FISH CONTAMINATION IN THE MARKET SUPPLY CHAIN

LAKE MALAWI- NKHATA BAY - MZUZU

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INTRODUCTION

1978 study by C.C. Rao and S. Gupta and the Kakinada Research Center (India)

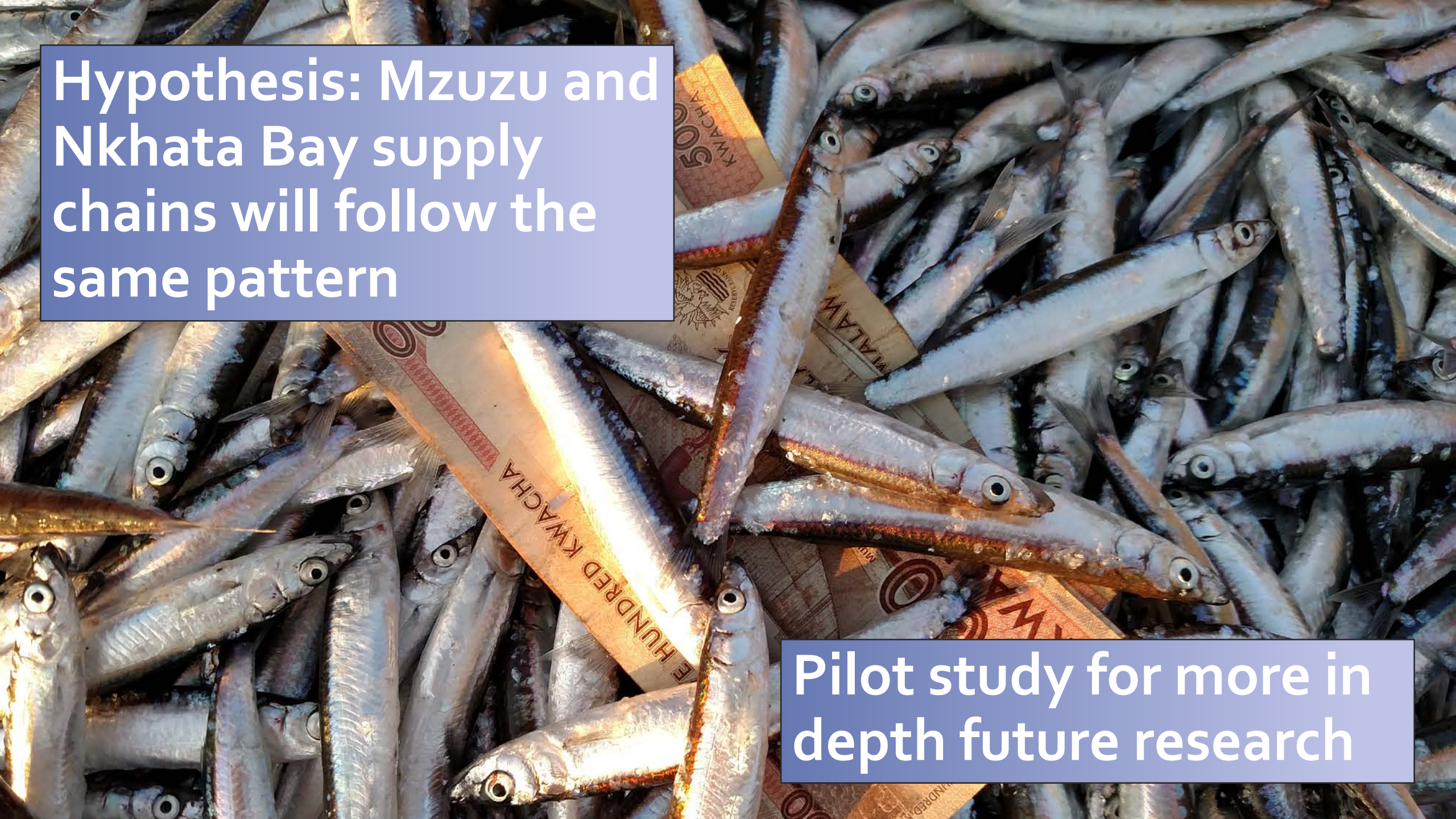
Most *E Coli* at market

Out of 126 total samples:

4 samples of fishermen

5 samples during transit

7 samples at market


Hypothesis: Mzuzu and Nkhata Bay supply chains will follow the same pattern
Pilot study for more in depth future research


Fish provides over 60% of the dietary animal protein intake and 40% of the total protein supply.
(Press Cooperation Limited, 2007)

Fisheries sector directly employs 50,000 fishermen and indirectly 350,000 people involved in fish processing, fish marketing, net making, boat building and engine repair.

(Kanyerere et al., 2009)

Quality management is not well developed due to the shortage of trained/skilled personnel.

(Kapute, 2008)

Food source is hampered by poor and inadequate food safety and handling practices - shelf life of not more than 48 hours.

