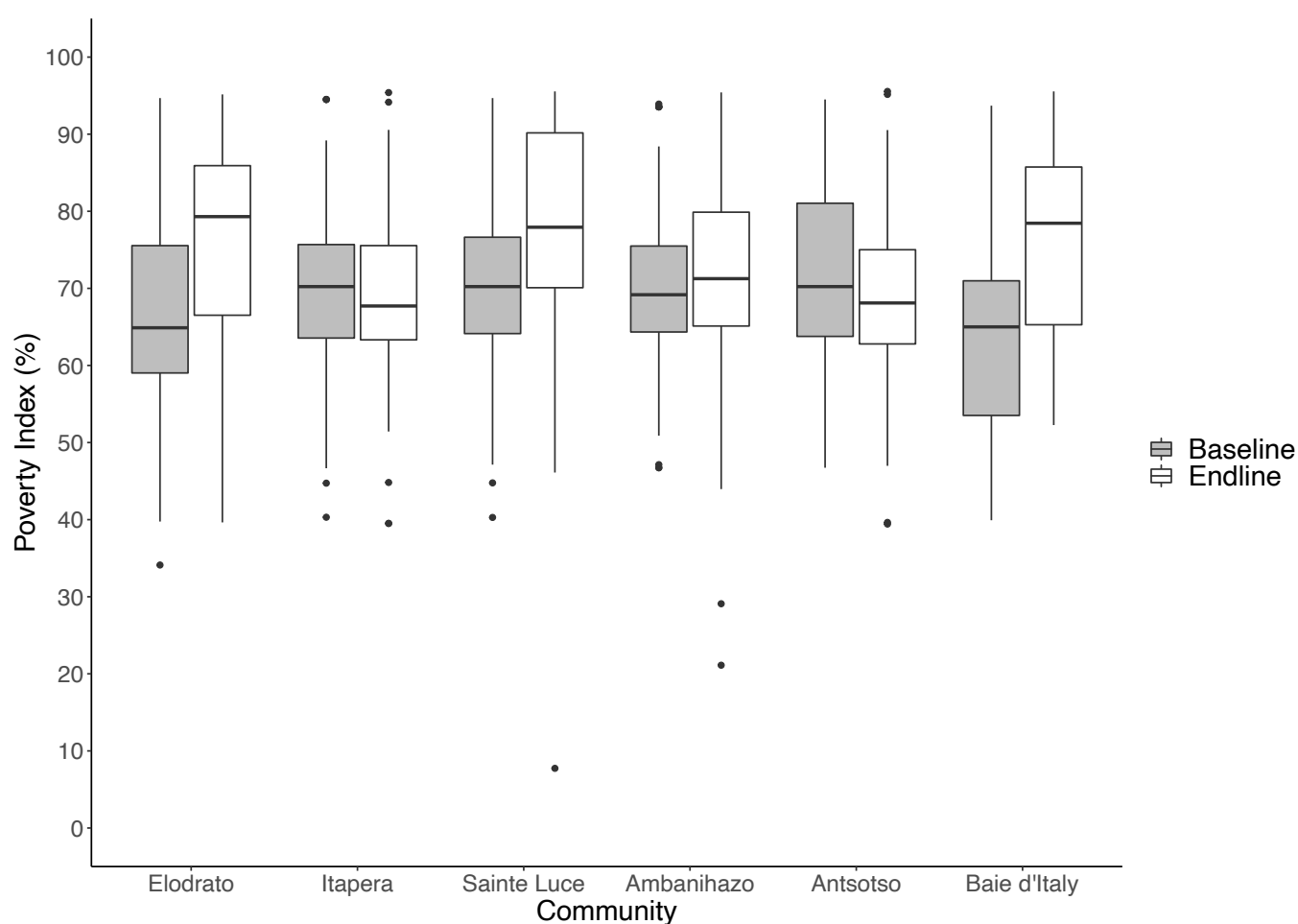


Figure 3. Comparison of endline and baseline poverty index (%) disaggregated by community with outliers removed (endline n=687, baseline n=553).

