

The sustainability of trading fish: evaluating the socioeconomic impacts of beach seines on small- scale fish traders on the coast of Kenya

Angela Yang
Dr. Tim McClanahan

angela.yang987@gmail.com



Introduction

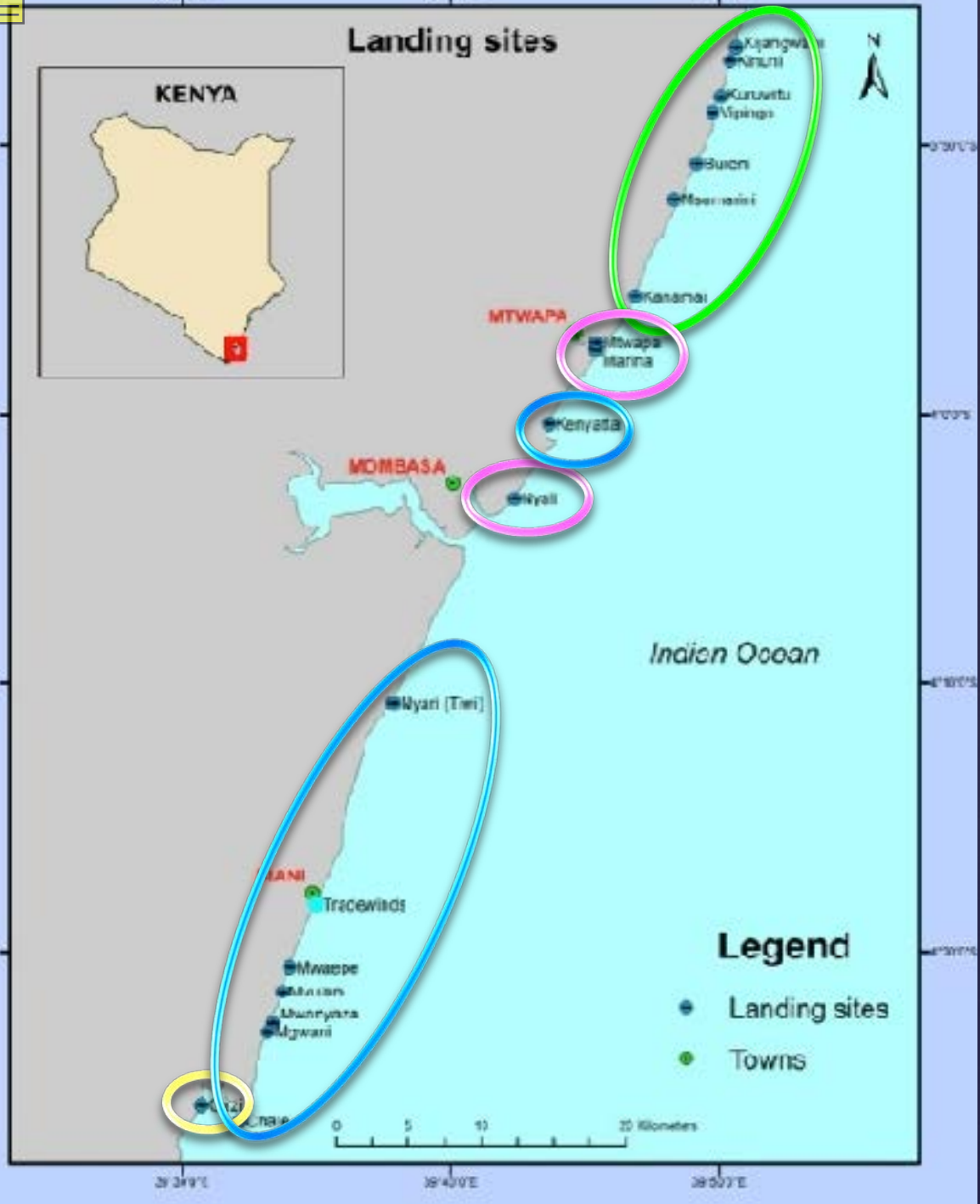
Beach seines have been banned in Kenya since 2001. However, they continue to be used, despite the known detrimental impacts on the environment and the livelihoods of *fishers*. One argument for continuing to use beach seines is that they provide employment opportunities in poor economic environments, particularly for the female fish traders.



This study aims to investigate:

- 1) The impact of beach seines on the socioeconomic status of fish traders
- 2) Other variables that may contribute to significant differences in socioeconomic status of fish traders
- 3) Fish traders' knowledge of marine resources and fisheries management
- 4) The “adaptability” of fish traders in the context of changing resources





Study Sites

19 Fish Landing Sites were divided into four “treatments” by their use of beach seines:

- No seine – historically never used beach seines (7)
- Seasonal seine – beach seines used seasonally (1)
- Seine – beach seines used year round (3)
- Stop Seine – stopped use of beach seines (8)



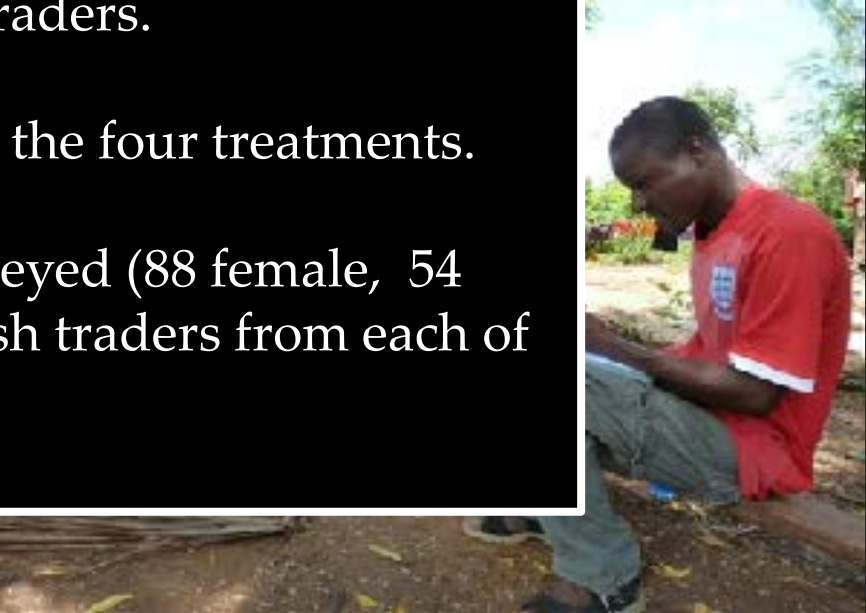

Methodology

382 names of traders were collected from 19 Fish Landing Sites.

Fish traders were approximately two-thirds female and one-third male and each treatment had between 90-100 Fish Traders.

Traders were grouped into the four treatments.

142 Fish Traders were surveyed (88 female, 54 male), approximately 35 fish traders from each of the four treatments.



Who are the fish traders?

CHARACTERISTIC	MEAN	STANDARD ERROR	STANDARD DEVIATION	MIN	MAX
Age	39.01	1.03287225	12.30809335	19	83
Education (Years of Formal Schooling)	4.25	0.31006114	3.694804901	0	14
Number of Household Members involved in Fish Trade	1.38	0.058901809	0.701896058	1	4
Number in Household	7.39	0.273337867	3.257196607	1	19
Hours/Week in Fish Trade					112
Net Weekly Income					140000
Weekly Food Expenditure					14000
Number of Years in Trade					50
Kg of Fish on "Good Day"					1000
Kg of Fish on "Bad Day"					150
Kg of Fish per Day					575
Kg of Fish Consumed					4

The "average" fish trader is close to 40 years old with limited education supporting a household of 7 by working 55 hours per week.

Across treatments, there was no significant demographic difference among the fish traders.

