



Whale shark population ecology and movement patterns in southern Mozambique

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Outline

1. Study site: Tofo Beach
2. Methods
3. Results: Population structure
Re-sighting rate
Total population size
Movement patterns
4. Discussion & implications



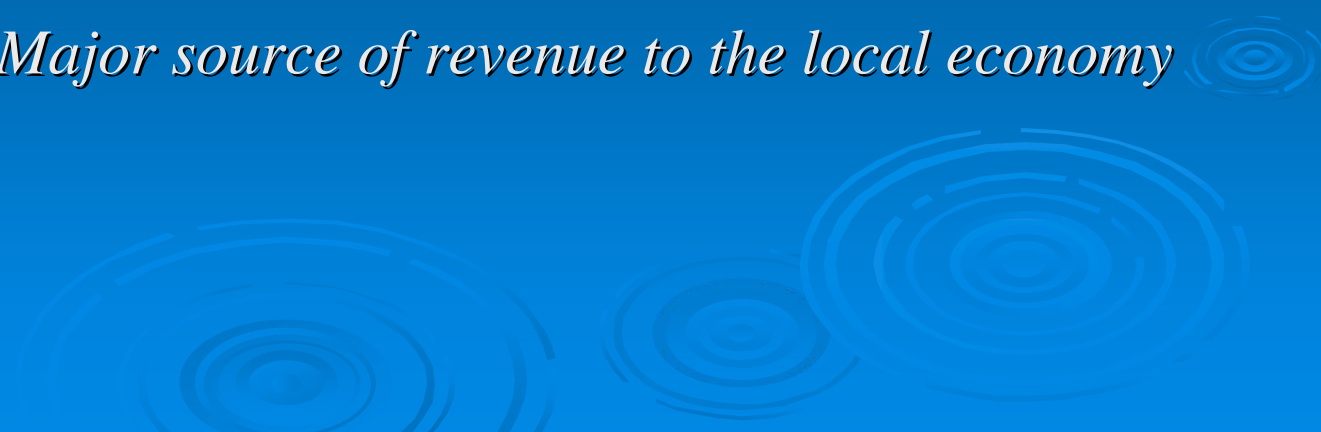
Tofo Beach, Mozambique



Tofo Beach

- On-site research program since 2005
- High density of whale sharks along a narrow coastal corridor (~20 km²)
- Important feeding area
- No pronounced seasonality
- Burgeoning tourism industry

Major source of revenue to the local economy



Methods

- Boat-based surveys with commercial tours and dedicated research trips
- Photographic sightings processed with I³S and submitted to the ECOCEAN database
- Two pop-up satellite archival tags (PTT-100, Microwave Telemetry) deployed in February 2006

