



Productive and resilient intertidal marine resources available to human foragers on the South Coast of South Africa

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# Significance of Coastal Foraging to Modern Human Origins Research

- Some researchers hypothesized that high quality diet rich in Omega-3s allowed the evolution of costly large brains
  - Broadhurst et al 2002
  - Parkington 2010
- Others have hypothesized that coastal diet and coastal adaptation facilitated population persistence during glacial periods and evolution of social complexities associated with coastal adaptations
  - Marean 2010
  - Marean 2011
  - Marean 2014
- All the above assumes that coastal resource use in the Cape of South Africa is productive and resilient

# Implications of a Coastal Adaptation

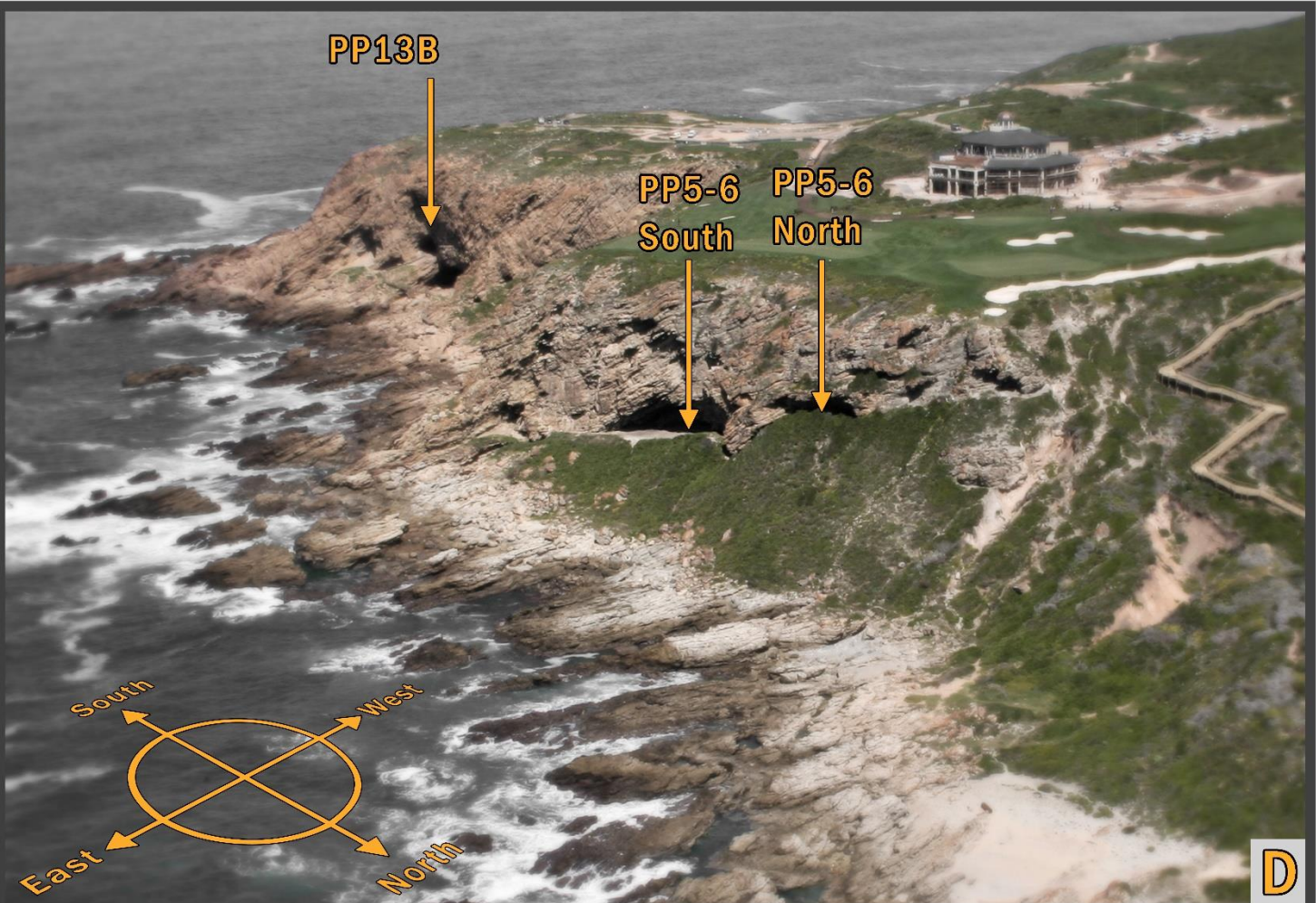
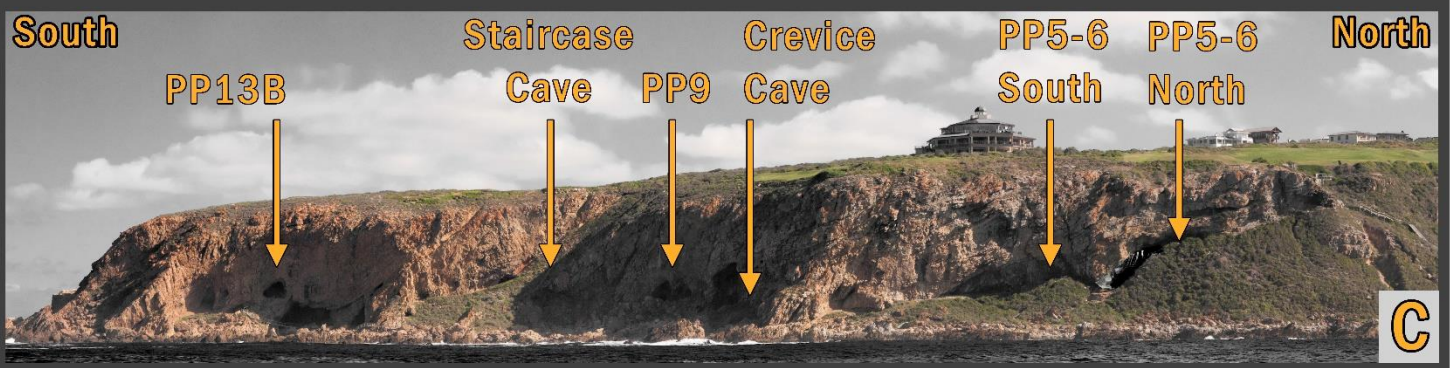
- Higher population size than other hunter-gatherers
- Band size is larger than other hunter-gatherers
- Residential mobility is reduced
- Women produce protein
- Shellfish is excellent source of omega-3 fatty acids and protein which may improve cognition and fertility
- Territoriality is elevated and Inter-group conflict may favor the evolution of mechanisms that promote large scale cooperation