CHARACTERISTIC	MEAN	STANDARD ERROR	STANDARD DEVIATION	MIN	MAX
Age					40.5
Education (Years of Formal Schooling)					4.91
Number of Household Members involved in Fish Trade					1.21
Number in Household					6.35
Hours/Week in Fish Trade	48.63	56.17	61.86		54.64
Net Weekly Income	6,648.00	9,919.43	2,261.51		4,665.76
Weekly Food Expenditure	2,456.58	3,810.00	2,219.00		2,677.06
Number of Years in Trade	11.42	11.34	9.07		10.99
Kg of Fish on "Good Day"	49.04	89.83	14.89		25.96
Kg of Fish on "Bad Day"	5.84	13.64	3.21		6.22



Results

Three proxies were used to measure relative wealth:

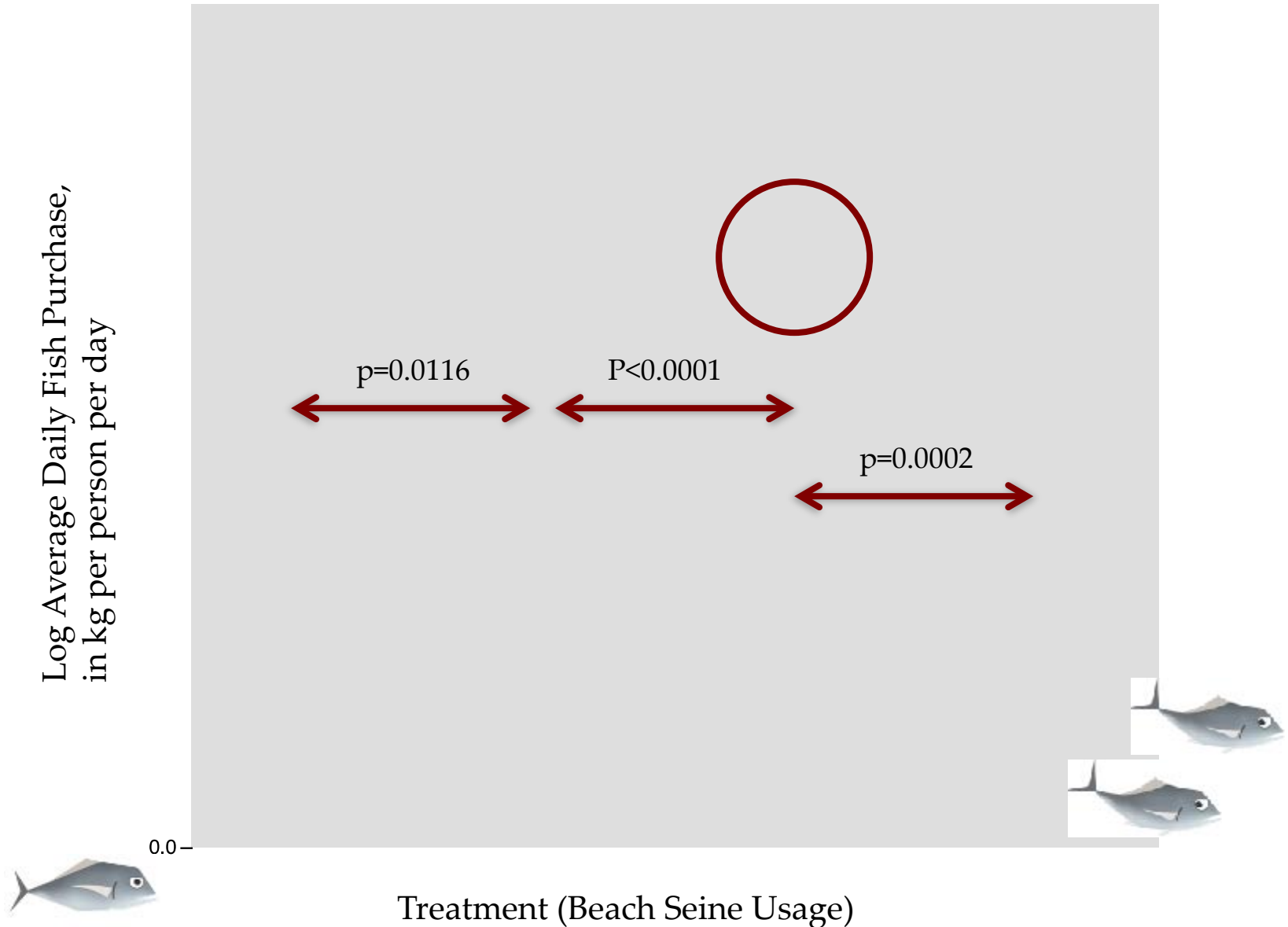
- 1) self-reported weekly income
- 2) Material Style of Life (MSL)
- 3) Weekly Food Expenditure (WFE)



Average Fish Purchased Per Day by Treatment

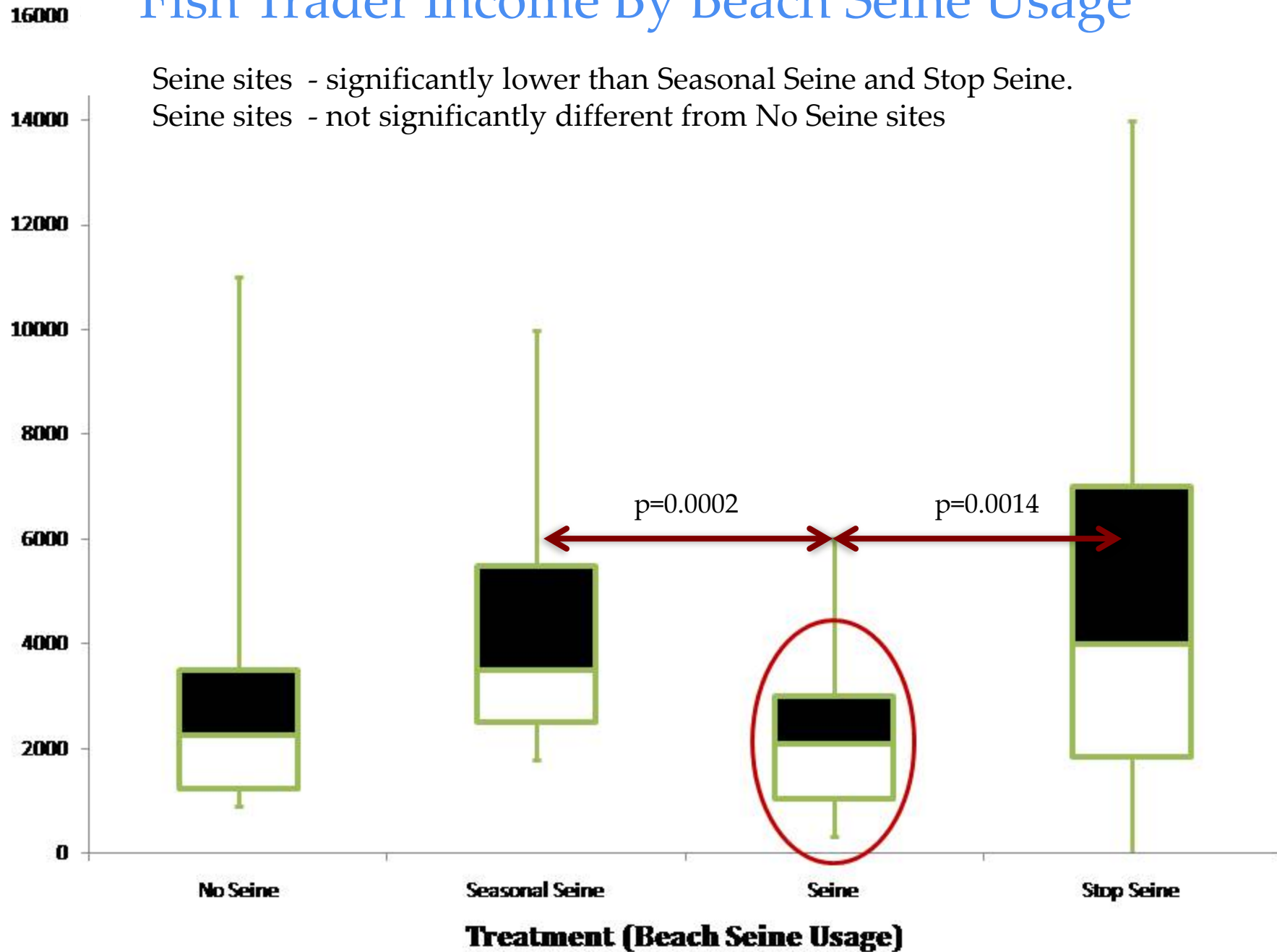
Seine sites - significantly lower than Seasonal Seine and Stop Seine.