(Ashie et al., 1996; Ghaly et al., 2010)

METHODOLOGY

PREPARATION


FISHERMEN

INTERVIEWING


MIDDLEMEN
EXCHANGE

RETURN OF THE FISHERMEN

MIDDLEMEN TRANSIT

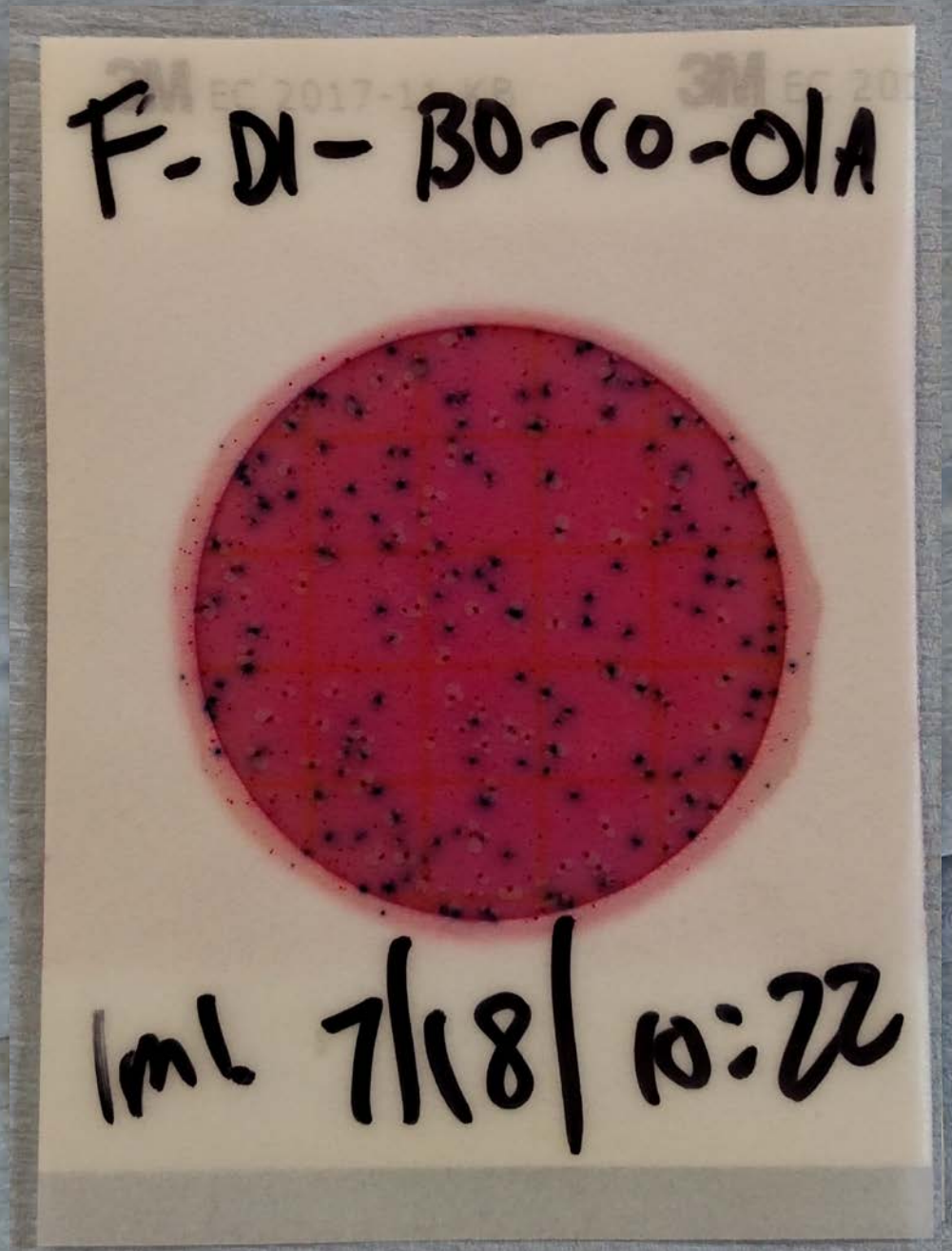
MARKET SAMPLING NKHATA BAY

WATER SAMPLING NKHATA BAY