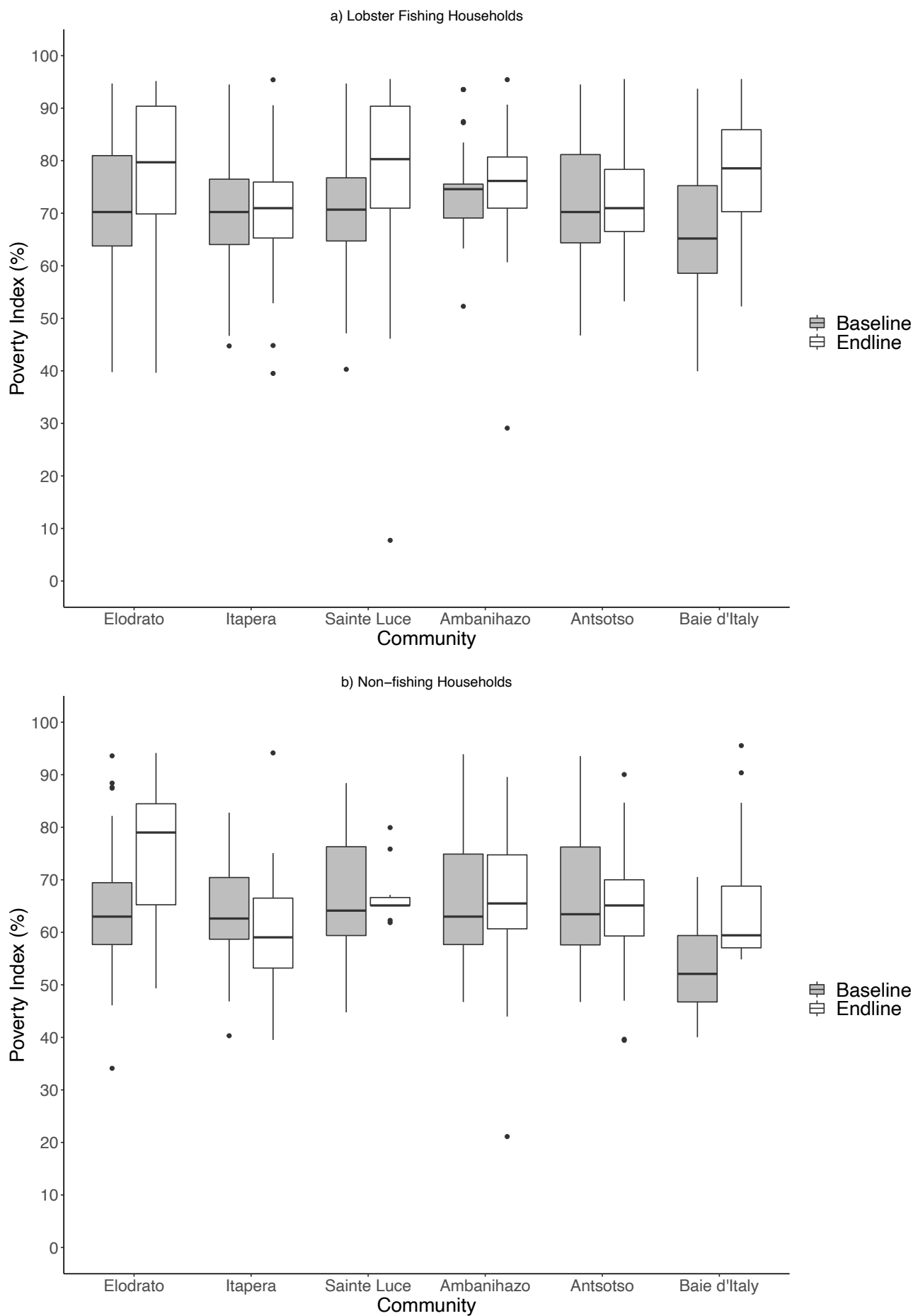


Figure 4. Comparison of endline and baseline poverty index (%) disaggregated by community and household involvement in lobster fishing with outliers removed (endline $n=687$, baseline $n=553$).

4.7. Zebu Ownership

Zebu, a dry-adapted indicine cattle, play a central role in Malagasy culture and are seen as a symbol of status and wealth. Zebu are used as an informal banking system with households using zebu as a way of storing wealth for future expenses. Increased zebu ownership was one of the reported benefits of NTZ openings in Sainte Luce in previous phases (Skinner, Burtenshaw-deVries, Long, Randrianantenaina, & Ellis, 2016) and Phase III trialled the use of zebu ownership as a culturally appropriate indicator of wealth. The percentage of households owning zebu at endline was higher for lobster fishing households compared to non-lobster fishing households in all communities except for Elodrato and Ambanihazao, whereas this was observed in all communities at baseline. For lobster fishing households in all communities, the percentage of households owning zebu decreased since the baseline. For non-lobster fishing households, the percentage of households owning zebu increased in Baie d'Italy, Elodrato and Itapera, and decreased in Ambanihazao, Antsotso and Sainte Luce. Mean zebu owned per household increased for all households in Baie d'Italy and Itapera, increased for lobster fishing households but decreased for non-lobster fishing households in Sainte Luce, increased for non-lobster fishing households but decreased for lobster fishing households in Elodrato, and decreased for all households in Ambanihazao and Antsotso (Table 16).

Table 16. Zebu ownership for lobster and non-lobster fishing households disaggregated by community (endline n=687, baseline n=553).

		Target communities			Control communities		
		Elodrato	Itapera	Sainte Luce	Ambanihazao	Antsotso	Baie d'Italy
Household ownership (%)	Fishing	26.5	20.3	27.1	70.8	18.6	41.9
	Non-fishing	45.5	18.2	20.0	41.7	23.2	18.8
Percentage change since baseline	Fishing	-54.1	-11.7	-11.4	-24.6	-65.8	-11.2
	Non-fishing	8.6	136.4	-15.3	-14.0	-56.0	22.1
Household ownership (mean + standard deviation)	Fishing	1.6 $\pm$ 4.0	0.7 $\pm$ 1.9	1.1 $\pm$ 2.5	4.1 $\pm$ 5.7	0.4 $\pm$ 0.9	1.5 $\pm$ 3.7
	Non-fishing	2.9 $\pm$ 4.5	0.8 $\pm$ 2.7	0.2 $\pm$ 0.4	1.1 $\pm$ 2.1	0.7 $\pm$ 1.5	0.3 $\pm$ 0.6
Percentage change since baseline	Fishing	-33.3	16.7	22.2	-31.7	-84.61	66.7
	Non-fishing	38.1	700.0	-85.7	-60.7	-82.9	50.0

4.8. Pirogue Ownership

Pirogue ownership amongst fishers is associated with the ability to sell catch without being restricted to a particular buyer/intermediary (*collecteur*), whereas fishers using a *collecteur* owned *pirogue* owned are obliged to sell only to the *pirogue* owner. Fishers who own a *pirogue* independent of a *collecteur* are not restricted in this way and can typically obtain a higher price. In 2018, lobster was bought for MGA 22,000/kg (\$6.35) from fishers using a *pirogue* owned by a *collecteur*, compared to MGA25,000/kg (\$7.20) from fishers who independently own *pirogue* (SEED Madagascar, 2018). In all communities, less than 50% of fishing households independently owned a *pirogue* at endline, and ownership decreased between 3.0 and 15.7 percentage points since baseline in all communities (Table 17).