Seasonal Seine sites - significantly different from No Seine sites

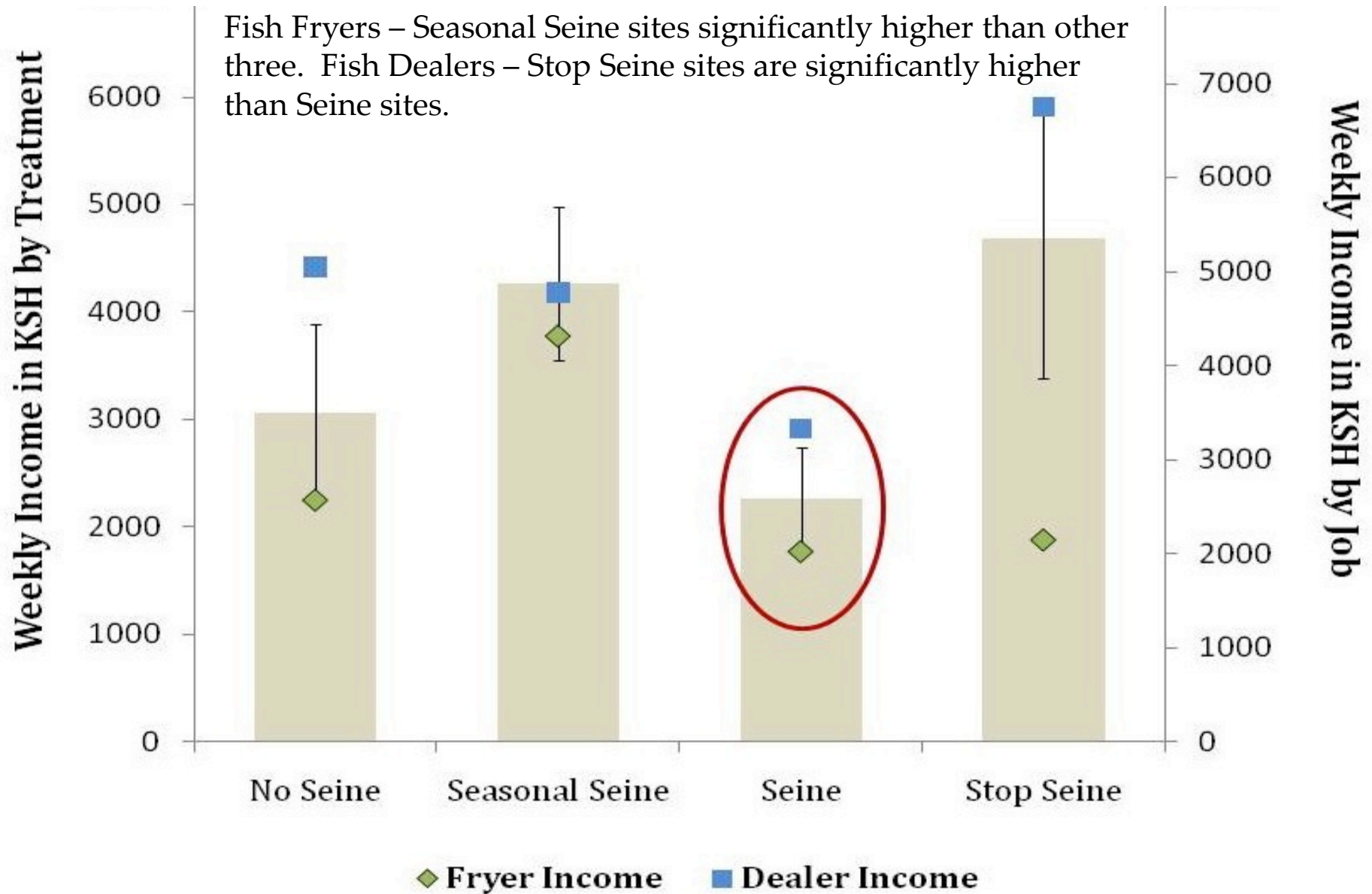


Fish Trader Income By Beach Seine Usage

Seine sites - significantly lower than Seasonal Seine and Stop Seine.
Seine sites - not significantly different from No Seine sites



Fish Trader Income By Job And Beach Seine Usage



Material Style of Life (MSL)

Rotated Component Matrix

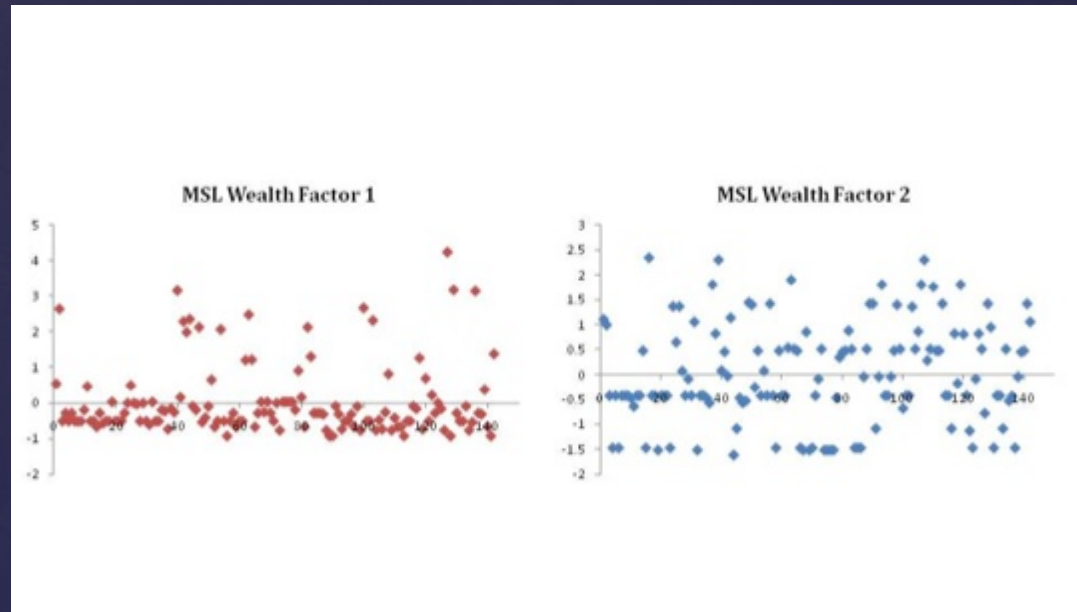
(converged in 3 iterations)

Item	Component	
	1	2
Television	0.878	0.145
Generator/Electricity	0.853	0.112
VCR/DVD Player	0.806	0.114
Refrigerator	0.599	0.182
Metal Roof	0.547	0.102
Cement Floor	0.524	0.429
Electric Fan	0.494	-0.068
Car/Motorbike	0.466	0.008
Mobile Phone	0.051	0.691
Bicycle	0.109	0.689
Hurricane Lamp	-0.039	0.647
Kerosene	0.399	0.412

**Bold denotes high factor loading (>0.4)*

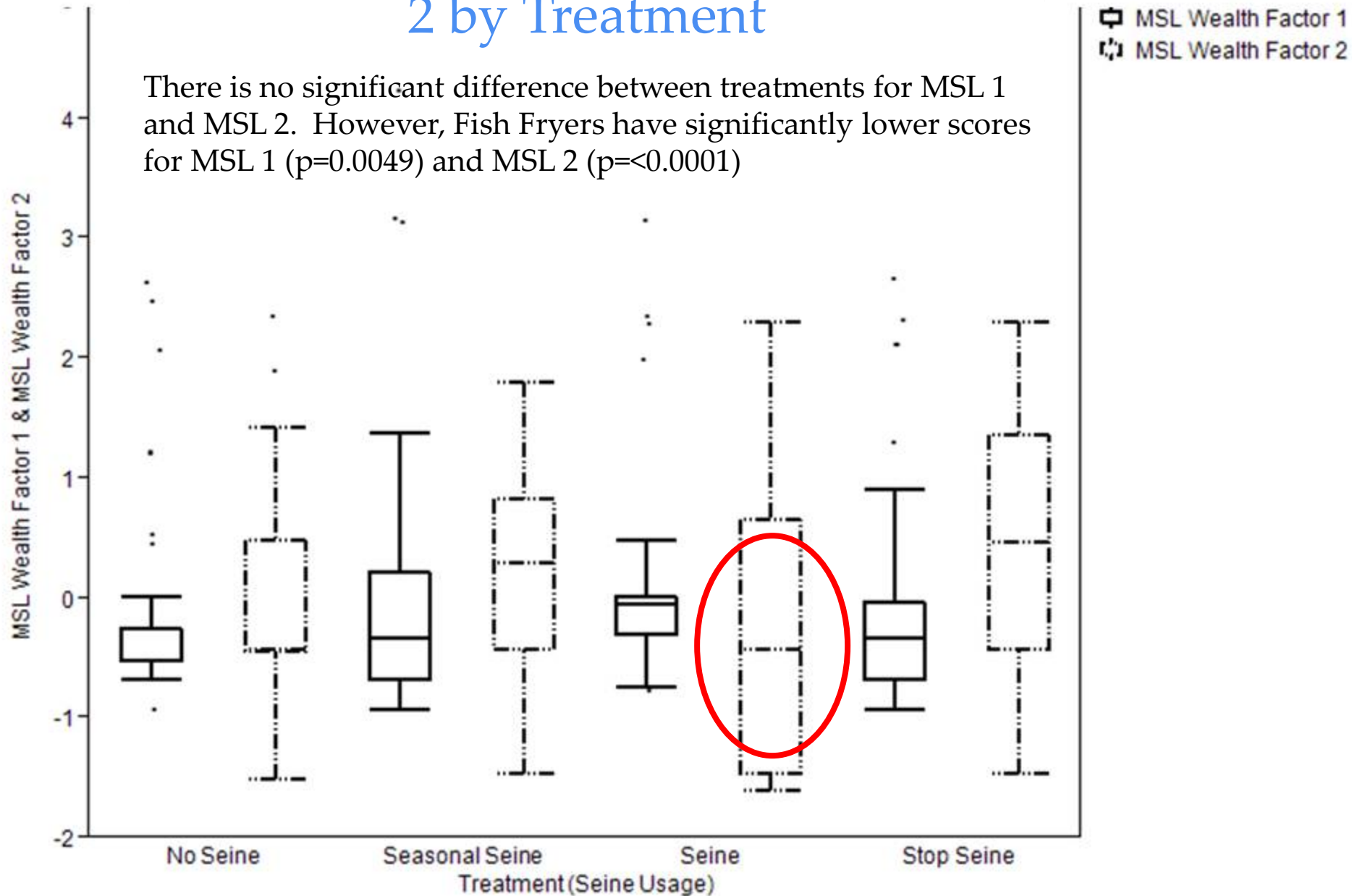
Extraction Method: Principal Component Analysis