MARKET SAMPLING MZUZU

SAMPLE PROCESSING

DATA COUNTING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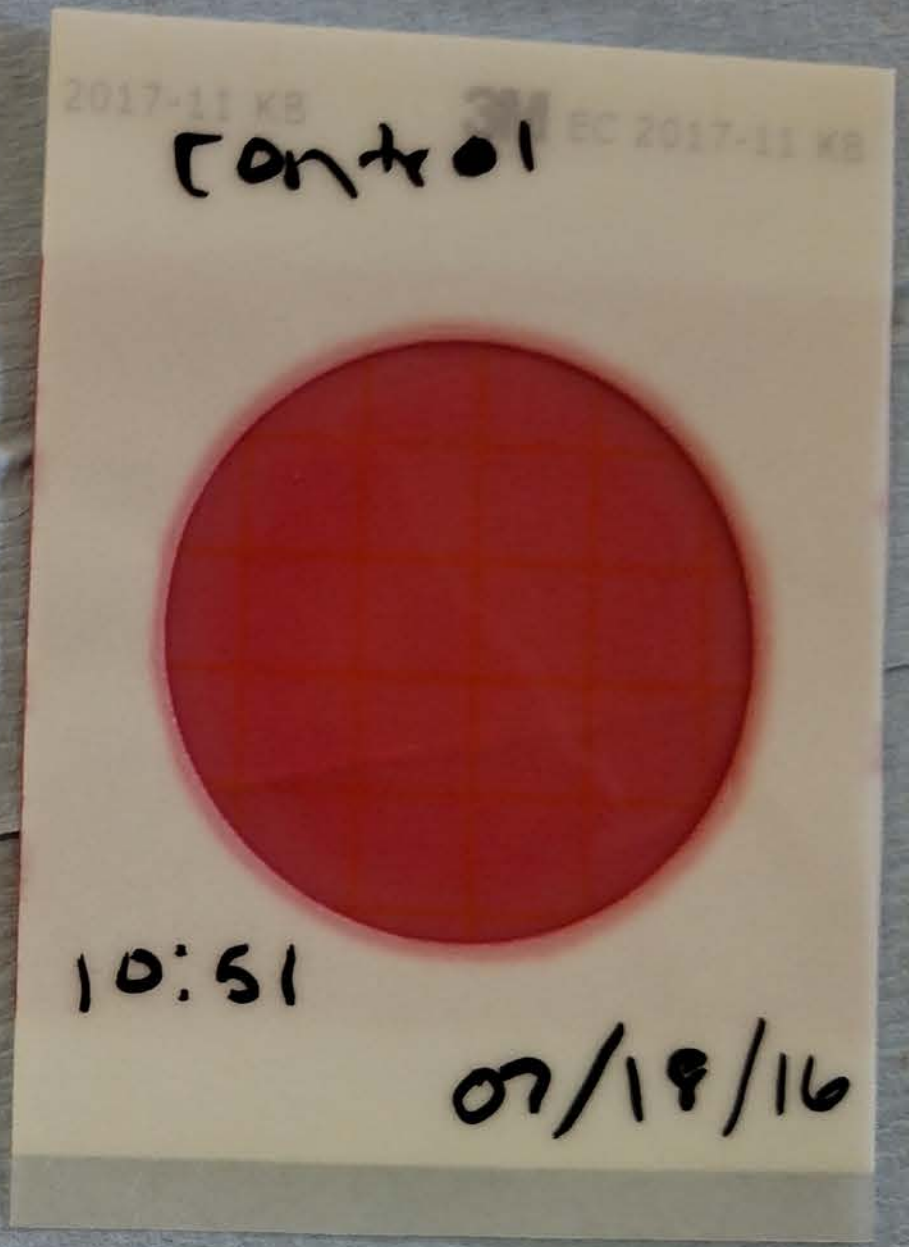
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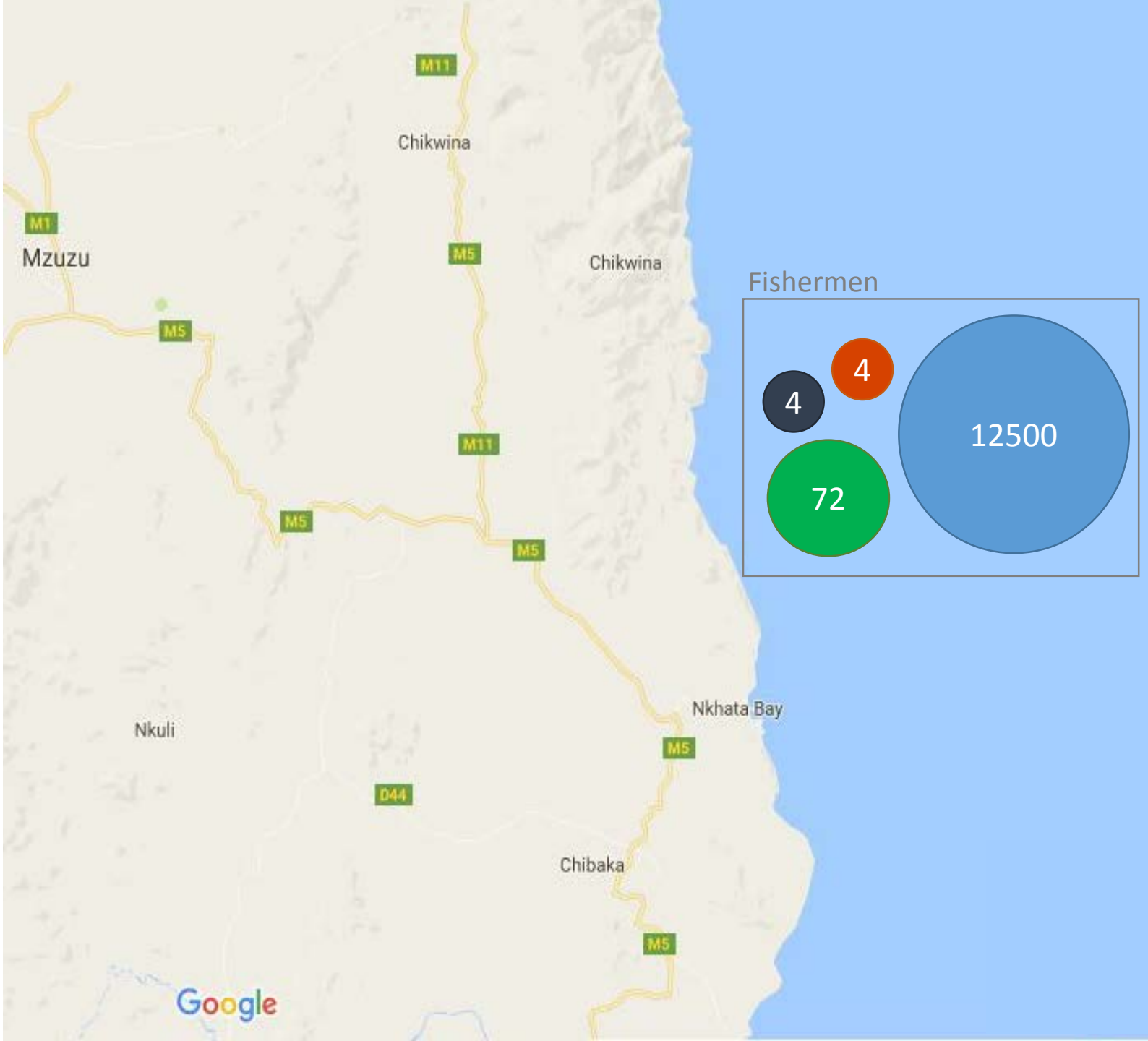
RESULTS