Table 17. Pirogue ownership in lobster fishing households (endline n=490, baseline n=415).

	Target communities			Control communities		
	Elodrato	Itapera	Sainte Luce	Ambanihaz	Antsotso	Baie d'Italy
Household ownership (%)	10.7	20.8	24.5	31.5	11.1	29.4
Percentage point change since baseline	-3.0	-11.6	-15.7	-6.3	-8.3	-10.8

4.9. Gender and Involvement

There is a strong gender role division in fishery activities; harvesting is exclusively carried out by men, whereas both men and women are involved in pre- and post-harvesting activities. These deeply entrenched socio-cultural traditions are also present in community structures and decision-making systems, and undermine women's engagement with fishery and other natural resource management in the three target communities. Failing to include women in fisheries management weakens decision-making, reduces community ownership (Westerman & Benbow, 2013), and undermines compliance with management measures (Agarwal, 2000). Progress towards gender equity in fisheries management and project activities has been monitored throughout Project Oratsimba Phase III, through self-reported awareness of the project and fisheries management, and event attendance. Involvement in decision-making was also assessed in Elodrato and Sainte Luce.

In all three target communities, participants were surveyed about their awareness of the project and attendance at events. Awareness and attendance in Elodrato and Sainte Luce and attendance in Itapera remained higher for men compared to women at midline. In Itapera, project awareness was approximately the same for both men and women. Awareness of Project Oratsimba and fisheries management increased since midline for men and women in Elodrato and Sainte Luce and women in Itapera, but decreased for men in Itapera. Self-reported attendance at events related to fisheries management and/or Project Oratsimba increased since midline for men and women in Elodrato and Itapera and men in Sainte Luce, but decreased for women in Sainte Luce (Table 18).

Table 18. Gender and project awareness and involvement by community (endline n=351, baseline¹ n=267).

		Endline			Percentage point change since baseline ¹		
		Elodrato	Itapera	Sainte Luce	Elodrato	Itapera	Sainte Luce
Project awareness (%)	Women	33.3	29.3	63.9	19.5	15.0	21.0
	Men	51.7	29.1	80.4	16.7	-1.7	16.1
Event attendance (%)	Women	40.7	41.5	58.3	15.7	17.7	-6.0
	Men	70.7	61.8	90.7	15.7	15.6	6.8

¹ Baseline data on self-reported project awareness and event attendance was collected during the midline household survey in November and December 2019.

Awareness of and involvement in decision-making remained higher for men than women in both Elodrato and Sainte Luce at endline. In Sainte Luce, decision-making awareness remained approximately the same for women and slightly increased for men since baseline, whereas involvement in decision-making increased for both men and women. The majority of participants in both communities were interested in becoming more involved in decision-making in the future, however this was reported more frequently by men in both communities (Table 19).

Table 19. Gender and decision-making awareness and involvement in Sainte Luce and Elodrato (endline n=255, baseline n=97¹).

		Endline		Percentage point change since baseline ¹
		Sainte Luce	Elodrato	Sainte Luce
Aware of decision-making	Women (%)	80.6	42.6	-0.4
	Men (%)	98.1	77.6	3.5
Involvement in decision-making	Women (%)	61.1	51.9	17.2
	Men (%)	95.4	81.0	9.7
Interested in becoming more involved in decision-making	Women (%)	75.0	55.6	N/A
	Men (%)	100.0	81.0	N/A

¹ Baseline data on self-reported awareness of and involvement in decision-making was collected during the midline household survey in November and December 2019.

4.10. Support for a Permanent NTZ (Sainte Luce only)

Community-wide support for a permanent NTZ in Sainte Luce was assessed; participants were asked about their level of support for closing an area of the fishing ground to lobster fishing year-round. At endline, full support for a permanent NTZ remained low and decreased since baseline by 5.8 percentage points. However, some support increased by 37.5 percentage points, whilst no support decreased by 43.4 percentage points (Table 20).

Table 20. Sainte Luce community support for a permanent NTZ (endline n=143, baseline=98).

	Endline(n=143)	Percentage point change since baseline
Full support (%)	12.6	-5.8
Some support (%)	40.6	37.5
No support (%)	46.2	-32.4

¹ Baseline data on self-reported project awareness and event attendance was collected at midline household survey in November and December 2019.

4.11. Knowledge of National Fisheries Regulations

Knowledge of the three main national lobster fishery regulations was assessed:

- i) The national closed season for lobsters occurs annually between January 1st to March 31st inclusive in southern Madagascar, during which it is illegal to fish for lobsters. Participants were asked if fishing for lobster between January and March is allowed.
- ii) The prohibition on landing berried females prohibits bringing berried (egg bearing female) lobsters back to shore. Participants were shown a picture of a berried lobster and asked what they would do if they caught this lobster.
- iii) The Minimum Landing Size (MLS) of 20cm is the legal minimum size for lobsters caught to be brought back to shore. Participants were randomly shown one of four pictures of varying sizes of lobsters (10cm, 14cm, 18cm, and 20cm) and asked what they would do if they caught this lobster.

Knowledge was assessed for lobster fishers and non-fishers to assess community knowledge of these regulations. 67 participants were unwilling or unable to answer questions about one or more of the national lobster fishery regulations at endline. In all six communities, correct knowledge of all three national regulations combined and individually increased from baseline, with the exception of the national closed season in Baie d'Italy. Compared to

control communities, endline knowledge of the national closed season and MLS was higher for all target communities, knowledge of all three national regulations was higher for Elodrato and Sainte Luce, and the prohibition on landing berried females was higher for Elodrato (Table 21).

