

# Dynamics of rabbit fish (*Siganus sutor*) spawning aggregations in Kenya

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# Introduction

- ★ Many reef fish species gather in large groups at specific times and places to reproduce=fish spawning aggregations (FSA)
- ★ Highly predictable >overfishing
- ★ Overfishing and weak fisheries management regimes compound ability of reef fishes to cope with a changing climate.
- ★ Protection of reef FSAs as sources of seed now central to the concept of building reef resilience to climate change



# Introduction

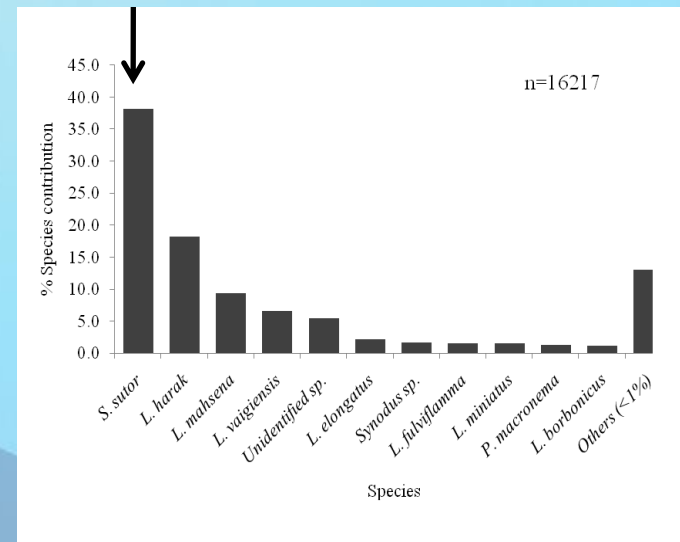
- Builds on previous work in the WIO (Robinson et al. 2004,2007, Samoilya et al 2006, Kimani 2007, Maina 2009)
- Focused on *Siganus sutor* (White spotted rabbit fish)
- Reported by fishers to aggregate to spawn.



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## Rabbit fish (Siganidae, tafi)

- Fast growing, short lived
- Important food fish in East Africa
- S. sutor*, among the most heavily fished yet abundant species on the Kenyan coast.