Rotation Method: Varimax with Kaiser Normalization

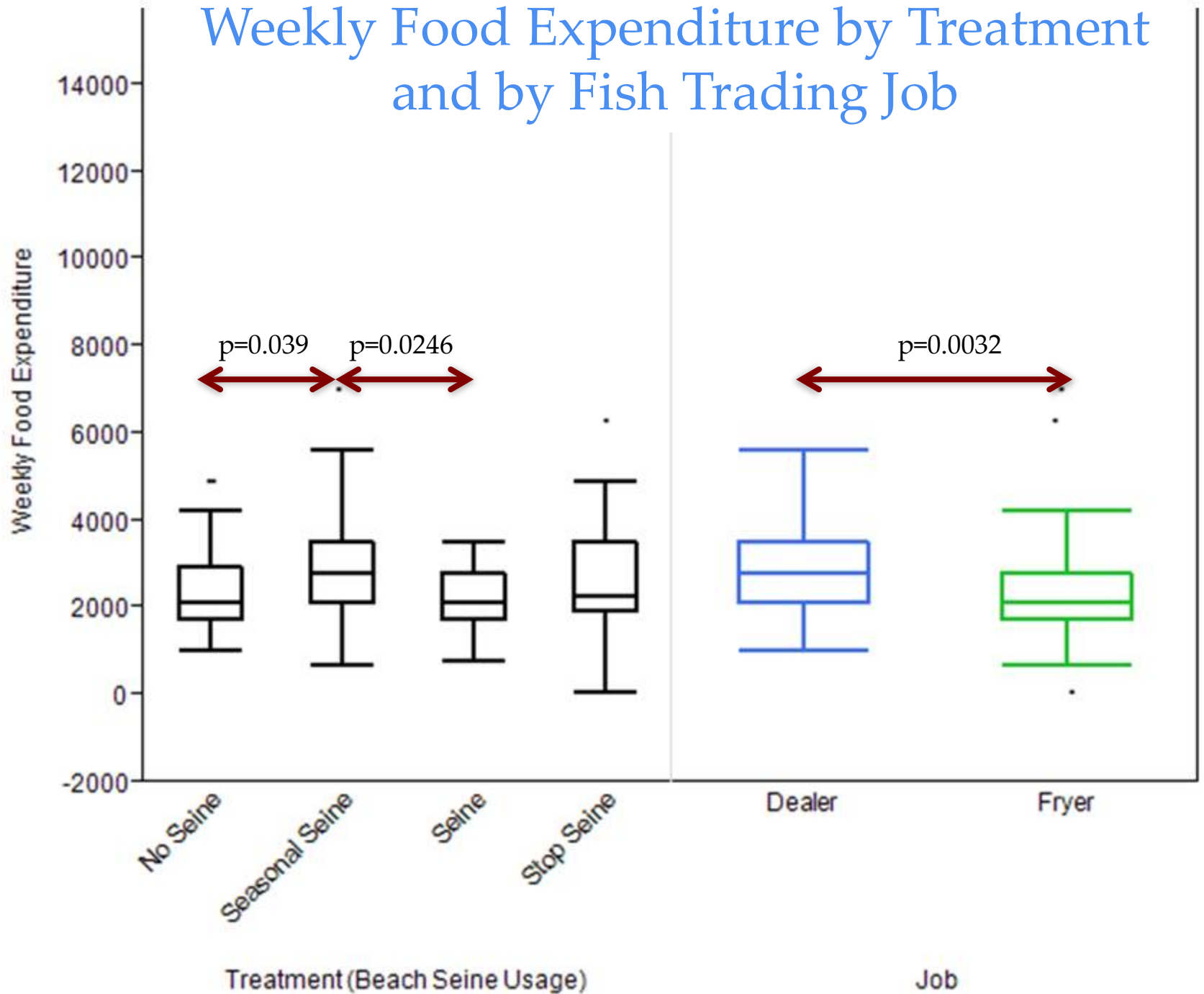


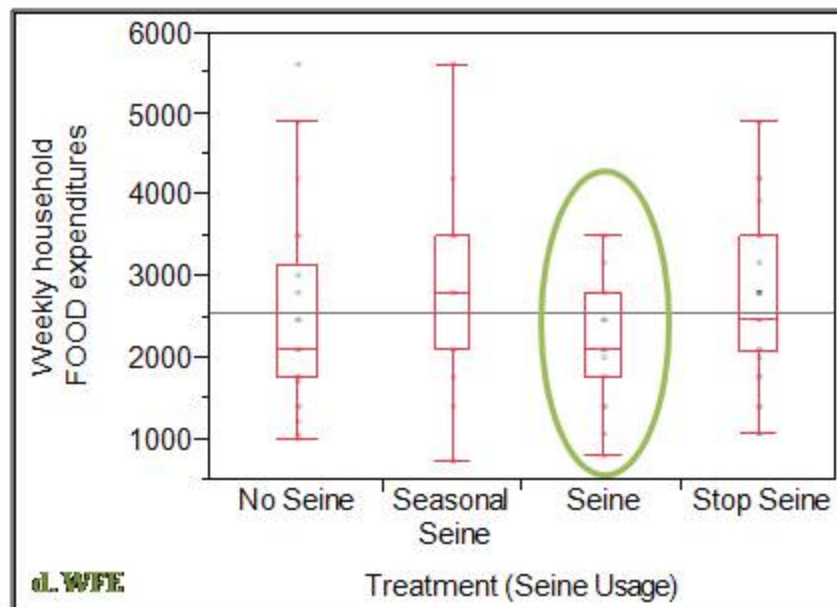
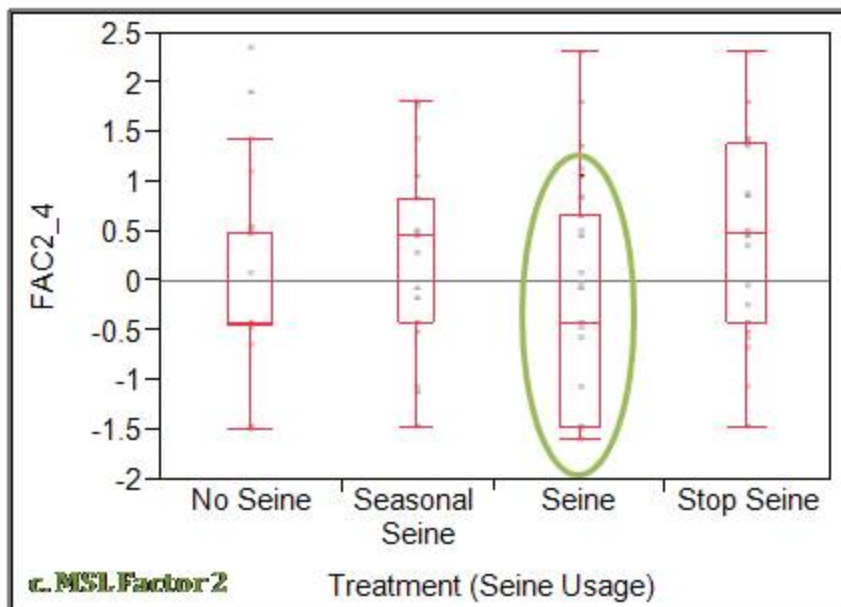
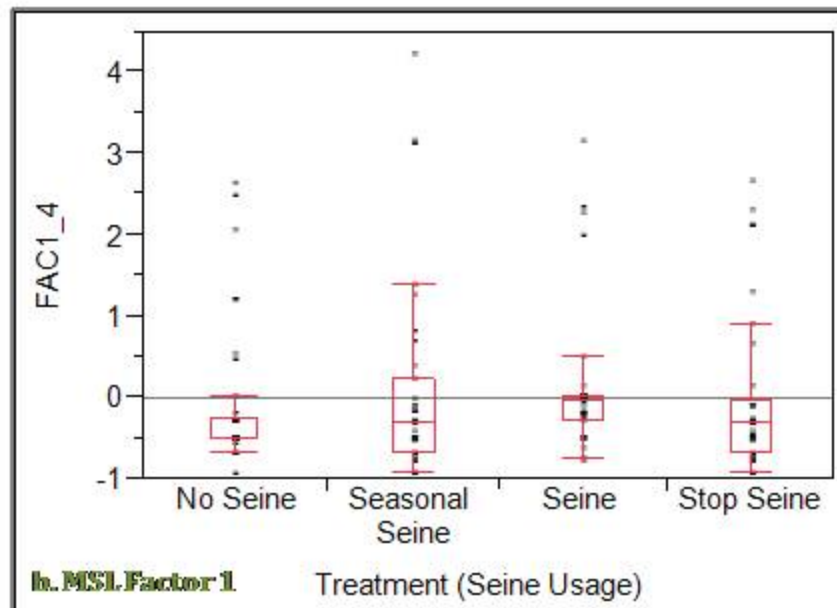
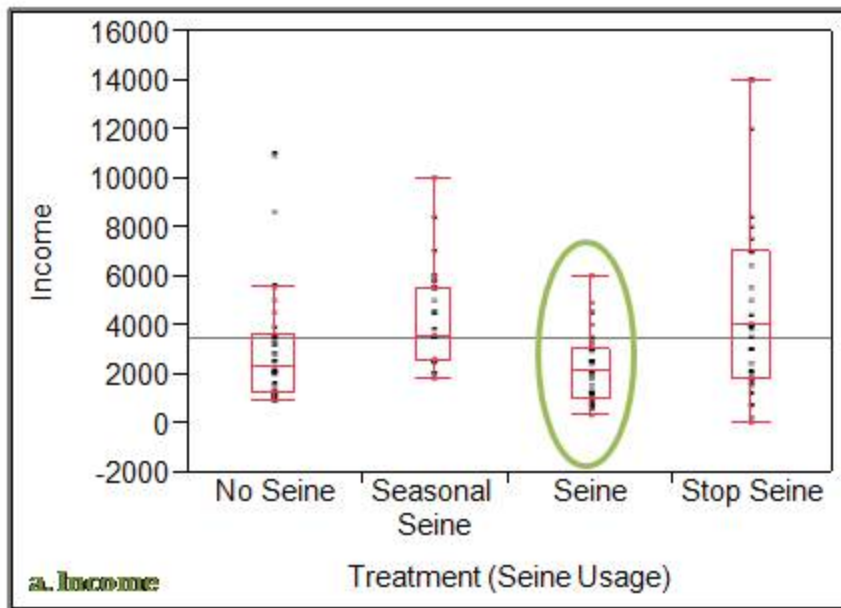
MSL Wealth Component Scores 1 & 2 by Treatment