Table 21. Participants (%) demonstrating correct knowledge of national fisheries regulations disaggregated by community, participants that did not answer one or more questions are excluded (endline n=620, baseline n=508).

		Target communities			Control communities		
		Elodrato	Itapera	Sainte Luce	Ambanihazo	Antsotso	Baie d'Italy
Endline	All three national regulations	95.1	66.7	78.0	70.5	65.4	56.1
	National closed season	100.0	98.8	97.2	88.6	95.3	91.8
	Minimum landing size	95.1	69.0	85.1	75.0	68.2	61.2
	Prohibition on landing berried females	95.1	79.8	85.8	84.1	82.2	93.9
Percentage point change since baseline	All three national regulations	61.8	40.6	39.4	49.1	46.5	13.2
	National closed season	26.7	22.0	4.1	24.3	24.8	-2.1
	Minimum landing size	29.8	13.9	10.8	5.0	14.5	2.0
	Prohibition on landing berried females	55.1	33.4	35.3	45.5	54.8	26.5

4.12. Knowledge of Local Fisheries Regulations (Sainte Luce)

At the time of surveying, Sainte Luce was the only target community with a lobster fisheries *dina* legally ratified. Knowledge of two regulations contained within the Sainte Luce *dina* was assessed:

- i) The prohibition on fishing with a mask and snorkel. Participants were asked whether it is permitted to fish using a mask and snorkel in Sainte Luce.
- ii) Upcoming NTZ closure. Participants were asked whether fishing was permitted in the first NTZ closure of 2021 (May).

Endline knowledge of the prohibition on fishing with a mask and snorkel remained high at 100.0% of participants; a slight increase of 2.8 percentage points since baseline. Endline knowledge of an upcoming NTZ closure remained low at 7.0% of participants, and decreased by 4.8 percentage points since baseline (Table 22).

Table 22. Participant (%) knowledge of local fisheries regulations in Sainte Luce (endline n=143, baseline n=102).

	Endline	Percentage point change since baseline
Prohibition on fishing with a mask and snorkel	100.0	2.9
NTZ closure	7.0	-4.8

4.13. Knowledge of Governance and Enforcement Structures (Elodrato and Sainte Luce)

At the time of surveying, Sainte Luce was the only community to have a legally ratified and operational *dina*. To assess knowledge of governance and enforcement structures and their roles within these communities, participants were asked a series of questions related to the roles of various stakeholders in governance and enforcement, from community members to governmental bodies. For the purpose of the survey, the concepts of governance and enforcement were simplified. Community members use the terms LMMA and *dina* synonymously, and governance was defined as making decisions about the lobster fishing *dina* and NTZ.

Enforcement was defined as making sure the rules (*dina*) were followed and that associated fines were paid if the rules were broken.

The majority of participants in both communities correctly identified the individual involvement of stakeholders in governance, with the exception of fishers and non-fishers from other communities, which were incorrectly identified by the majority of participants as involved in governance. Complete correct knowledge of which stakeholders are and are not involved in governance was extremely low in both communities; 10.5% of participants in Sainte Luce and 0.0% of participants in Elodrato. However, complete incorrect knowledge was also low, reported by 0.0% of participants in Elodrato and Sainte Luce. 55.4% of participants in Elodrato and 86.0% in Sainte Luce identified six or more stakeholders correctly (Table 23).

Table 23. Participant (%) knowledge of different stakeholders involved in governance (n=255).

	Elodrato	Sainte Luce
<i>“Are ... involved in making decisions about the dina and NTZ?”</i>		
Community members who are not fishers	62.5	86.7
Women	66.7	97.2
People from another community who are not fishers ¹	50.9	74.1
Fishers	73.2	97.2
Fishers from another community ¹	57.1	76.2
Fisheries Management Committee	74.1	99.3
Community Leader	74.1	99.3
Mayor	72.3	95.1
All correct	0.0	10.5
Six or more correct	55.4	86.0
All incorrect	0.0	0.0

¹ Residents of other communities are not permitted to be involved in decision-making.

The majority of participants in both communities correctly identified the individual involvement of different stakeholders in different roles in enforcement. Both complete correct knowledge and complete incorrect knowledge of all stakeholders was extremely low, reported by 0.0% of participants in both communities. 73.2% of participants in Elodrato and 99.3% in Sainte Luce correctly answers 13 or more statements (Table 24).

Table 24. Participant (%) knowledge of different stakeholders involved in enforcement (n=255).

	Elodrato	Sainte Luce
<i>“Are ... involved in making sure people follow the rules in the lobster fishing dina, including informing people about the dina or reporting if someone breaks the rules?”</i>		
Community members who are not fishers	66.1	92.3
Women	74.1	98.6
People from another community	66.1	83.9
Fishers	75.9	98.6
Fishers from another community	68.8	94.4
Fisheries Management Committee	76.8	98.6
Community Leader	75.9	99.3
<i>“Are ... involved in making sure people follow the rules in the lobster fishing dina, including informing fishers about the dina or not purchasing lobsters which have been caught against the rules in the dina?”</i>		
Collecteur	74.1	93.7
Rabbateur	75.0	93.7
<i>“If fishers from another community fish in this community’s fishing ground, should they follow the rules in the lobster fishing dina?”</i>		
	76.8	97.9
<i>“Are... involved in making sure people pay the fine when they have broken the rules in the lobster fishing dina?”</i>		
Community members who are not fishers	70.5	95.1
Women	74.1	97.9
Fishers	76.8	98.6
Fisheries Management Committee	75.9	99.3
Community Leader	75.9	100.0
Mayor	75.0	97.9
Court in Fort Dauphin	73.2	97.9
All correct	0.0	0.0
13 or more correct	73.2	99.3
All incorrect	0.0	0.0

4.14. Itapera Motivation and Engagement

The community of Itapera has rejected a periodic No Take Zone (NTZ) as a management measure, due to conflicts within the community between different gear users (pot users versus free-divers) and between resident and long-term migrant fishers. Lack of community cohesion undermines the effectiveness of community-based fisheries management (CBFM) measures. Consequently, Project Oratsimba adapted its approach during project year two and ceased promoting an NTZ as a management measure. Instead, the focus of project activities shifted to

increasing community support for CBFM. To monitor the community's support for CBFM and engagement with the project, a series of Likert scale statements were included in the midline and endline socioeconomic surveys.