# Objectives

- Measure return rates of intertidal foraging on the south coast of South Africa
- Determine what variables affect the return rates for intertidal foraging and how much
- Compare return rates from the southern Cape to other hunter-gatherer returns
- Measure depletion of intertidal resources to determine predictability

## Goal

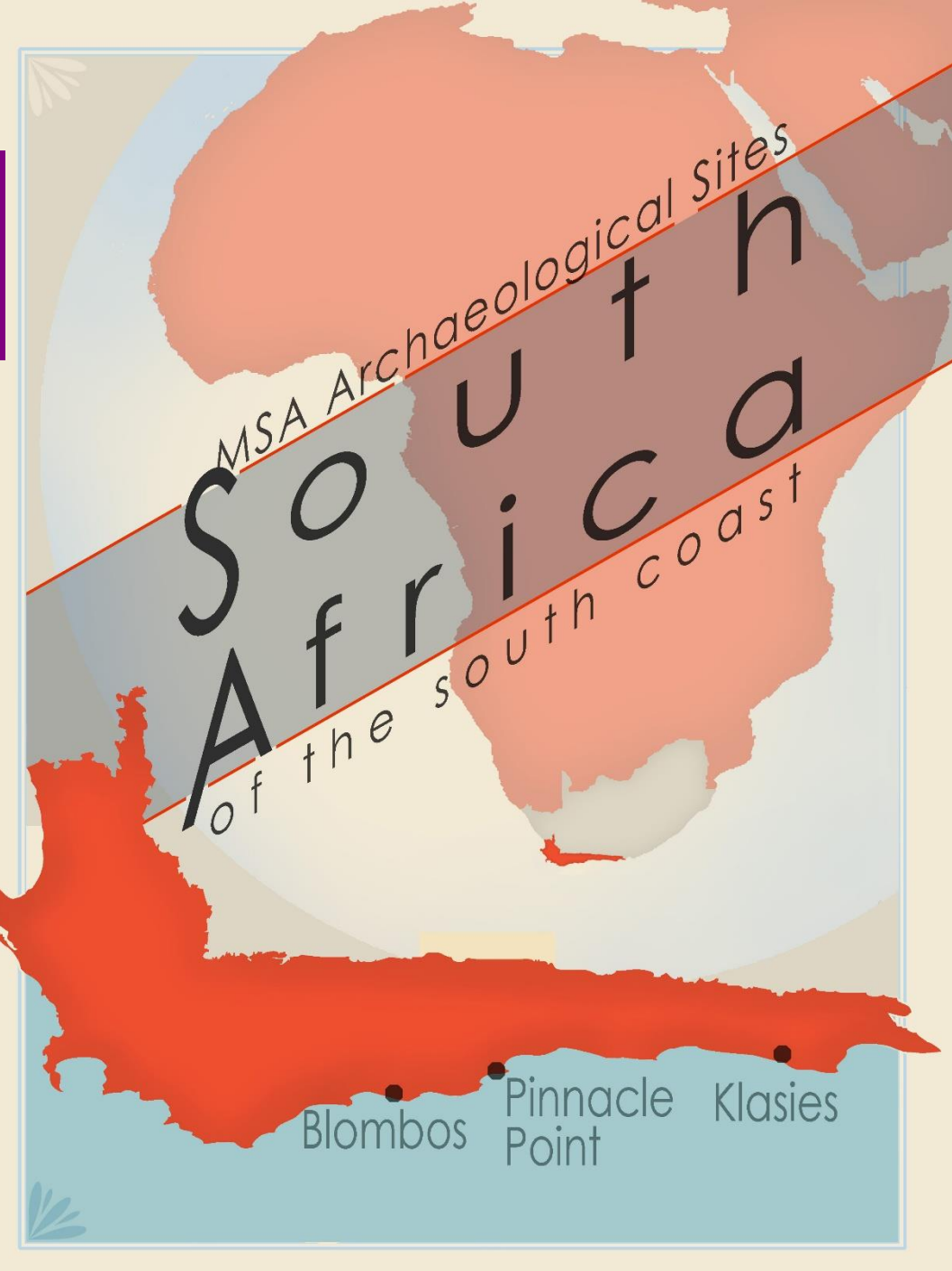
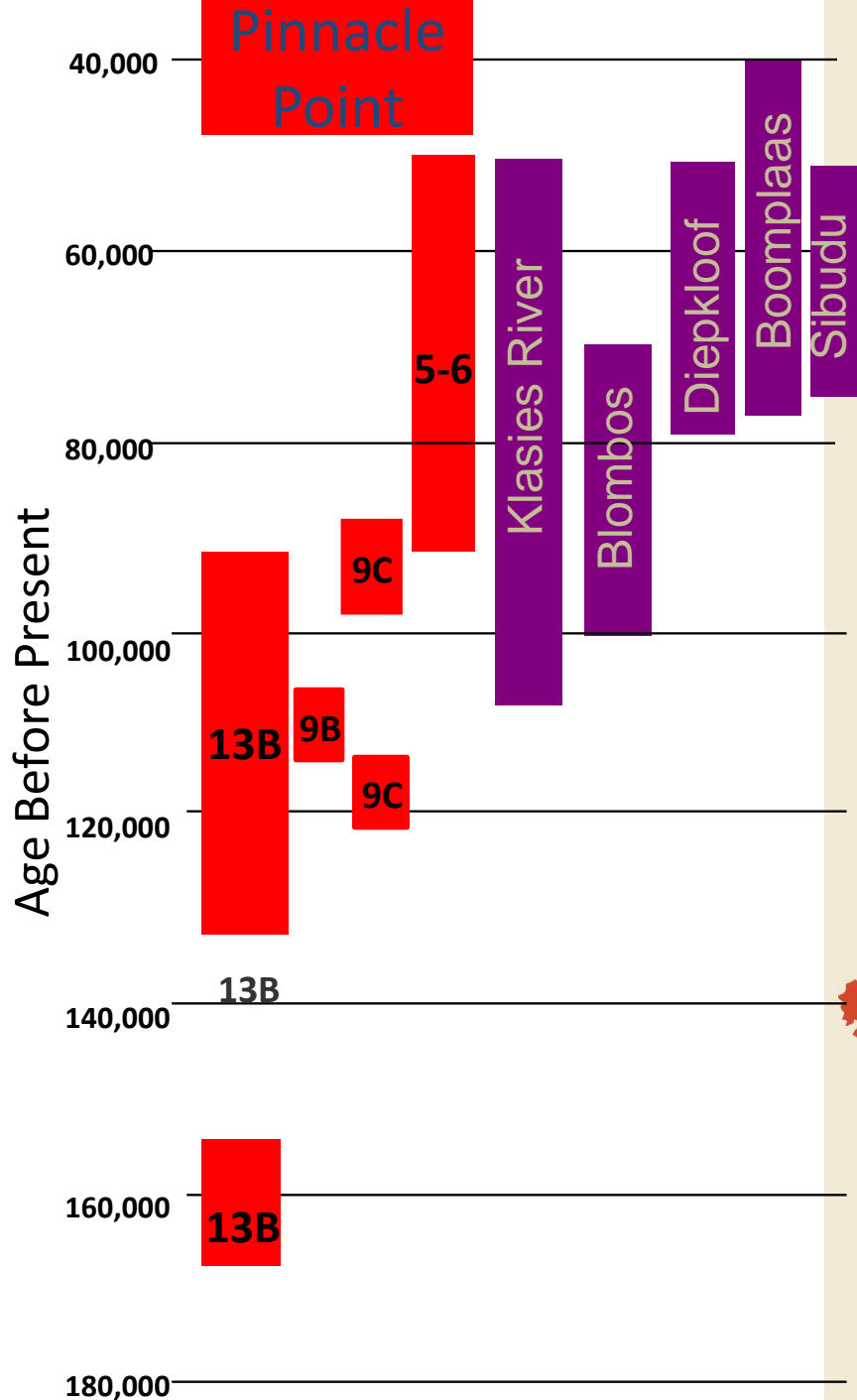
- Use the information generated to predict economic patterns during the MSA =>  
Determine whether predictability and productivity create a unique adaptive landscape that might favor key factors of human behavioural modernity