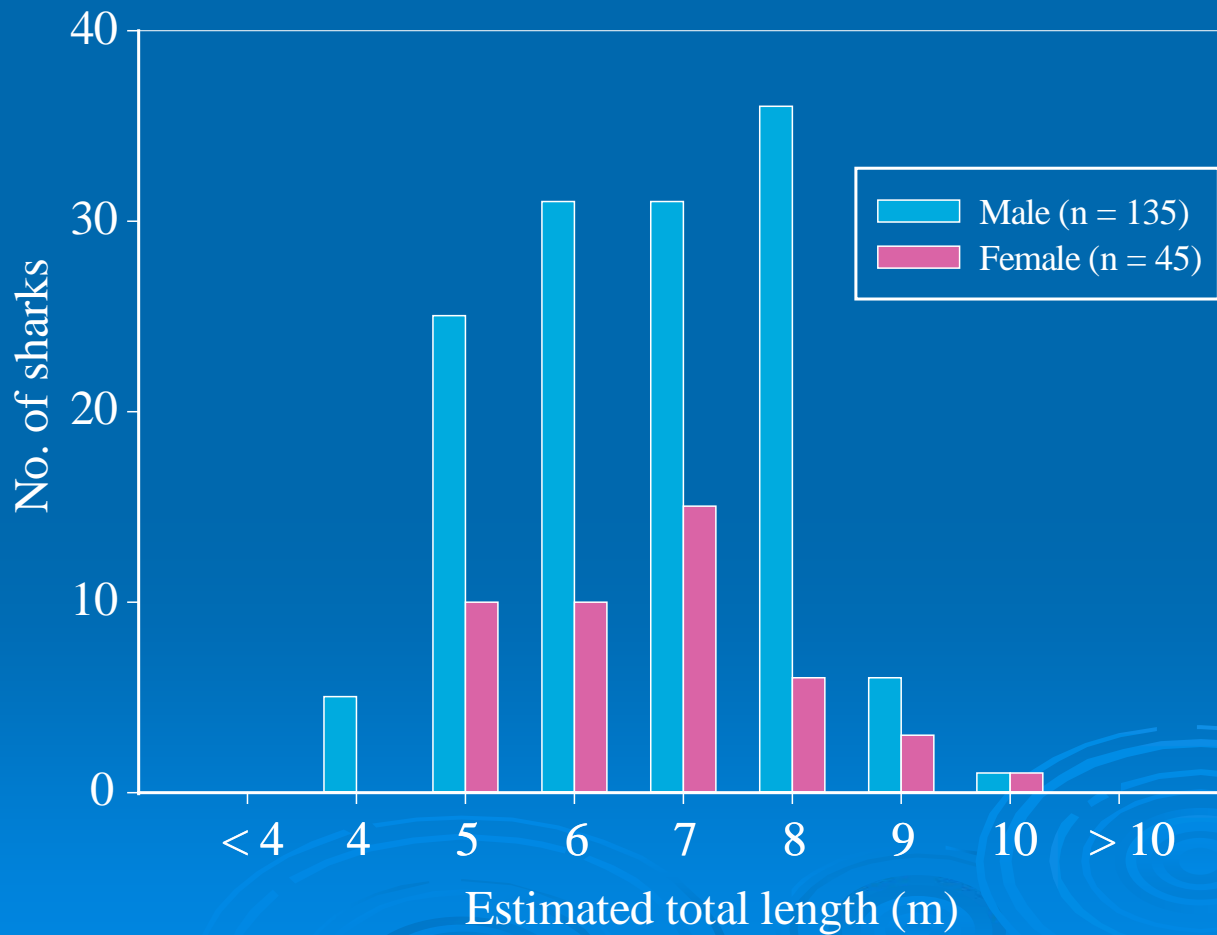


Results (population structure)

- > 300 individuals identified
- Significant juvenile male bias (~ 81%)
- Mean size of 6.7 m TL for both sexes
- ≤ 3 m TL specimens rarely reported; no reports of ≥ 12 m TL fish



Results (population structure)*



* Data to Jan 2007

Results (re-sightings)

- Overall resighting rate (n = 307): 39%
- Male resighting rate (n = 172): 43%
- Female resighting rate (n = 65): 43%





Results (total population size)

Preliminary population estimate (POPAN):

Model	Weight	Estimate	S.E.
(Phi (t) p (t) pent (.) N)	0.73	1501.49	91.58
(Phi (t) p (t) pent (t,0) N)	0.26	1501.64	91.58
<u>Weighted average</u>		<u>1501.53</u>	<u>91.58</u>
Unconditional S.E.			91.58

95% C.I. for the weighted average estimate are 1322 to 1681

Results (movement patterns)

Photographic re-sightings:

- Two sharks sighted at both Tofo (Mz) and Ponta do Oura (Mz), ~ 415 km apart
- Three sharks sighted at both Tofo (Mz) and Sodwana Bay (SA), ~ 490 km apart



Results (movement patterns)