There was complete agreement at endline that lobster stocks have declined, a slight increase from baseline by 5.5 percentage points. The majority of participants, 64.9%, were aware that current fishing effort will impact future catches; this increased by 52.2 percentage points since baseline. Less than half of participants disagree that lobster fishing will still be a livelihood without fisheries management. However, this has increased from baseline by 14.0 percentage points. Only 35.1% of participants agree that the community should continue to work with SEED, which is a decrease of 26.8 percentage points from baseline.

Table 25. Participant agreement (%) with Likert statements (endline n=94, midline n=73 and baseline n=63).

		Endline	Percentage point change since baseline ¹
There are fewer lobsters in the sea now than in the past. ²	Agree / Yes	100.0	5.5
	Neutral / Don't know	0.0	-1.4
	Disagree / No	0.0	-4.1
Fishers can catch as many lobsters as they want now, to sell or to eat, and in the future will still be able to catch many lobsters.	Agree / Yes	25.5	-58.6
	Neutral / Don't know	9.6	6.4
	Disagree / No	64.9	52.2
Lobster fishing will still be a source of income in the future if there is no fisheries <i>dina</i> (management).	Agree / Yes	45.7	-24.1
	Neutral / Don't know	14.9	10.1
	Disagree / No	39.4	14.0
The community should continue to work with Project Oratsimba and SEED to manage the lobster fishery.	Agree / Yes	35.1	-26.8
	Neutral / Don't know	30.9	19.8
	Disagree / No	34.0	7.0

¹ Baseline data was collected in June 2019.

² Change since midline.

5. Discussion

5.1. Livelihoods

Livelihood activities remained similar from baseline to endline, and lobster fishing has remained an important livelihood in both target and control communities. This is despite COVID-19 causing severe disruptions to lobster fishing from April 2020 onwards. Resumption of lobster fishing following the national closed season for lobster fishing, which occurs annually in southern Madagascar from January 1st – March 31st, was delayed by two weeks due to intermediaries returning to purchase lobsters late. Once lobster fishing activities did resume, fewer intermediaries were reported to be operating, and thus fewer available to purchase lobster in Sainte Luce. Furthermore, lobster catch prices significantly decreased compared to previous years. In 2019, the reported price received by fishers was 20,000 MGA/kg in Elodrato and Itapera, and between 20,000 – 25,000 MGA/kg in Sainte Luce. In April 2020, when lobster fishing resumed after the national closed season, reported prices were 10,000MGA/kg in all three communities (Savage, 2020). This significantly reduced household income for lobster fishing households. Whilst this data was only collected in target communities, anecdotal evidence suggests similar

impacts occurred in the control communities. COVID-19 also disrupted other important livelihood activities such as *mahampy* weaving, through travel restrictions and reduced access to markets for woven goods. Almost all participants from both lobster fishing and non-fishing households reported a decrease in household income since COVID-19 reached Madagascar.

5.2. Unsustainable Livelihood Practices

Reported unsustainable livelihood activities decreased overall in target communities, with the exception of the sale of shark meat or fins in Sainte Luce. However, unsustainable livelihood activities also decreased in control communities, with the exception of mosquito net fishing in Ambanihazao and bushmeat consumption in Baie d'Italy. Therefore, changes in reported household involvement in unsustainable livelihood practices have likely not been influenced as a result of project interventions. A major limitation of this study, however, is that reported household involvement in unsustainable livelihood activities may not be accurate, as for example bush meat consumption (of lemurs) is illegal and therefore may have been underreported.

In Sainte Luce, it was hoped that increased income from NTZ openings would reduce the frequency of unsustainable livelihood activities during NTZ openings. However, the results from this study suggest that during NTZ openings unsustainable livelihood activities are practiced more frequently compared to during NTZ closures. This may be explained by a combination of the increased distance fishers have to travel to fish when the NTZ is closed and the low economic resilience and high levels of poverty in Sainte Luce. Reported increases in catch and household income are temporary and immediately following NTZ openings. However, due to high levels of poverty, households maximise their potential income by diversifying their livelihood activities, including unsustainable livelihood practices.

5.3. Basic Necessities Survey

At endline, fewer items were identified as basic necessities compared to baseline, and the percentage of participants identifying items as basic necessities had also decreased for the majority of items individually. This is a significant downward revision of participant perceptions of what constitute basic necessities needed for life. This is not surprising, given the massively changing socioeconomic context in these communities. The COVID-19 pandemic has decreased household income and caused disruptions to lobster fishing (see Savage, 2020) and other livelihoods. This has been compounded by extreme food shortages and rising costs of living, due to restrictions on travel and trade coupled with seasonal drought in the region. A possible limitation of this study however was that the basic necessity item list used in the survey wasn't revised at endline. However, the downward revision of participant perceptions on what basic necessities are suggests this wasn't a major limitation.