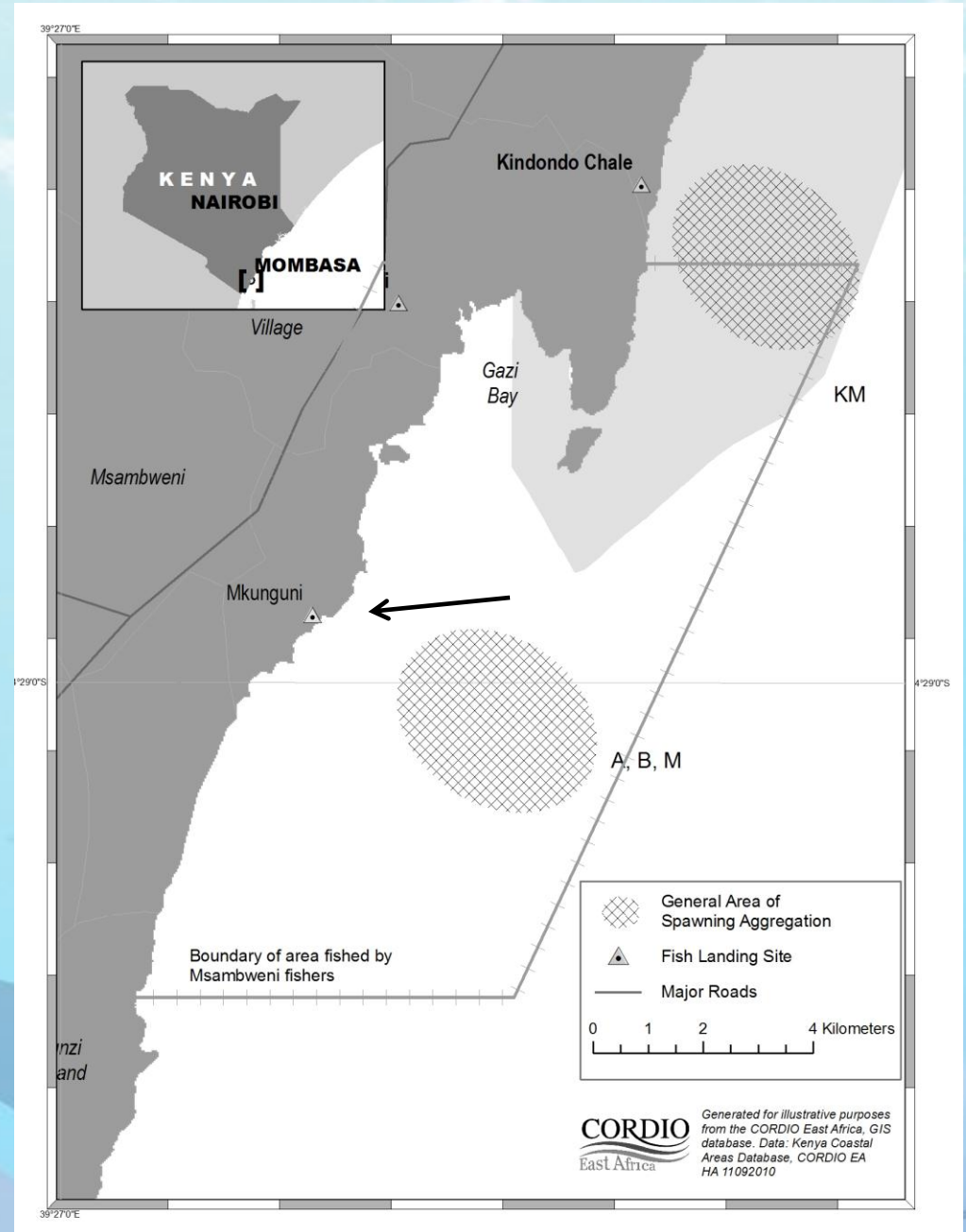


# Objectives

- ★ Verify fisher knowledge
- ★ Test the hypothesis that spawning aggregations of rabbit fish have predictable **seasonal** and **lunar patterns** and **site fidelity**
- ★ Recommend management options.

# Study Locations

- Known to fishers
- Exploited by fishers
- Mapped fishing grounds



# Methods

1. Fisher knowledge (FK): analyzed based on Domeier & Colin (1997)

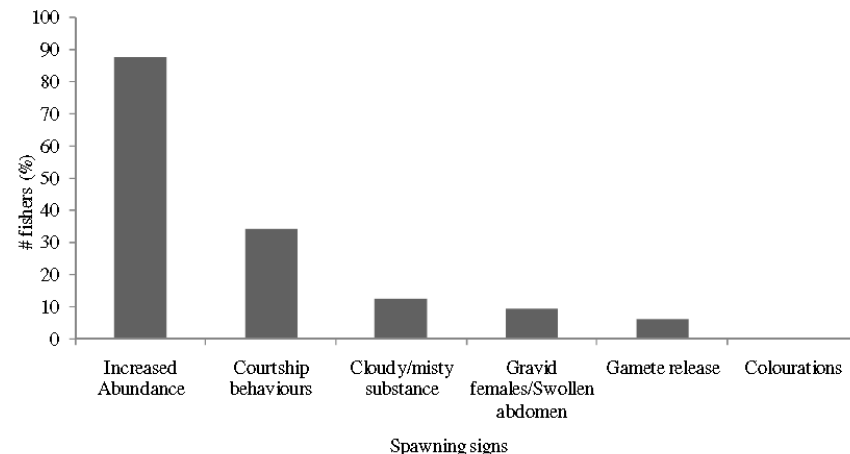


Figure 2. Positive descriptions of *S sutor* spaggs from knowledgeable fishers (n=16).