There is no significant difference between treatments for MSL 1 and MSL 2. However, Fish Fryers have significantly lower scores for MSL 1 ($p=0.0049$) and MSL 2 ($p<0.0001$)



Weekly Food Expenditure by Treatment and by Fish Trading Job



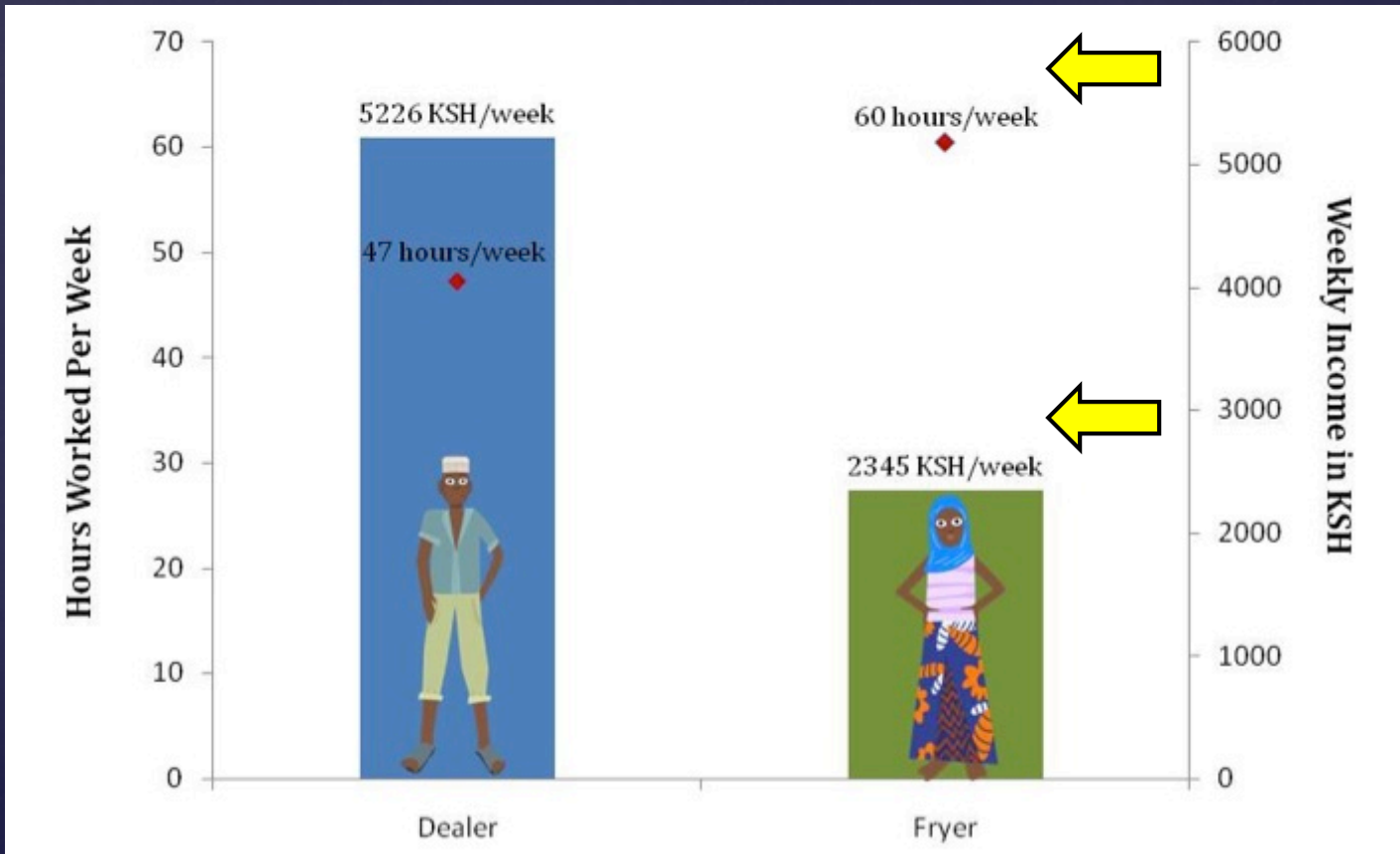


Gender and Fish Trading Jobs

About 2/3 of Fish traders are female. Most female fish traders are Fish Fryers so gender and job are highly correlated.

Fish Fryers purchased the least amount of fish, earned the least money, and worked the most hours.

MSL Wealth Factor 2 scores were significantly lower for Fish Fryers ($p < 0.0001$)



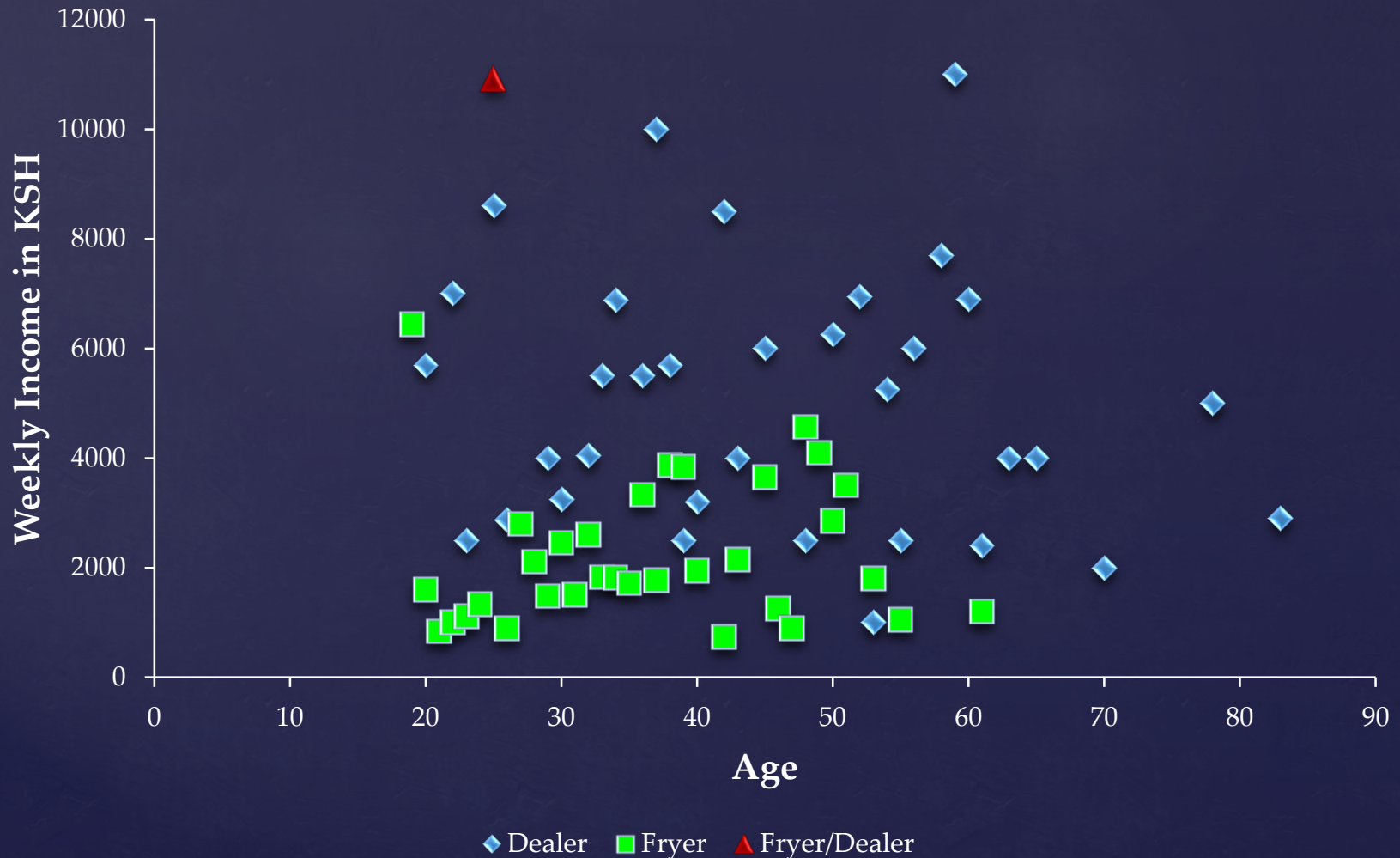
Fish Fryers used 100% or more of their weekly income on food for the household alone. Several Fish Fryers earned “negative” income.