The observed increases in poverty index scores were unexpected due to the worsening economic situation in the region. Perceptions of what constitutes a basic necessity have revised downwardly whilst basic necessity item ownership/access has also decreased. However, the data shows that access/ownership in general has decreased less than perceptions of basic necessities, which may explain the increase in poverty index scores observed. Increases in poverty index scores in Sainte Luce, and thus decreases in poverty, cannot solely be attributed to project interventions, namely the continued operation of the periodic NTZ. In Elodrato and Baie d'Italy, poverty index scores also increased. Whilst Elodrato made progress towards establishing an NTZ, the first NTZ opening and expected economic benefits will occur after project end. Furthermore, the percentage change in poverty index scores was highest in the control community of Baie d'Italy, where no fisheries management interventions were implemented. In all communities, endline poverty index scores were higher for lobster fishing households compared to non-fishing households, providing further evidence of the role of small-scale lobster fishing in poverty alleviation in the Anosy region of Madagascar.

5.4. Gender and Involvement

During Project Oratsimba Phase III, efforts towards gender equity in fisheries management have included the establishment of the Marine Ambassador Programme and delivery of women-only education sessions. The Marine Ambassador Programme trained female representatives from each community on public speaking, basic concepts of fisheries management, and topics such as women's role in fisheries. The Marine Ambassadors then led women-only education sessions. Whilst this study has demonstrated success towards increasing women's awareness of the project, attendance at events, and involvement in decision-making, a disparity between men and women is still observed, with significantly higher reported awareness, attendance, and involvement in decision-making by men. This is not surprising, given the strong gender division of fishing activities and entrenched socio-cultural traditions in community decision-making systems.

5.5. Knowledge of Fisheries Regulations

This study has demonstrated increases in knowledge of national fisheries regulations. However, increases were also observed in control communities, meaning increases in knowledge cannot solely be attributed to project activities. It should be noted that some outreach activities were conducted in control communities and representatives attended a regional lobster forum. Furthermore, other than Baie d'Italy located to the south of the regional capital Fort Dauphin, informal knowledge exchange between target and control communities cannot be ruled out due to the close proximity of communities. Anecdotal evidence shows that the control communities of Ambanihazo and Antsotso are aware of the fisheries management measures implemented in Sainte Luce and Elodrato. It should also be noted that knowledge of fisheries regulations does not necessarily lead to behaviour change, as economic necessity and export market demand may prevent fishers from adopting more sustainable behaviours in relation to national fisheries regulations.

6. Conclusion

This study presents the results of the endline socioeconomic survey conducted in target and control communities to assess the impact of Project Oratsimba Phase III interventions. This study should also be used to inform the design of future phases.

7. Acknowledgements

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Appendix A

Table 26. Full list of items used in survey

Item
Plastic bucket
Big cooking pot, size 60 for celebration
Big cooking pot for rice
Small metal spoon for eating
Mahampy mat
Fleece blanket
Metal lobster pot
Wooden lobster pot
Life jacket
Cement floor in house
Metal roof on house
Radio
Latrine
Zebu
<i>Antanosy</i> pirogue
<i>Vezo</i> pirogue
Fibreglass boat with motor
Bicycle
Shoes
Glass cup
Tin plate
Foam mattress
Bed
Mobile
Motor cycle
Television
Metal cooking tripod
Solar panel
Generator
Money to visit a doctor
Money to send all school age kids to school
Water from a well or tap in the community
Enough money to be able to save money

Appendix B

Table 27. Endline basic necessity item identification disaggregated by community and household involvement in lobster fishing, where f = lobster fishing household and nf = non-fishing household (n = 687). Dark grey highlights represent item identified as a basic necessity by <50.0% of participants

Basic Necessity Item	Target Communities						Control Communities							
	Elodrato		Itapera		Sainte Luce		Ambanihazoz		Antsotso		Baie d'Italy		Elodrato	
	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF
Mahampy mat	100.0	100.0	100.0	90.9	99.2	100.0	100.0	98.3	98.6	100.0	100.0	100.0	100.0	100.0
Metal spoon	98.7	97.0	100.0	100.0	97.7	100.0	100.0	98.3	100.0	100.0	97.7	100.0	98.7	97.0
Metal cooking tripod	98.7	100.0	97.3	95.5	99.2	90.0	100.0	98.3	98.6	100.0	98.8	93.8	98.7	100.0
Tin plate	93.7	97.0	98.6	100.0	96.2	100.0	100.0	98.3	98.6	100.0	100.0	100.0	93.7	97.0
Cooking pot for rice	100.0	100.0	95.9	100.0	98.5	100.0	100.0	96.7	97.1	100.0	91.9	93.8	100.0	100.0
Plastic bucket	97.5	100.0	82.4	68.2	97.7	100.0	100.0	98.3	100.0	98.2	100.0	93.8	97.5	100.0
Fleece blanket	91.1	90.9	85.1	86.4	98.5	100.0	100.0	100.0	97.1	89.3	83.7	81.3	91.1	90.9
Lobster pot (wooden)	93.7	57.6	100.0	45.5	89.5	20.0	91.7	16.7	90.0	5.4	88.4	25.0	93.7	57.6
Shoes	57.0	66.7	51.4	54.5	73.7	90.0	85.4	81.7	85.7	78.6	75.6	75.0	57.0	66.7
Money to visit a doctor	67.1	69.7	89.2	86.4	78.9	100.0	52.1	51.7	50.0	51.8	62.8	50.0	67.1	69.7
Antanosy pirogue	88.6	60.6	98.6	45.5	84.2	20.0	68.8	36.7	37.1	12.5	46.5	6.3	88.6	60.6
Zebu	55.7	72.7	95.9	95.5	57.1	100.0	77.1	66.7	40.0	44.6	31.4	6.3	55.7	72.7
Money to send all school age kids to school	63.3	51.5	83.8	86.4	72.2	100.0	43.8	43.3	50.0	51.8	48.8	31.3	63.3	51.5
Enough money to be able to save money	65.8	54.5	64.9	77.3	67.7	100.0	37.5	36.7	50.0	51.8	54.7	37.5	65.8	54.5
Water from a well or tap in the community	60.8	60.6	68.9	27.3	76.7	10.0	29.2	27.7	32.9	42.9	86.0	68.8	60.8	60.6
Bed	49.4	66.7	31.1	36.4	63.2	90.0	66.7	63.3	67.1	69.6	36.0	43.8	49.4	66.7