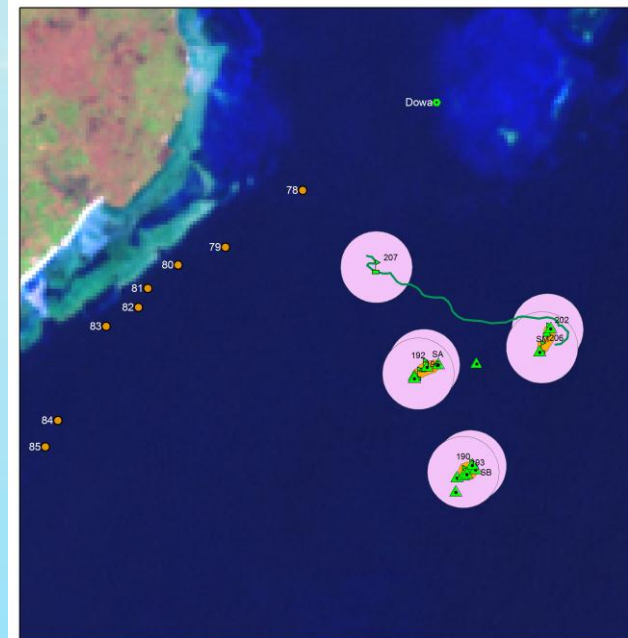
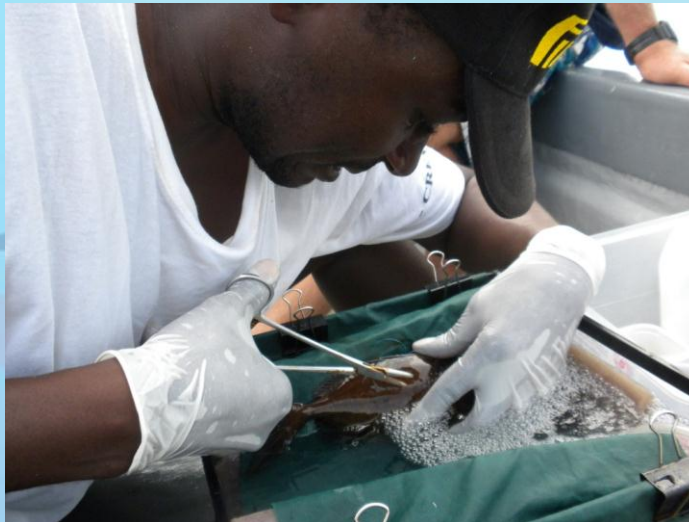
2. Under Water visual Census (UVC) Surveys-trends in abundance and density over the aggregation period

3. Acoustic telemetry-to monitor the movement of aggregating fish

# Methods- Acoustic telemetry

- 7 acoustic receivers anchored on the aggregation sites.

- 29 fish tagged with transmitters inserted surgically into the body cavity and an external numbered floy tag



**Legend**

- ▲ SutorAgg\_sites
- S.sutor\_home
- ▲ Final\_VR2\_array
- Ref\_site
- Channel\_mapped
- Final\_array\_300mBuffer
- Buguni\_extnt
- Arusha\_extnt
- Mekka\_extnt

Kilometers  
0 0.2 0.4 0.8 1.2 1.6 2

This map was created from the CORDIO E.A GIS database on 4/02/2010

Coordinate system: WGS 1984 UTM Zone 37S

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# RESULTS & DISCUSSION: Fishers Knowledge

- *S sutor* FSAs : +ve responses from 50% of the interviewed fishers,
- *S sutor* spawns Nov-February during fullmoon; 14-18<sup>th</sup> lunar days (86% of +ve responses)
- Fishers reported *S sutor* spawning aggregations at 3 sites

Table 1: The number of interviewed fishers by landing site

Landing site	Basket traps	Cast net	Gillnet	Hook & Line	Speargun	Total
Gazi	1	3			3	7
Msambweni	6			11		17
Mvuleni	5		1	2		8
Total	12	3	1	13	3	32