Fishermen

- Water in Boat (n=6)
  - Max: 12,500 colonies per 100ml
- Hands (n=8)
  - Max: 72 cfu per 10 x 10 cm
- Surface of Boat (n=6)
  - Max: 4 cfu per 10 x 10 cm
- Fish (n=6)
  - Max: 4 cfu per 10 x 10 cm

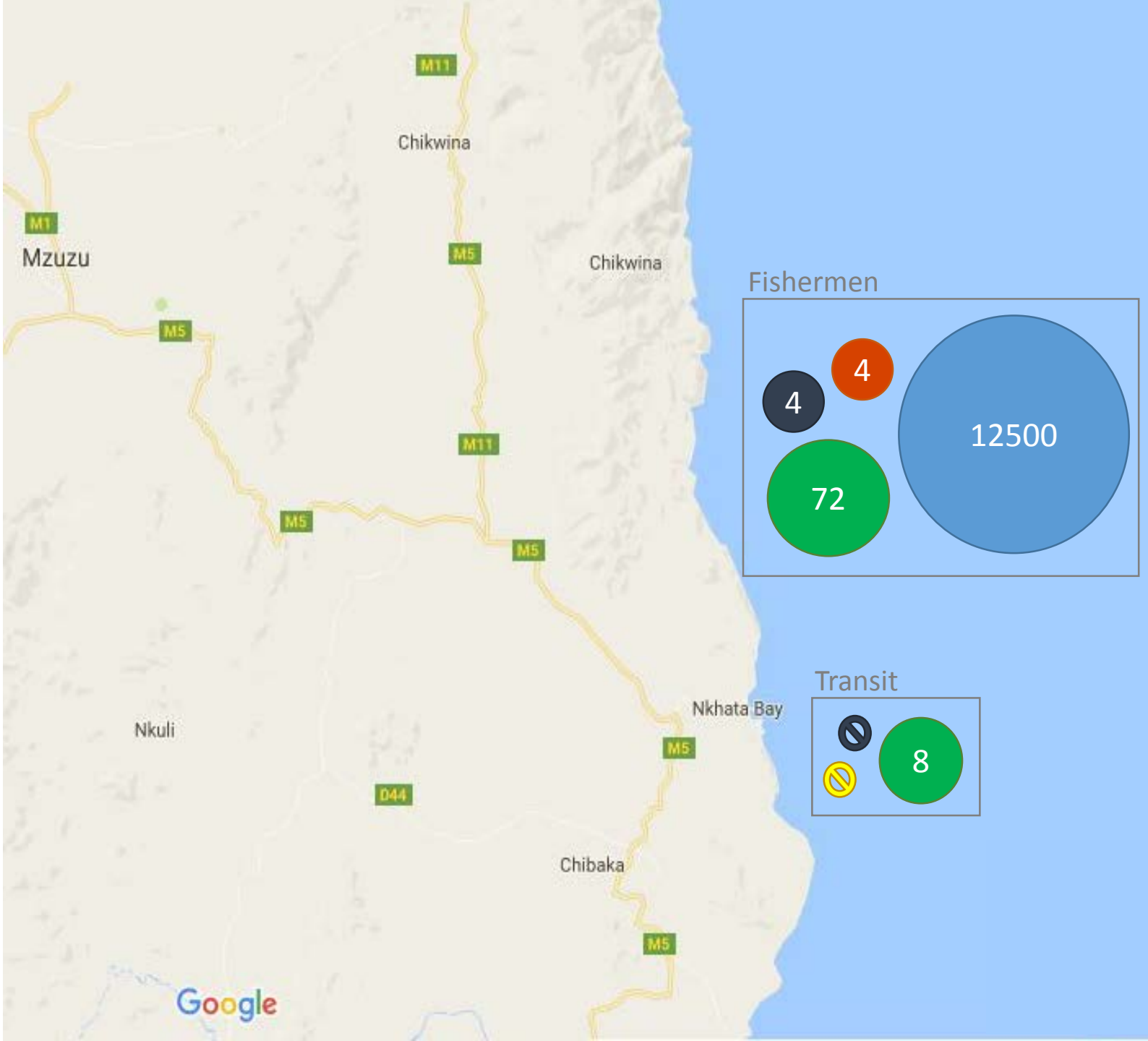
*all minimums equal to 0 cfus



Transit

- Hands (n=4)
  - Max: 8 cfu per 10cm x 10cm
- Container (n=4)
  - Max: 0 cfu per 10 x 10 cm
- Fish (n=1)
  - Max: 0 cfu per 10 x 10 cm