	Mean Weekly Income	Mean Weekly Food Expenditure	Food Expenditure as percentage of Income
Dealers (n=58)	10896.55	3369.31	30.92%
F	25428.57	5285.71	20.79%
M	8901.96	3106.27	34.89%
Fryers (n=83)	2345.46	2388.13	101.82%
F	2367.16	2381.44	100.60%
M	1766.67	2566.67	145.28%
Fryer/Dealer (n=1)	10920.00	1750	16.03%



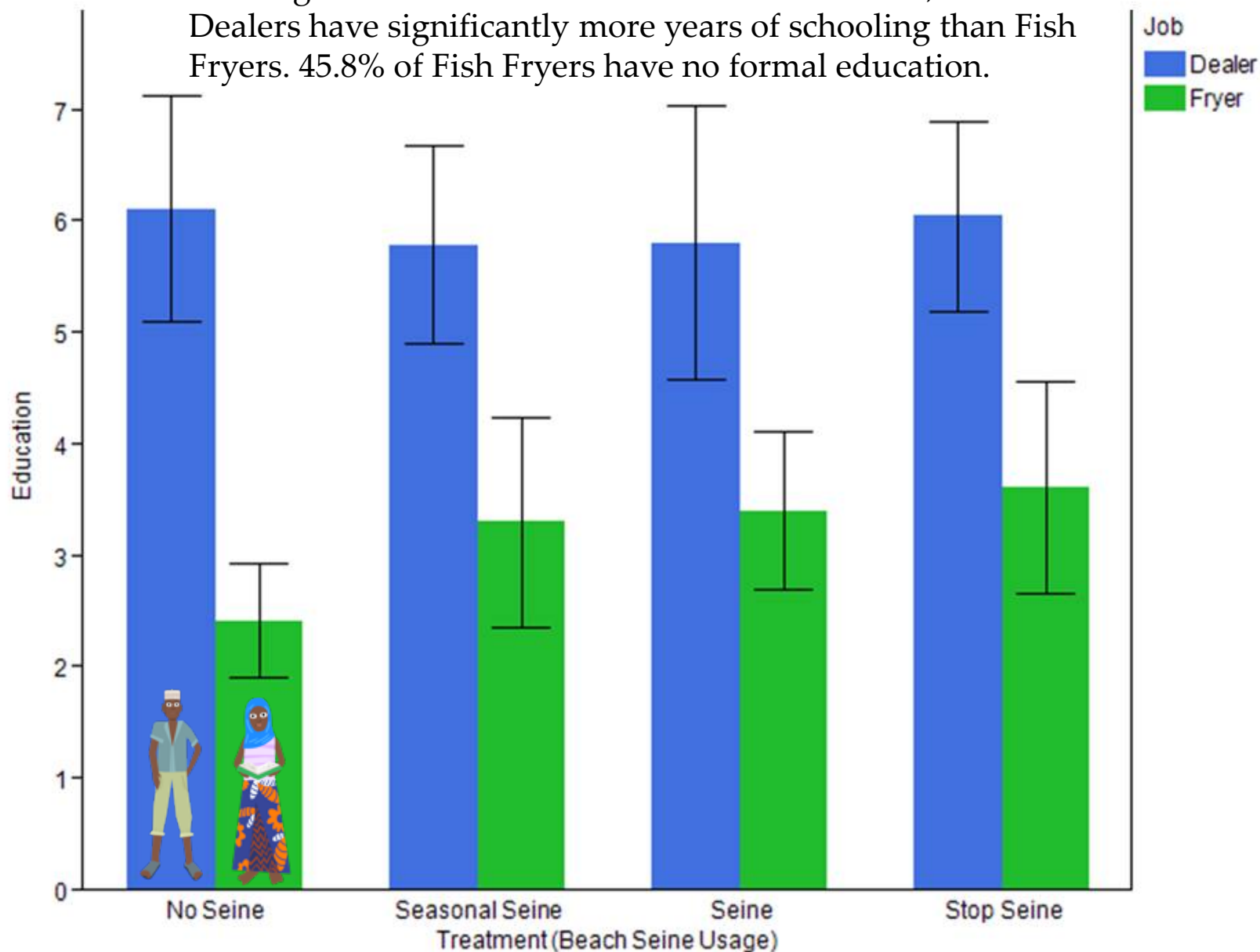
Age

Age was positively correlated with income ($p= 0.0354$, $y= 2015.4164 + 38.69583x$) and consequently Weekly Food Expenditure ($p= 0.0331$, $y=1973.8159 + 14.865903x$). Age is significantly different between fish traders ($p=0.0027$)