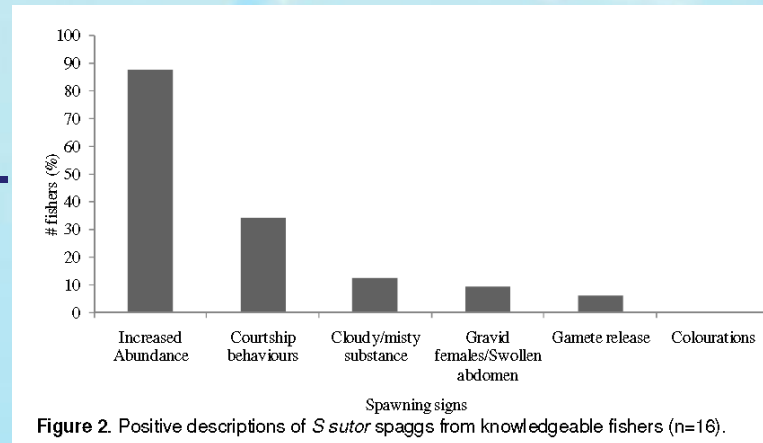
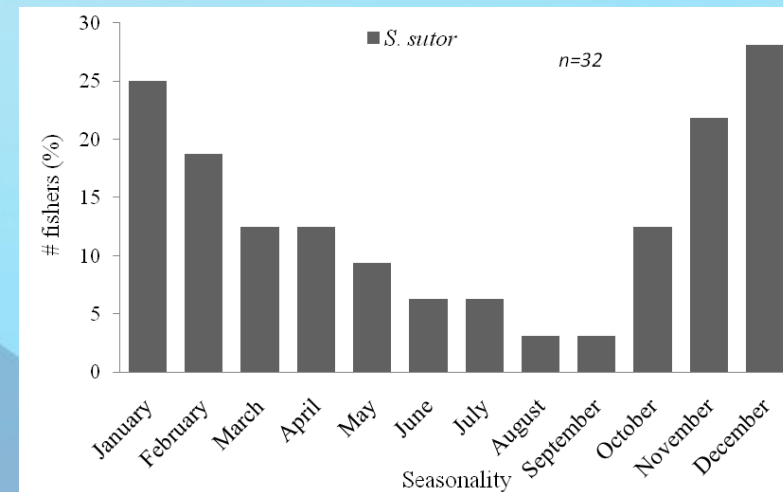
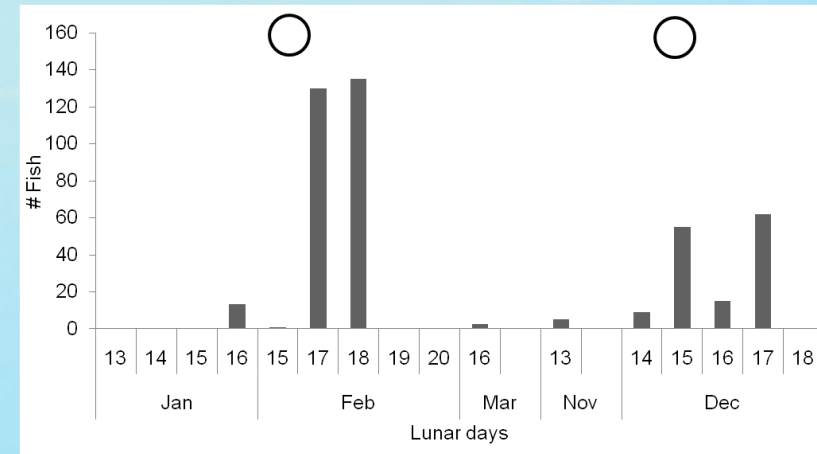
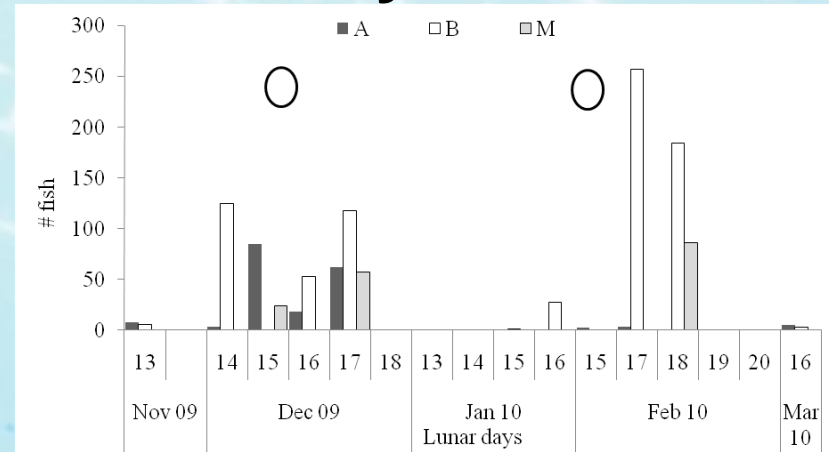


Figure 2. Positive descriptions of *S sutor* spags from knowledgeable fishers (n=16).