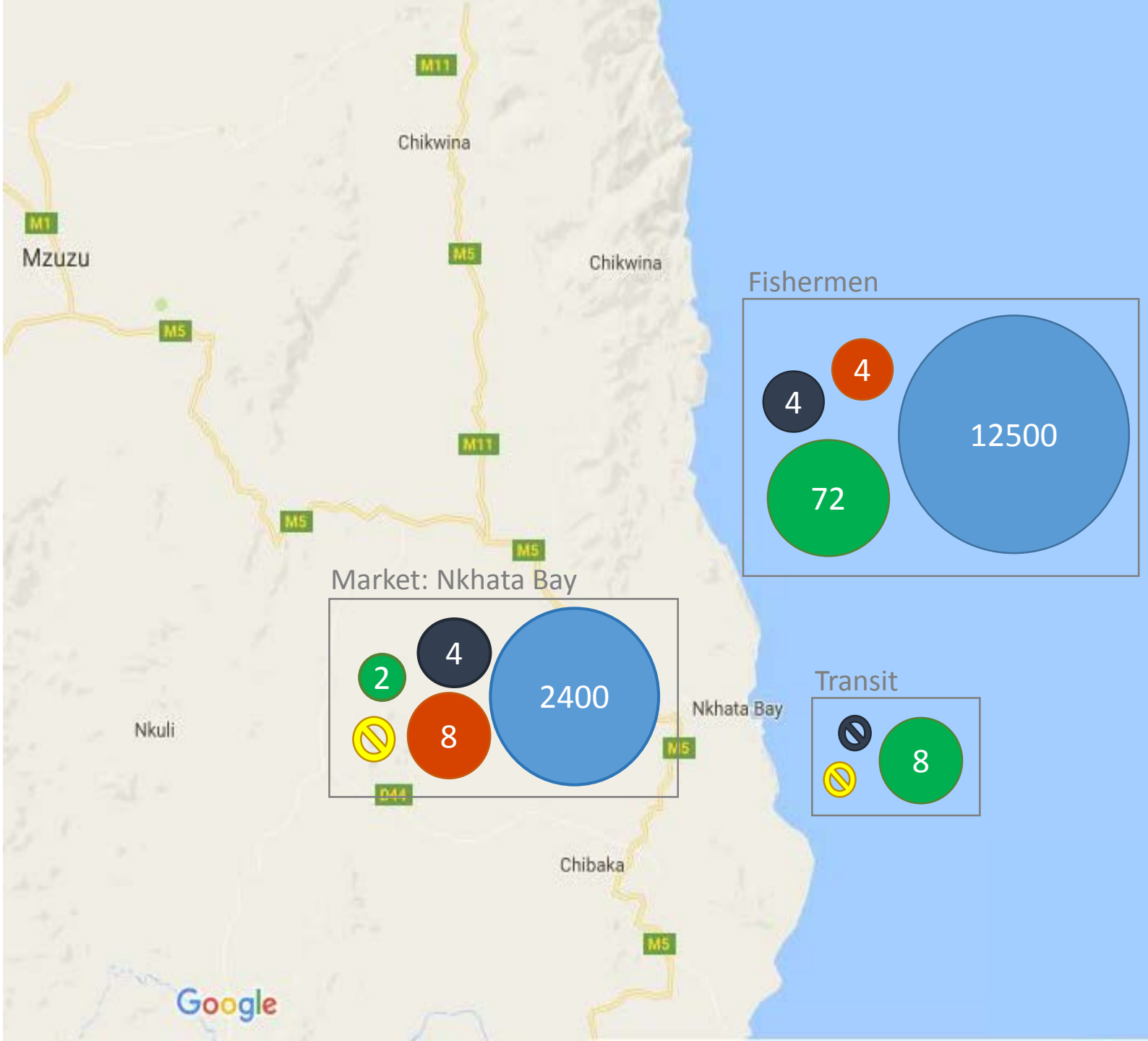
*all minimums equal to 0 cfus



Market: Nkhata Bay

- Wash Water (n=1)
  - Max: 2400 colonies per 100ml
- Surface (n=2)
  - Max: 8 cfu per 10 x 10 cm
- Fish (n=2)
  - Max: 4 cfu per 10 x 10 cm
- Hands (n=2)
  - Max: 2 cfu per 10 x 10 cm
- Container (n=1)
  - Max: 0 cfu per 10 x 10 cm