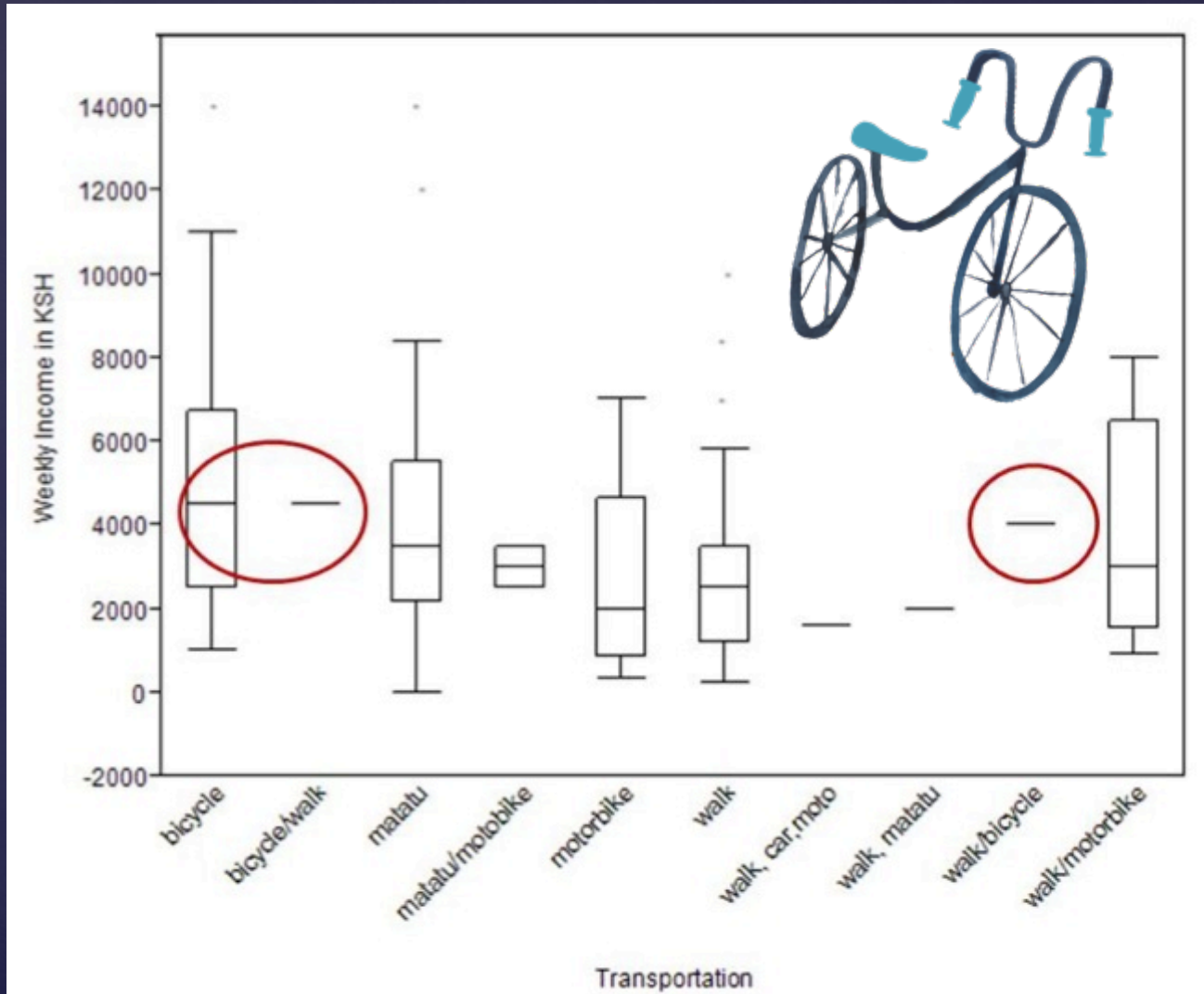
Education by Treatment and Job

Although education across *treatments* is consistent, Fish Dealers have significantly more years of schooling than Fish Fryers. 45.8% of Fish Fryers have no formal education.



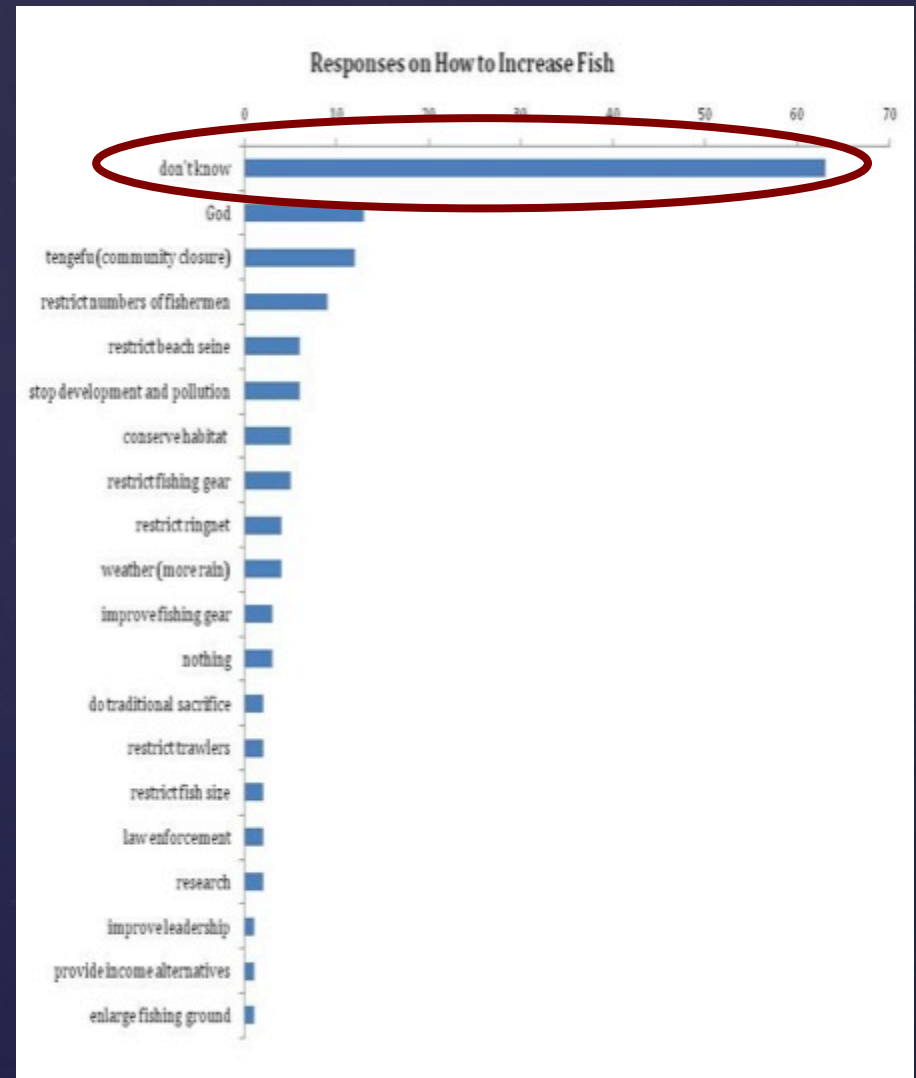
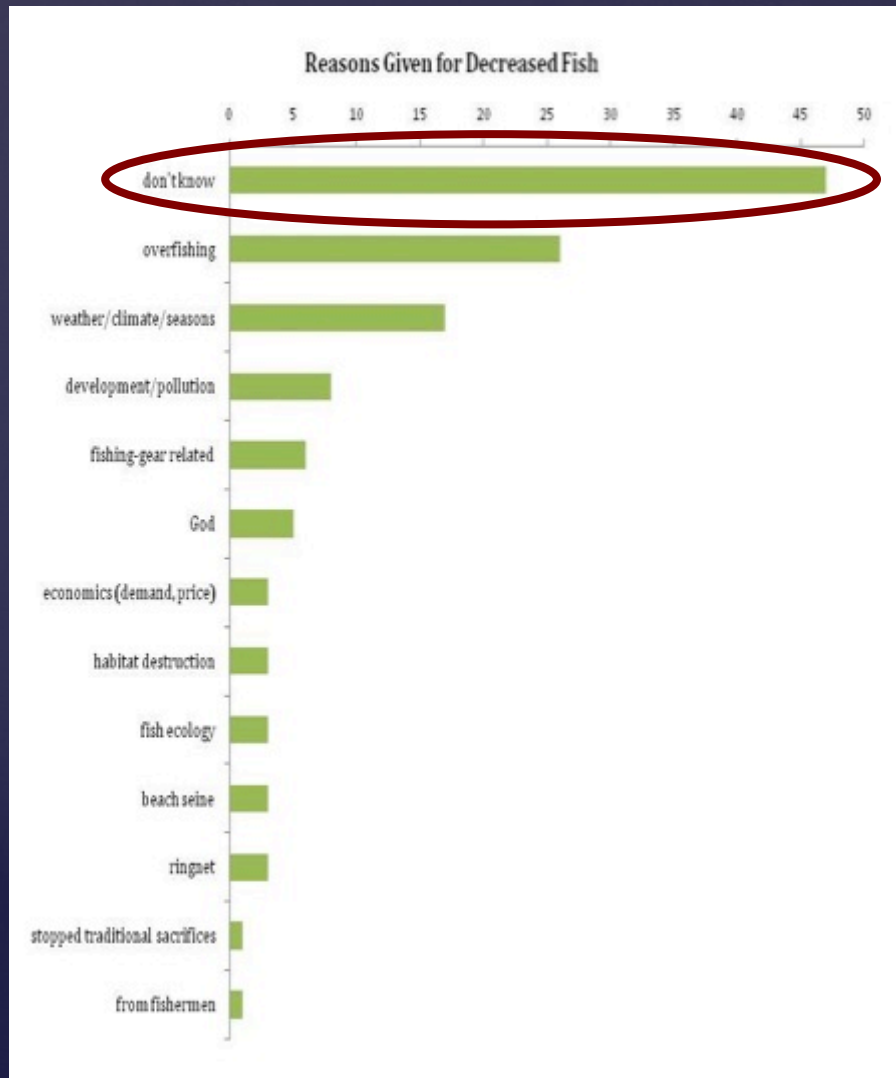
Transport

Modes of transport impacted all proxies for relative wealth, with bicycles playing a key role. Only Fish Dealers used bicycles, although bicycles were in 12 Fish Fryer households as well.