# RESULTS & DISCUSSION: Visual surveys at aggregation sites

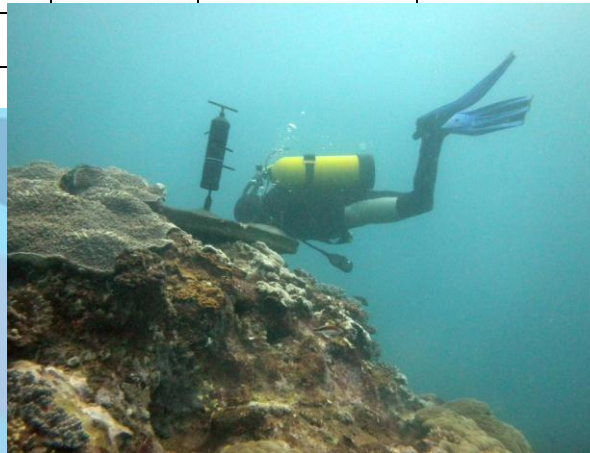
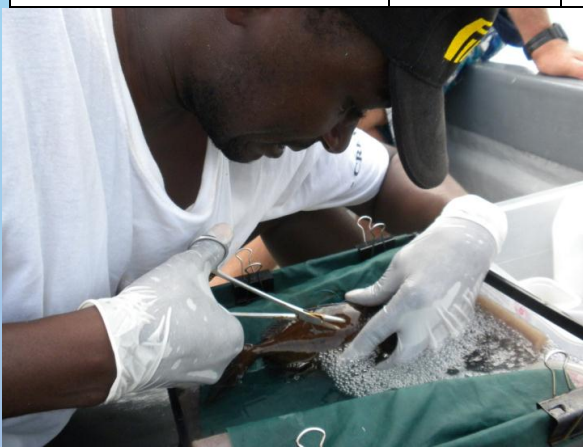
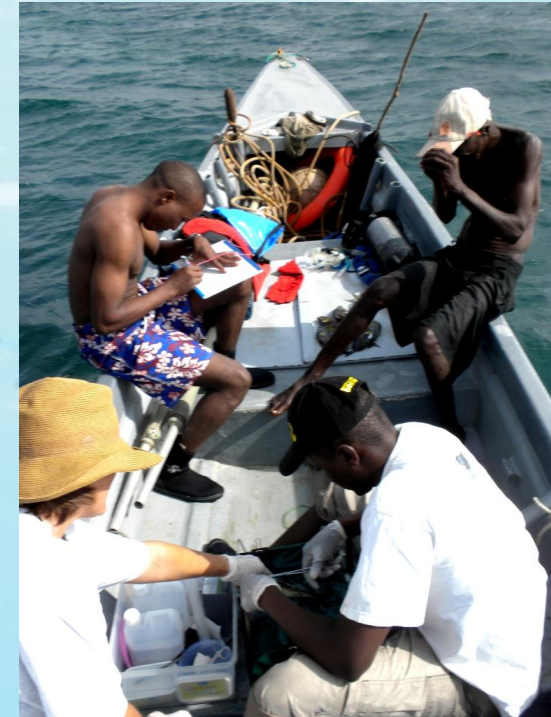
- Sites based on FK; 20,000 - 24,000m<sup>-2</sup>
- Aggregations observed during Nov-March
- peak numbers counted :100 - 250 fish on a site (Dec, Feb)
- non-aggregation. Nos; On site: 0-10
- Aggs. appear coupled to just after Full Moon
- Male courting colour patterns + very rapid swimming in large groups observed