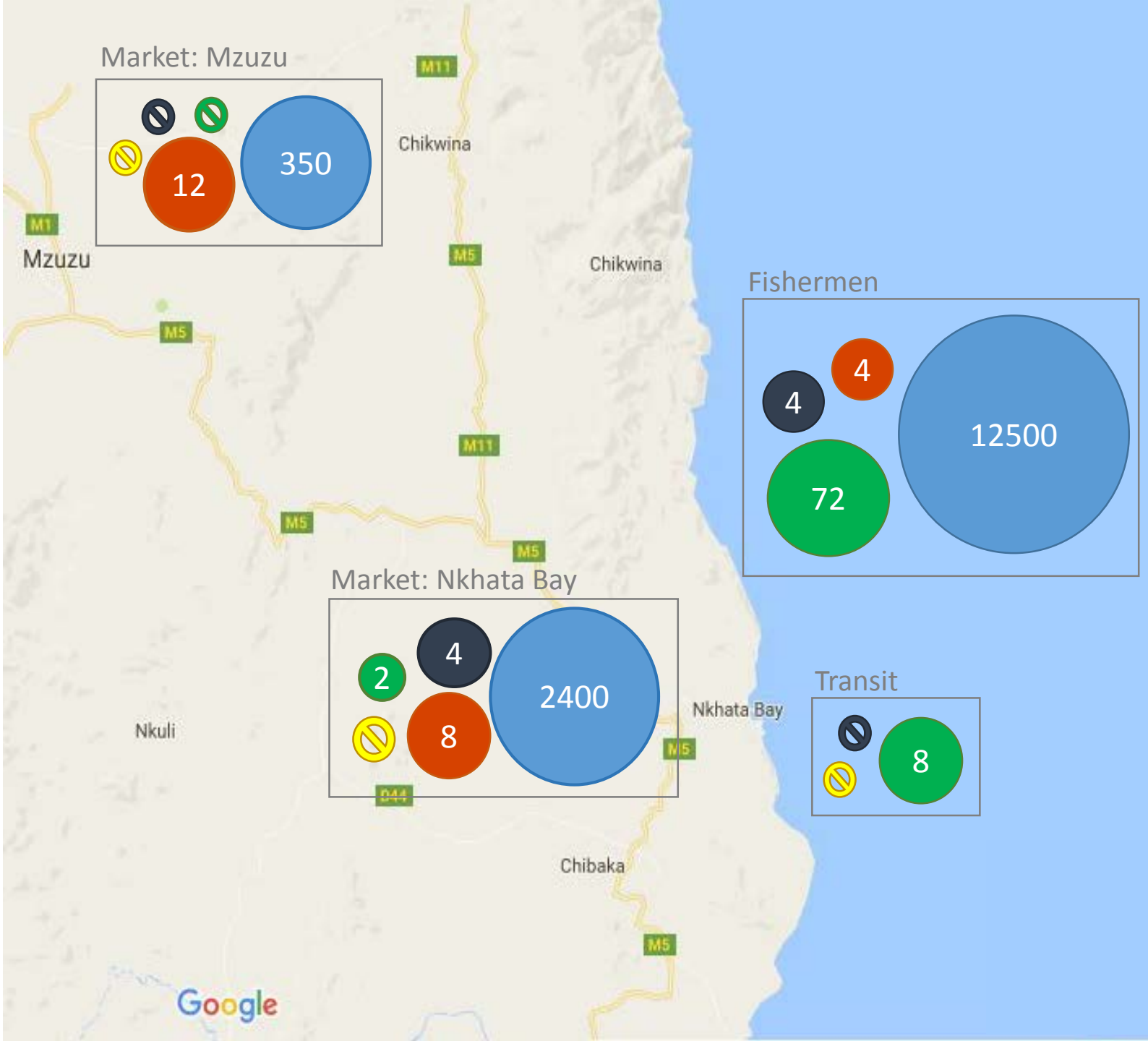
*all minimums equal to 0 cfus



Market: Mzuzu

- Wash Water (n=2)
  - Max: 350 colonies per 100ml
- Surface (n=2)
  - Max: 12 cfu per 10 x 10 cm
- Fish (n=2)
  - Max: 0 cfu per 10 x 10 cm
- Hands (n=2)
  - Max: 0 cfu per 10 x 10 cm
- Container (n=1)
  - Max: 0 cfu per 10 x 10 cm