Baseline Basic Necessity Items not identified at endline														
Glass cup	38.0	54.5	24.3	18.2	66.9	90.0	60.4	46.7	50.0	60.7	31.4	37.5	38.0	54.5
Lobster pot (metal)	1.3	6.1	24.3	9.1	9.0	10.0	27.1	5.0	32.9	7.1	1.2	0.0	1.3	6.1
Latrine	0.0	3.0	5.4	9.1	3.0	0.0	18.8	6.7	4.3	7.1	3.5	0.0	0.0	3.0
Large cooking pot for celebrations	32.9	51.5	71.6	77.3	34.6	100.0	39.6	31.7	31.4	39.3	15.1	6.3	32.9	51.5
Life jacket	24.1	24.2	71.6	36.4	56.4	20.0	35.4	5.0	37.1	3.6	25.6	12.5	24.1	24.2
Radio	35.4	51.5	19.0	13.6	36.8	30.0	41.7	35.0	25.7	37.5	19.8	18.8	35.4	51.5

Appendix C

Table 28. Percentage point change in basic necessity item identification disaggregated by community and household involvement in lobster fishing, where; f = lobster fishing household and nf = non-fishing household (endline n=687, baseline n=534) dark grey represents decreases.

Basic Necessity Item	Target Communities						Control Communities							
	Elodrato		Itapera		Sainte Luce		Ambanihazoz		Antsotso		Baie d'Italy		ALL	
	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF
Mahampy mat	1.9	0.0	3.3	-9.1	0.6	7.1	0.0	-1.7	2.4	5.3	3.7	0.0	2.1	0.0
Metal spoon	0.7	-3.0	1.6	0.0	-2.3	0.0	0.0	-1.7	1.3	0.0	-2.3	0.0	-0.4	-1.0
Metal cooking tripod	0.6	2.3	-1.1	-4.5	-0.8	-10.0	2.0	-1.7	-1.4	0.0	2.2	9.2	0.3	0.2
Tin plate	-4.4	-0.7	1.9	0.0	-2.4	0.0	0.0	-1.7	2.4	0.0	0.0	0.0	-0.6	-0.3
Cooking pot for rice	1.9	2.3	-4.1	0.0	-0.1	0.0	2.0	-3.3	-1.6	0.0	-7.0	1.5	-1.6	0.0
Plastic bucket	1.3	0.0	-17.6	-31.8	-0.9	0.0	0.0	1.3	1.3	3.5	9.0	1.5	-0.7	-2.9
Fleece blanket	-3.1	-2.1	6.4	17.2	1.4	0.0	8.2	15.2	8.5	-0.2	26.4	19.8	9.7	6.8
Lobster pot (wooden)	-2.5	4.1	3.3	-16.0	-6.2	-72.9	-8.3	-34.3	-8.7	-52.5	-9.4	-36.5	-5.7	-34.9
Shoes	-31.5	-26.3	-38.8	-22.4	-14.7	-10.0	-4.4	-9.2	-5.4	-10.9	-9.8	-17.3	-17.9	-16.0
Money to visit a doctor	-29.1	-27.0	-10.8	-13.6	-6.6	7.1	-39.7	-36.2	-41.1	-37.7	-18.1	-42.3	-21.0	-32.4
Antanosy pirogue	5.9	-9.2	23.2	-0.7	-11.5	-72.9	-29.2	-33.0	-42.6	-50.7	-28.8	-39.9	-11.3	-35.2
Money to send all school age kids to school	-34.8	-43.8	-16.2	-13.6	-17.7	0.0	-54.2	-41.5	-37.3	-42.9	-38.8	-45.6	-38.7	-29.5
Zebu	-36.6	-6.4	32.0	41.7	-27.0	7.1	-10.7	0.0	-37.2	-39.6	-34.9	-62.9	-19.4	-13.4
Enough money to be able to save money	-30.4	-40.8	-31.8	-22.7	-20.7	7.1	-58.4	-51.1	-39.8	-27.1	-26.2	-39.4	-31.0	-37.8
Water from a well or tap in the community	-35.4	-34.7	-31.1	-72.7	-20.4	-90.0	-58.6	-45.0	-51.9	-36.0	-14.0	-31.2	-30.8	-49.3
Bed	-37.1	-26.3	-39.4	-2.1	-19.4	-2.9	-10.9	-3.3	-1.3	11.7	-4.4	28.4	-16.2	-5.7

Appendix D

Table 29. Endline ownership/access to basic necessity items disaggregated by community and household involvement in lobster fishing where; f = lobster fishing household and nf = non-fishing household (n=687) dark grey represents decreases.