*Male in sp. colours*

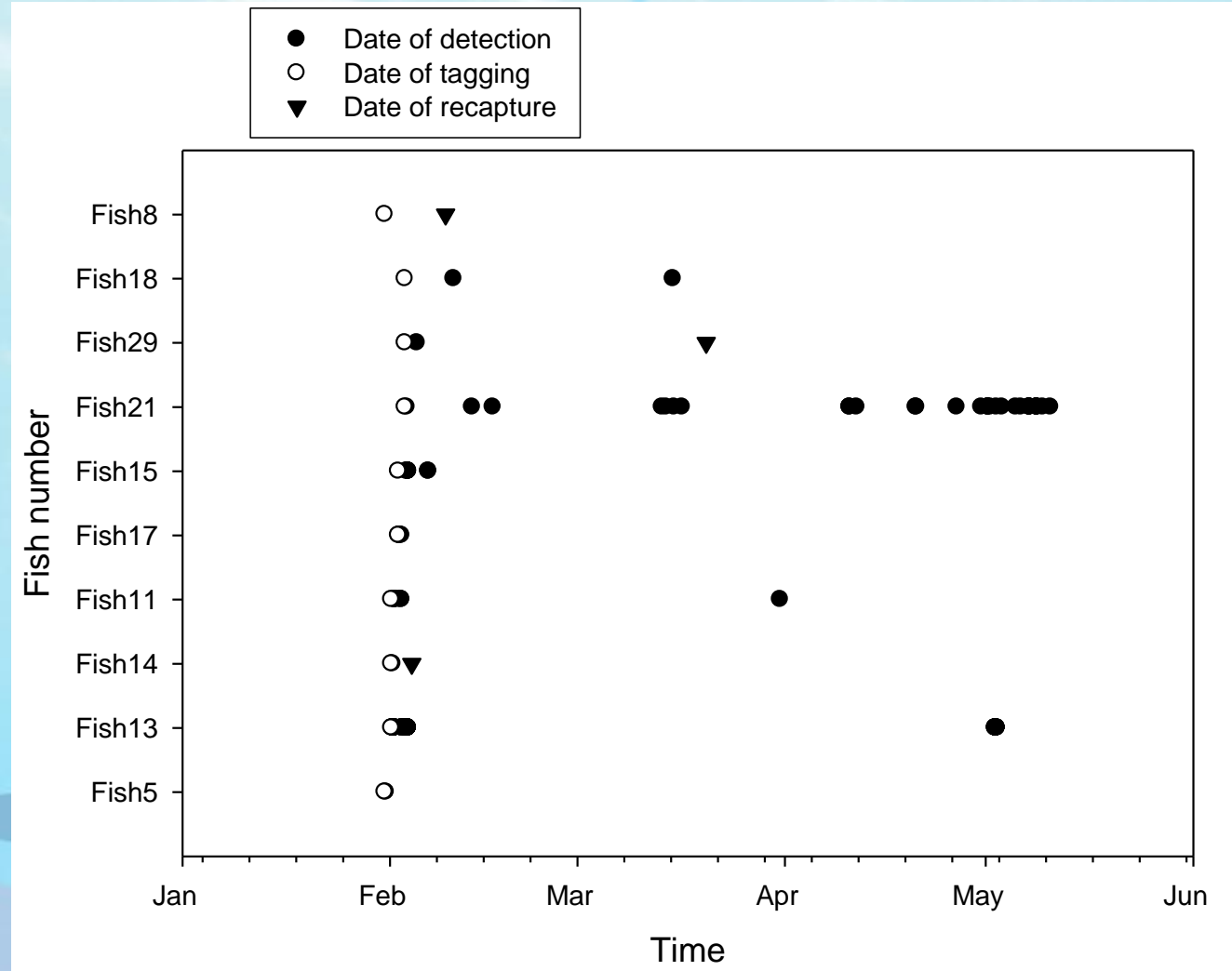
# RESULTS & DISCUSSION: Tagging *S. sutor* at aggregation sites

	Spawning aggregation sites			Fishing sites	
	M	A	B	Mabarani	Chale
Number of fish tagged	12	8	9	N/A	N/A
Number of fish detected by receivers	3	1	5	N/A	N/A
Number of fish only detected on day of tagging	0	1	2	N/A	N/A
Number recaptured by fishers		1	1	2	1