*all minimums equal to 0 cfus



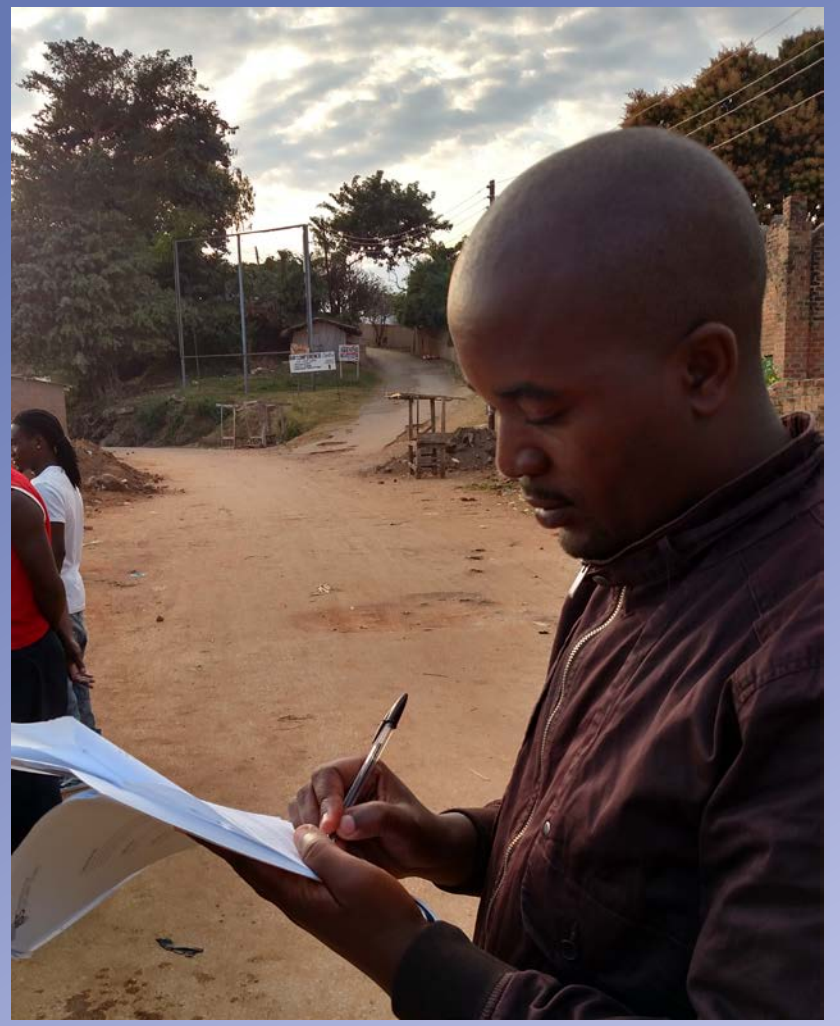
RESULTS: FISHERMEN/TRANSIT SURVEYS

44% of fishermen/middlemen use the lake for the bathroom

- Only 12% use market toilets

79% of fishermen/middlemen do not use soap

88% of fishermen/middlemen use the lake for washing hands



RESULTS: FISHERMEN/TRANSIT SURVEYS

100% of fishermen & middlemen believe there are no health issues with the market fish

100% of fishermen & middlemen are interested in training on food safety

RESULTS: MARKET SURVEYS

66% of market sellers do not wash hands with soap

66% wash hands after handling fish, but not before

89% of market sellers keep fish greater than one day through heating/drying methods

RESULTS: MARKET/CUSTOMER SURVEYS

100% of sellers think there are no health risks with eating market fish

2 out of 4 customers surveyed have gotten sick from eating fish

100% of market sellers and customers said they would be interested in training about food safety

LIMITATIONS

Complexity of supply chain

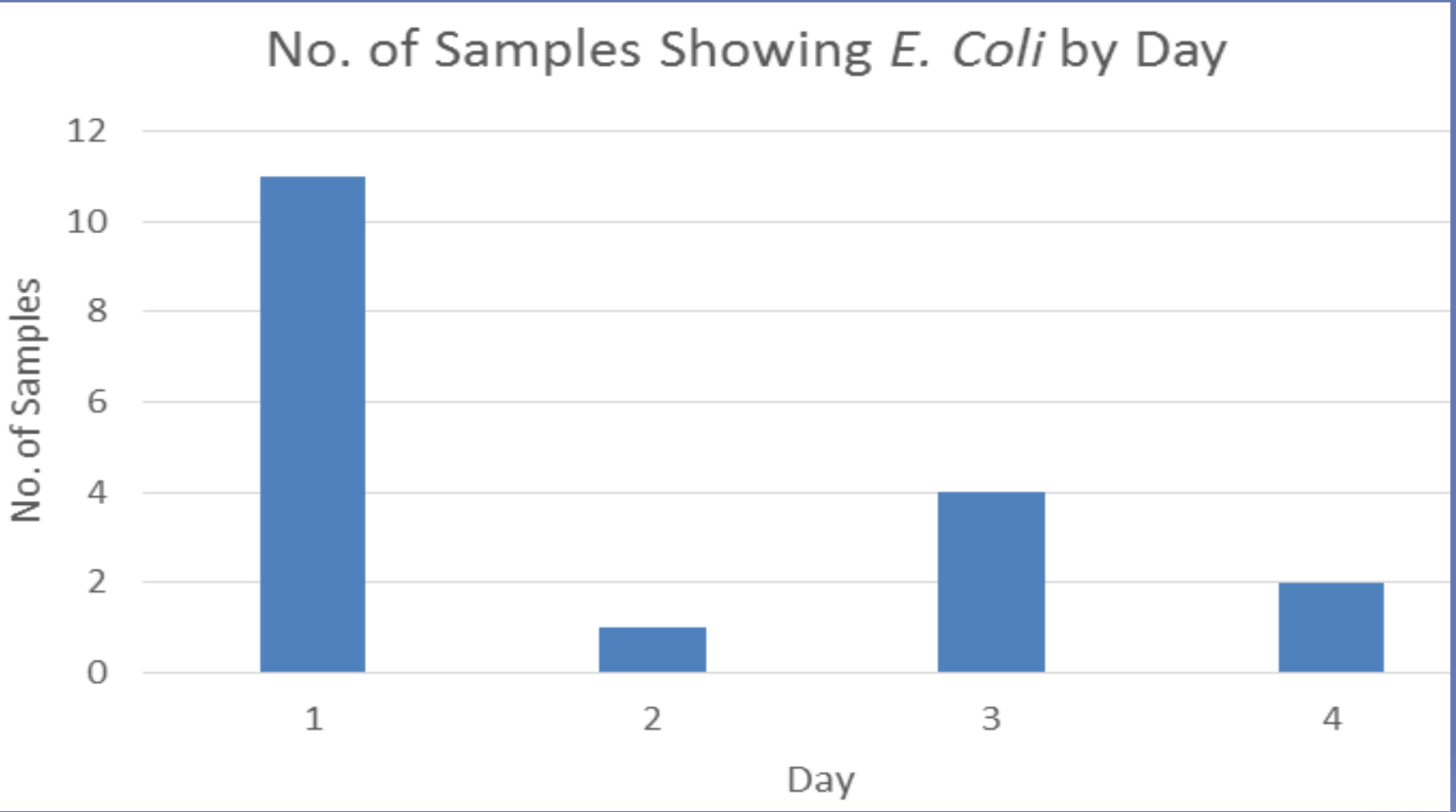
Logistics of finding fishermen and following fish