Basic Necessity Item	Target Communities								Control Communities					
	Elodrato		Itapera		Sainte Luce		Ambanihazoz		Antsotso		Baie d'Italy		ALL	
	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF
Mahampy mat, hand woven reed mat	100.0	100.0	95.9	100.0	96.2	80.0	95.8	95.0	100.0	98.2	98.8	100.0	99.6	98.5
Metal spoon	98.7	97.0	98.6	100.0	97.7	100.0	97.9	98.3	100.0	100.0	98.8	100.0	98.8	99.0
Metal cooking tripod	98.7	87.9	100.0	100.0	99.2	90.0	97.9	98.3	100.0	98.2	95.3	87.5	98.8	98.0
Tin plate	96.2	97.0	95.9	100.0	97.7	100.0	97.9	100.0	100.0	100.0	98.8	100.0	97.6	99.0
Cooking pot for rice	100.0	100.0	91.9	86.4	98.5	100.0	97.9	95.0	97.1	98.2	100.0	100.0	98.5	97.1
Plastic bucket	97.5	100.0	98.6	90.9	98.5	100.0	97.9	96.7	98.6	96.4	100.0	100.0	96.3	94.9
Fleece blanket	87.3	97.0	86.5	77.3	95.5	100.0	97.9	96.7	97.1	83.9	79.1	75.0	92.4	92.7
Lobster pot (wooden)	79.7	6.1	97.3	18.2	79.7	10.0	93.8	6.7	82.9	3.6	90.7	12.5	91.8	24.4
Shoes	86.1	90.9	78.4	72.7	91.7	100.0	95.8	76.7	80.0	69.6	73.3	62.5	70.8	75.1
Money to visit a doctor	49.4	66.7	9.5	13.6	43.6	20.0	29.2	20.0	24.3	17.9	55.8	37.5	69.0	60.9
Antanosy pirogue	8.9	15.2	21.6	9.1	24.1	20.0	45.8	20.0	10.0	12.5	31.4	6.3	72.2	31.5
Money to send all school age kids to school	38.0	48.5	12.2	9.1	41.4	10.0	14.6	11.7	25.7	14.3	45.3	25.0	62.4	53.8
Zebu	26.6	45.5	20.3	18.2	27.1	20.0	70.8	41.7	18.6	23.2	41.9	18.8	57.8	61.4
Enough money to be able to save money	44.3	57.6	4.1	9.1	45.1	10.0	14.6	18.3	25.7	16.1	51.2	18.8	59.2	51.8
Water from a well or tap in the community	63.3	60.6	64.9	27.3	75.9	10.0	6.3	5.0	22.9	25.0	91.9	75.0	63.7	39.6
Bed	74.7	78.8	43.2	50.0	71.4	90.0	70.8	61.7	55.7	58.9	24.4	25.0	52.2	62.4

Appendix E

Table 30. Percentage point change in basic necessity item ownership/access disaggregated by community and household involvement in lobster fishing where; f = lobster fishing household and nf = non-fishing household (endline n=687, baseline n=553) dark grey represents decreases.

Basic Necessity Item	Target Communities						Control Communities							
	Elodrato		Itapera		Sainte Luce		Ambanihazo		Antsotso		Baie d'Italy		ALL	
	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF	F	NF
Mahampy mat	0.0	4.7	-2.4	7.7	-2.6	-20.0	-4.2	-2.0	0.0	3.5	2.2	0.0	0.8	2.1
Metal spoon	0.7	-3.0	0.3	0.0	-2.3	5.9	-2.1	-1.7	1.3	0.0	-1.2	0.0	-0.5	-0.3
Metal cooking tripod	0.7	-0.5	4.9	15.4	-0.8	-4.1	-2.1	1.4	0.0	-1.8	6.6	33.7	2.2	8.9
Tin plate	-1.9	-3.0	-4.1	0.0	-1.1	0.0	-2.1	0.0	3.8	0.0	1.1	0.0	-0.7	-1.0
Cooking pot for rice	0.0	2.3	-8.1	-13.6	0.8	0.0	-2.1	-5.0	-2.9	-1.8	0.0	23.1	-1.0	0.0
Plastic bucket	-0.6	4.7	3.6	-1.4	-1.5	11.8	0.0	2.7	-0.2	-3.6	23.6	7.7	2.8	0.7
Fleece blanket	2.7	94.6	4.5	61.9	7.3	76.5	2.0	87.6	9.8	68.1	40.9	75.0	15.5	7.9
Lobster pot (wooden)	-12.6	3.7	3.9	2.8	-3.8	-13.5	-6.3	-2.4	-14.6	-12.2	-4.8	12.5	-1.5	15.0
Shoes	-2.4	-4.4	-11.8	-19.6	-2.4	0.0	-4.2	-11.2	-14.9	-14.6	-17.8	-29.8	-22.2	-16.9
Money to visit a doctor	26.3	36.4	-13.5	-17.1	26.0	8.2	19.0	-7.3	-2.3	-8.5	50.2	29.8	51.7	36.3
Antanosy pirogue	-10.4	8.2	5.2	-6.3	-20.6	2.4	3.0	-10.3	-7.7	-13.8	-10.2	6.3	40.9	14.8
Money to send all school age kids to school	20.7	27.6	-2.6	9.1	28.4	-7.6	-18.1	-27.7	-11.0	-12.0	30.7	17.3	41.4	31.3
Zebu	-31.1	3.6	-2.7	10.5	-3.5	-3.5	-23.0	-6.8	-35.9	-29.4	-5.3	3.4	9.4	24.4
Enough money to be able to save money	21.2	29.7	-23.8	1.4	28.6	-7.6	-3.8	-8.9	0.4	-10.2	47.8	18.8	41.1	30.1
Water from a well or tap in the community	19.1	21.1	-26.9	-65.0	-5.2	-72.4	-1.9	-10.2	-21.4	-1.3	-7.0	-25.0	-2.6	-8.2
Bed	1.6	9.0	-19.1	-3.8	-7.4	13.5	-6.7	-5.0	-2.5	-9.5	-5.9	-5.8	-9.0	-2.1