# RESULTS & DISCUSSION: Acoustic Detections per fish over time

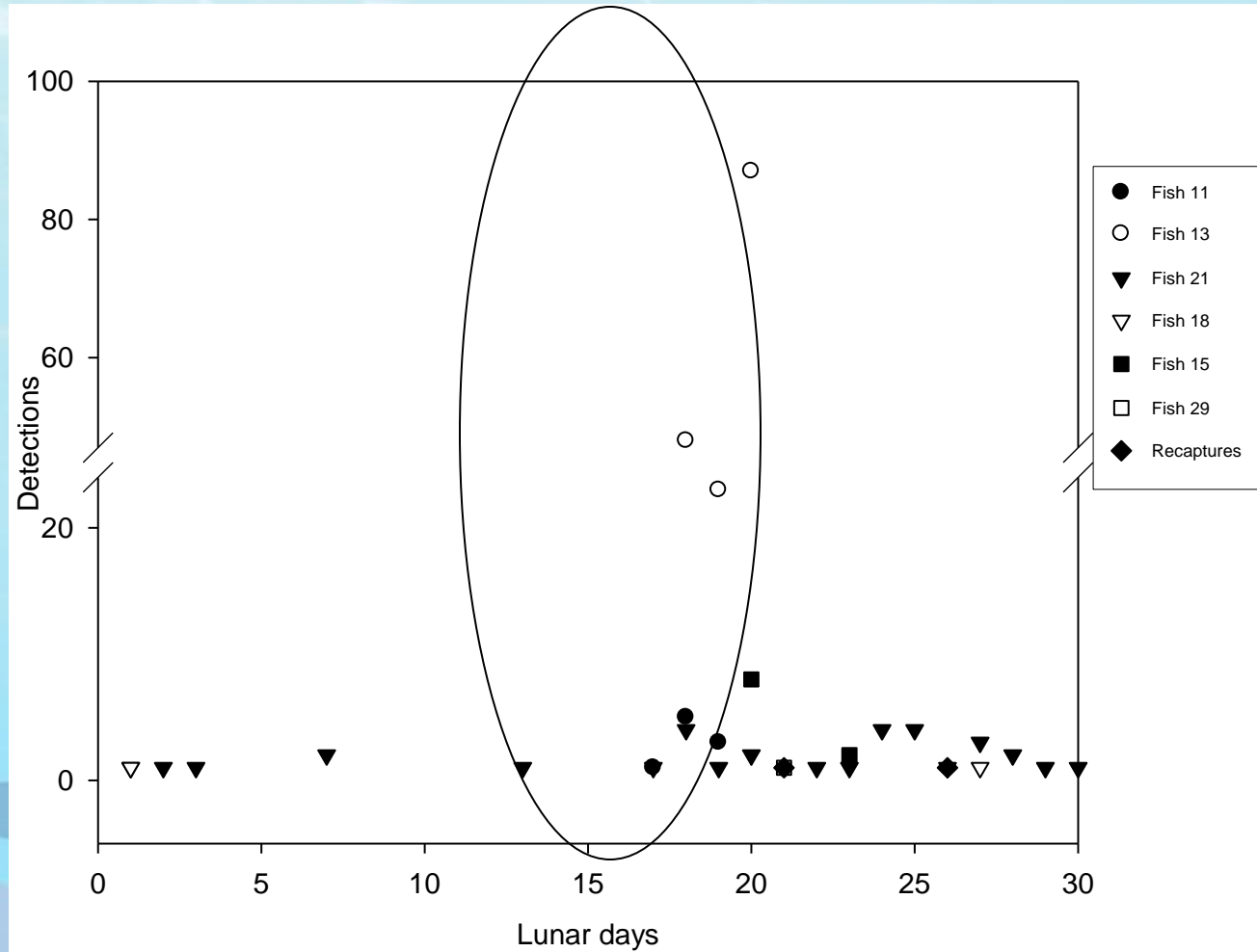
- Fish returning to aggregation sites



Receivers

# RESULTS & DISCUSSION: Acoustic detections by Lunar Period

More detections slightly after the fullmoon



# CONCLUSIONS

1. Acoustic tags provide first preliminary **evidence of *S. sutor* moving to spawning aggregation sites** - individuals disappeared and then returned over a three month period.
2. Detection of tagged fish on the spawning aggregation sites provides **some indication of full moon spawning.**
3. Fishers knowledge confirmed the **location** of the aggregation sites and the **seasonal and fullmoon spawning**
4. Individuals were only detected at one aggregation site **suggesting site fidelity.**
5. UVC surveys confirmed the **full moon timing** and recorded **aggregation densities x 50 higher than non-aggregation densities**, and also confirmed dispersal off the sites during other lunar phases.
6. These results provide the **first evidence of lunar and spatial patterns in the formation of spawning aggregations in *S. sutor* in Kenya.**

# ACKNOWLEDGEMENT

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## THANK YOU FOR YOUR ATTENTION