Time and sample size constraints

DISCUSSION


Not as far along the fish supply chain as originally hypothesized
Majority of *E Coli* found in the fishermen's boats and hands
Possibly follow the fishermen supply chain instead of fish supply chain

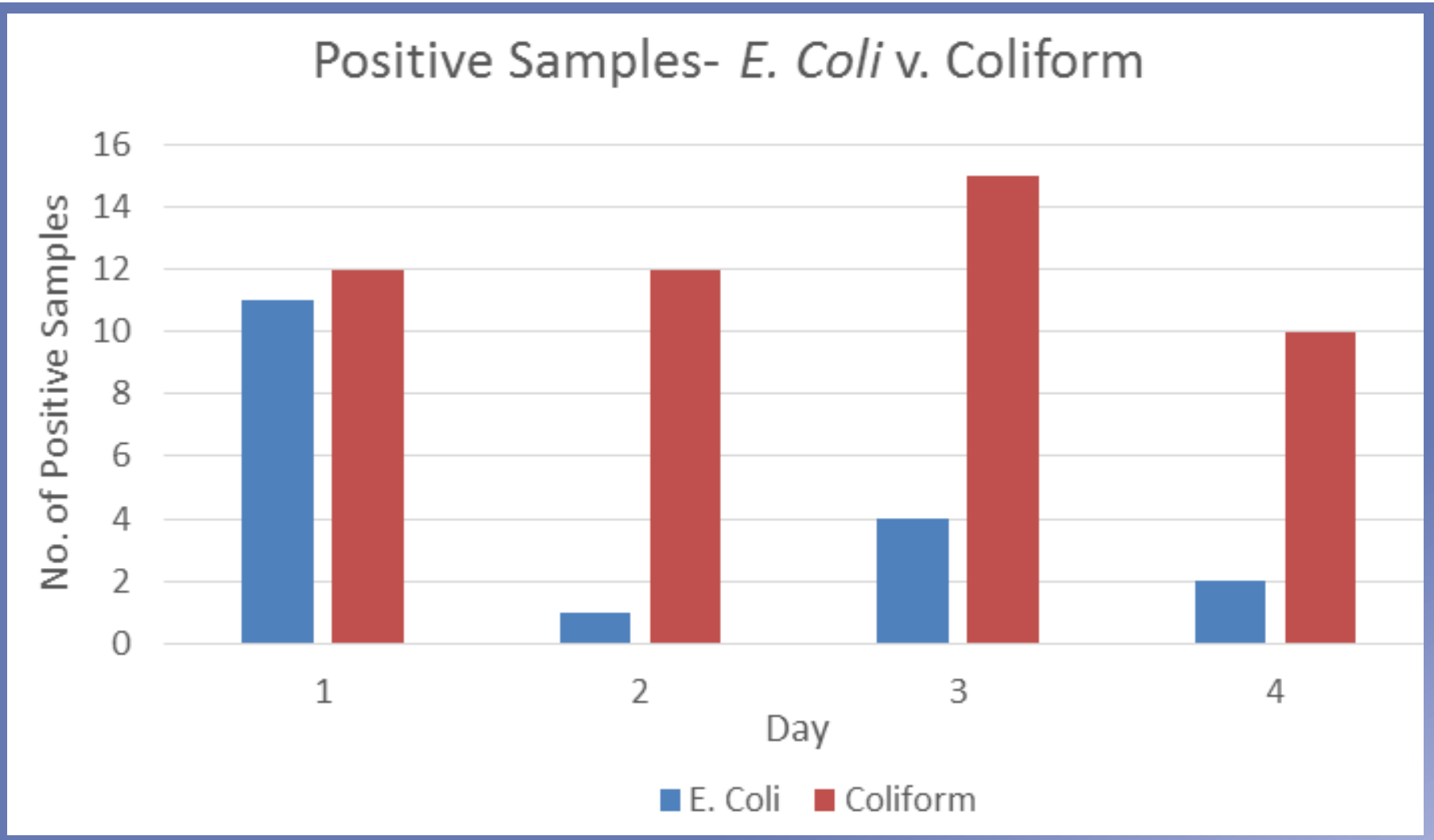
Greater chance of contamination on the busier days



Major drop in *E Coli* found as the activity slowed during the week

Make sure to clean boats prior to the busiest days

Large amount of coliform, small amount of *E Coli*



CONCLUSION

E Coli and other coliform are an issue, but not where originally hypothesized

Logistics of the fish market supply and value chain are very complex

Many hands, many markets, many boats

Pilot study for more in-depth research and analysis

Possible future steps to take:

1. Follow both supply chains in more detail

2. Educate the fishermen on major contamination points

3. Further studies on other possible contaminants
   (salmonella, listeria)

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