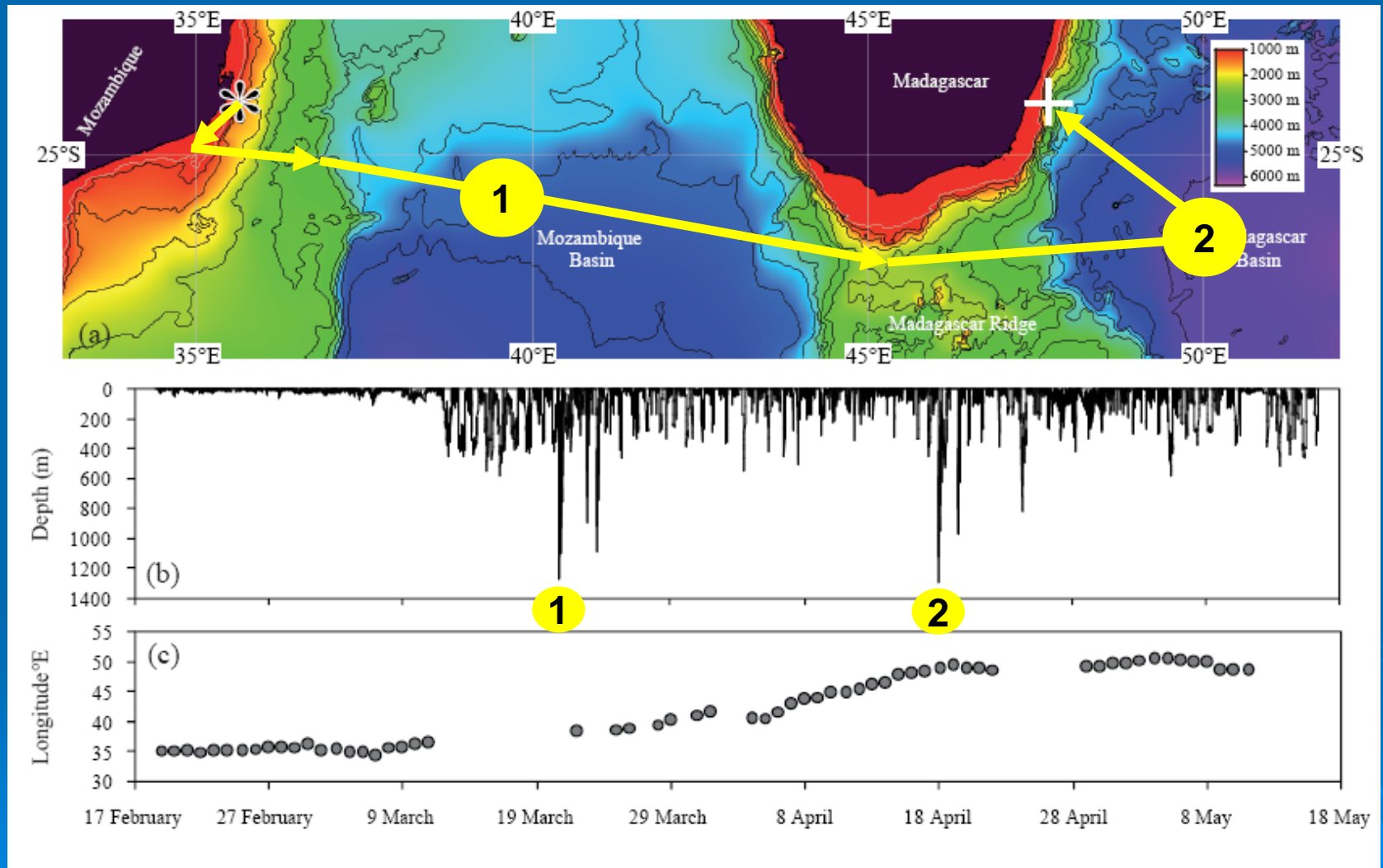
Two PSAT-tagged sharks:

Shark 1 = female, ~ 6.5 m TL, 87 day track

Shark 2 = male, 8 m TL, 7 day track



The (approximate) journey of Shark 1*:



*Modified from Brunnschweiler et al. (In review) Journal of Fish Biology

Results (Shark 1 track)

Coastal waters:

Sig. deeper at night

64% of time in < 10 m depth

Oceanic waters:

Sig. deeper during day

Regular epipelagic diving; five dives >1000 m,
max. 1286 m (3.4° C)



Discussion (population ecology)

- Large coastal feeding aggregation of juvenile male sharks
- Similar population structure to other known Indian Ocean feeding sites
- No evidence of reproductive activity



Discussion (movement patterns)

- High re-sighting rates suggest some degree of site-attachment
- Possible regional linkages
- Regular deep-diving behaviour during oceanic migration



Summary

- Not a functional population in itself
- Site-attachment supports a local MPA
- Complimentary results from photo-ID and tagging studies



Acknowledgements

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