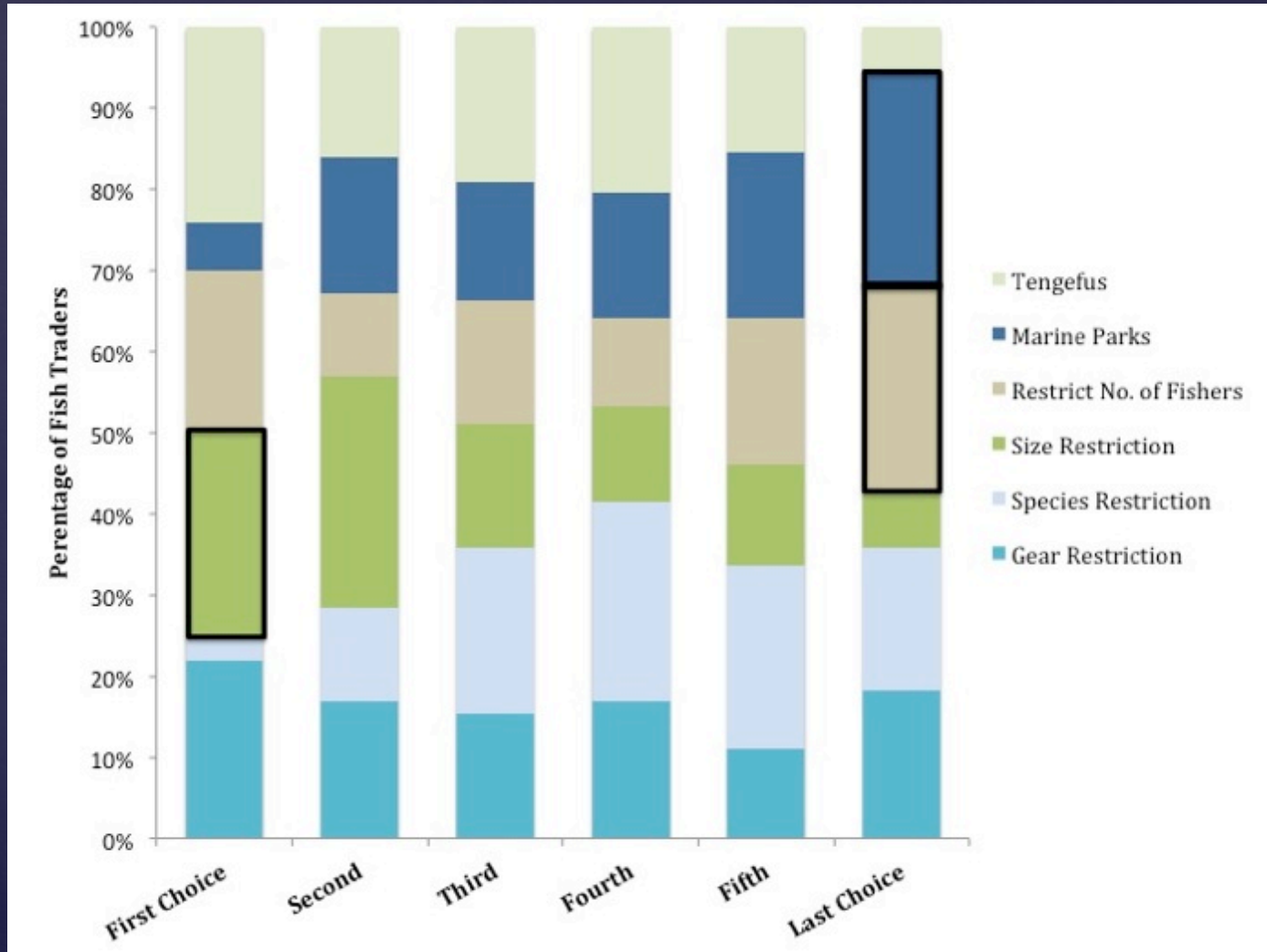
Marine Perceptions

Although 83.8% of fish traders were aware that there was less fish, the majority did not know the reasons why or how to increase fish.



Fishery Management Preferences

When asked to rank 6 management approaches, size restriction was the most preferred by the traders, possibly indicating that they prefer larger fish. Marine Parks are the least preferred management option.



Adaptability

Fish traders were asked hypothetical scenarios and if they would be still trading fish in five year's time:

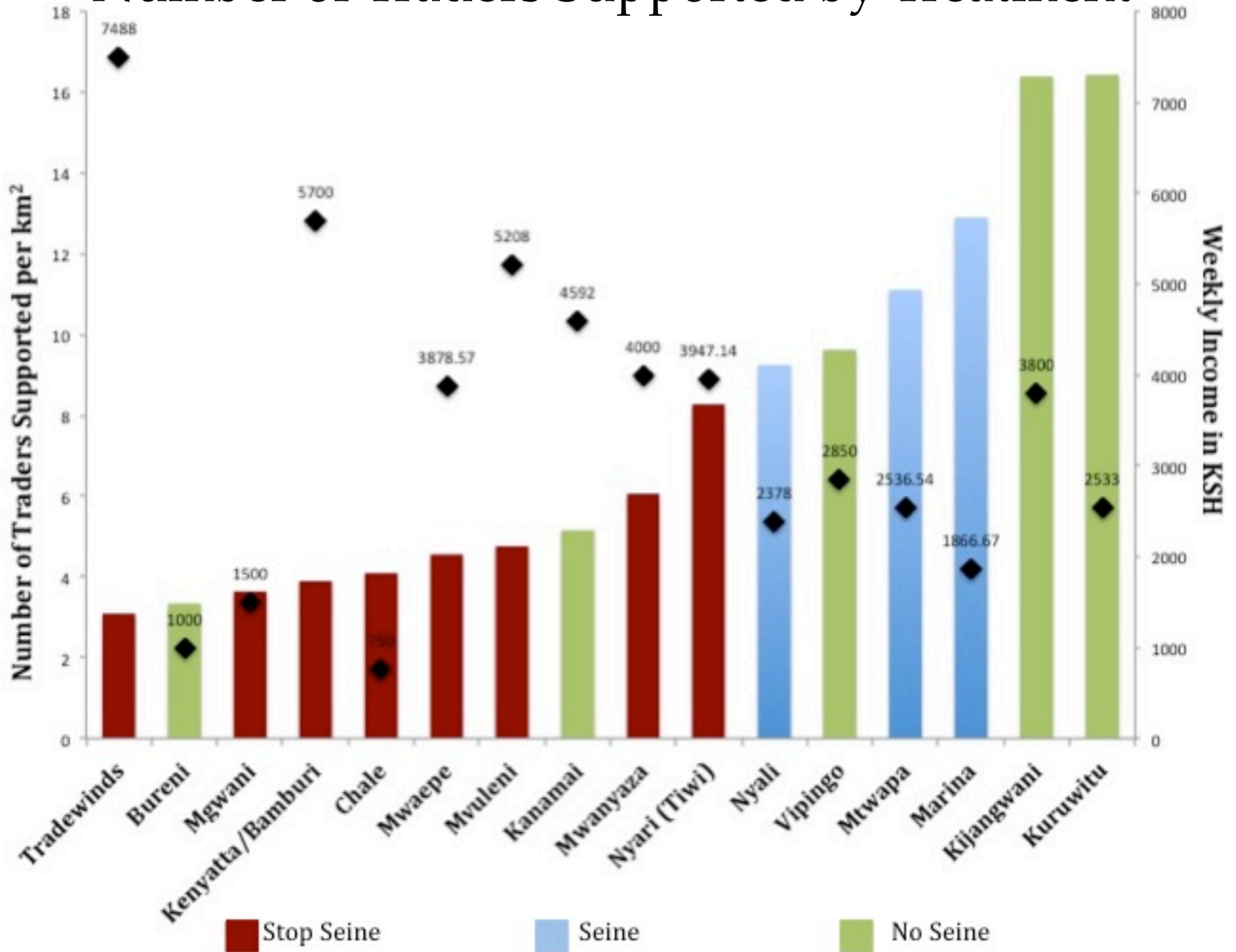
50% less fish: 66.2% would continue, although 16% of those will "adapt"
31% would exit fish trading

If no more fish: 82.4% would default to selling non-fish products or farm

In 5 years: 80.3% anticipated they will still be trading fish



Number of Traders Supported by Treatment



Conclusions & Recommendations

There are no obvious benefits to fish traders at fish landing sites that use beach seines continuously. Fish traders at Seine sites earned 26% less income than No Seine sites, 46% less than Seasonal Seine sites, and 52% less than Stop Seine sites. Will stopping or controlling the use of beach seines benefit everyone?

Fish Dealers had higher average weekly incomes than Fish Fryers. Most female fish traders were Fish Fryers. Are there other opportunities for Fish Fryers to improve their socioeconomic status?

Most fish traders were aware of decreased fish catches, but did not know why or how to improve fish catches. Will increased ecological knowledge improve sustainable resource management?

Most traders would continue trading fish even if there is a 50% decline. At what point will fish traders seek alternative employment?

Acknowledgements

Dr. Tim McClanahan, Dr. Nyawira Muthiga, Caroline Abunge, Rodgers Charo, Joshua Kinyili, Caroline Kiriinya, Douglas Maina , Rose Machaku, Maureen Otieno, Johnstone Omukoto, Amini Tengeza, and the WCS Coral Reef Conservation Program team.

Dr. Tim Daw (University of East Anglia, Stockholm Resilience Centre)

Dr. Joshua Cinner, James Cook University

Dr. David Wilkie, Dr. Caleb McClennen ,and Dr. Elizabeth Matthews, WCS

Brendan Wenzel, artist and conservationist

The fishing communities and the fish traders who so willingly gave up their time to assist and participate in the surveys. *Asanteni!*