**PINNACLE POINT**  
South Africa

- A - PP13B
- B - Staircase Cave
- C - PP9
- D - Crevice Cave
- E - PP5-6 South
- F - PP5-6 North

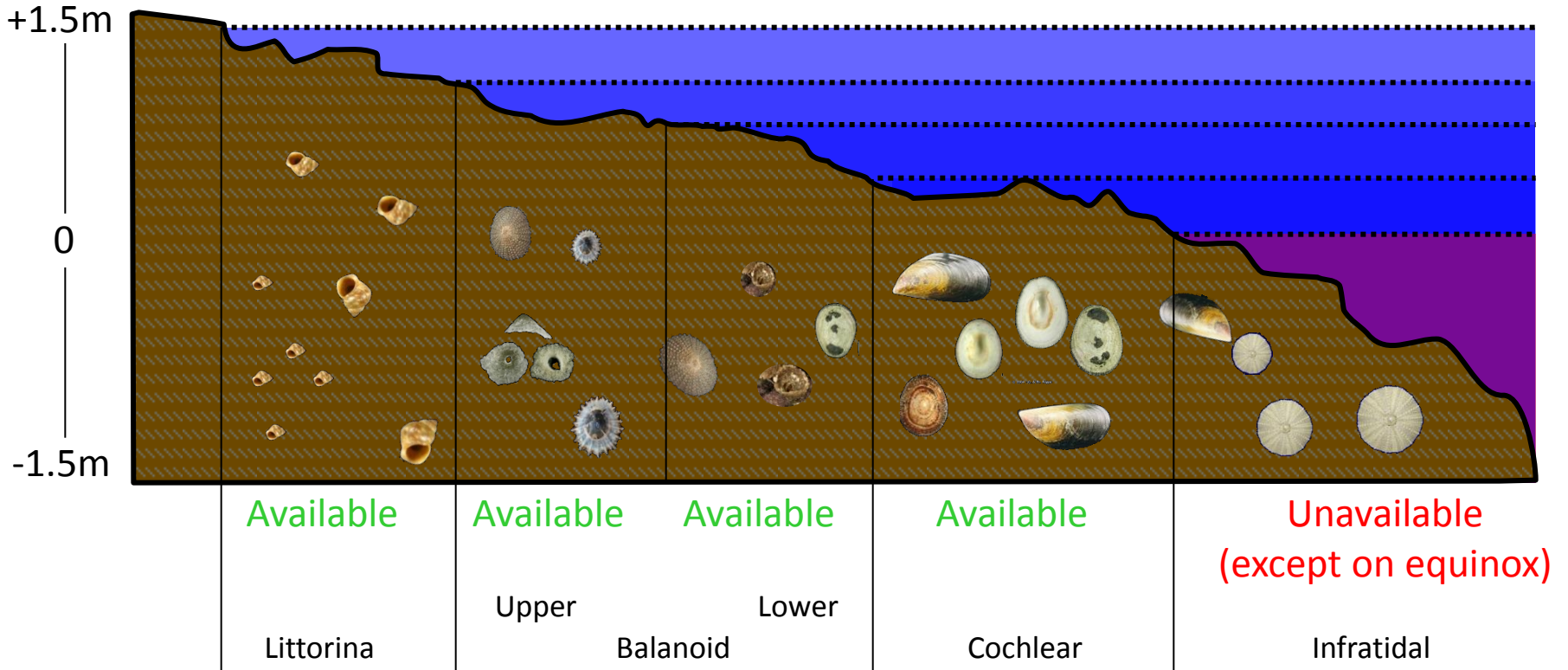




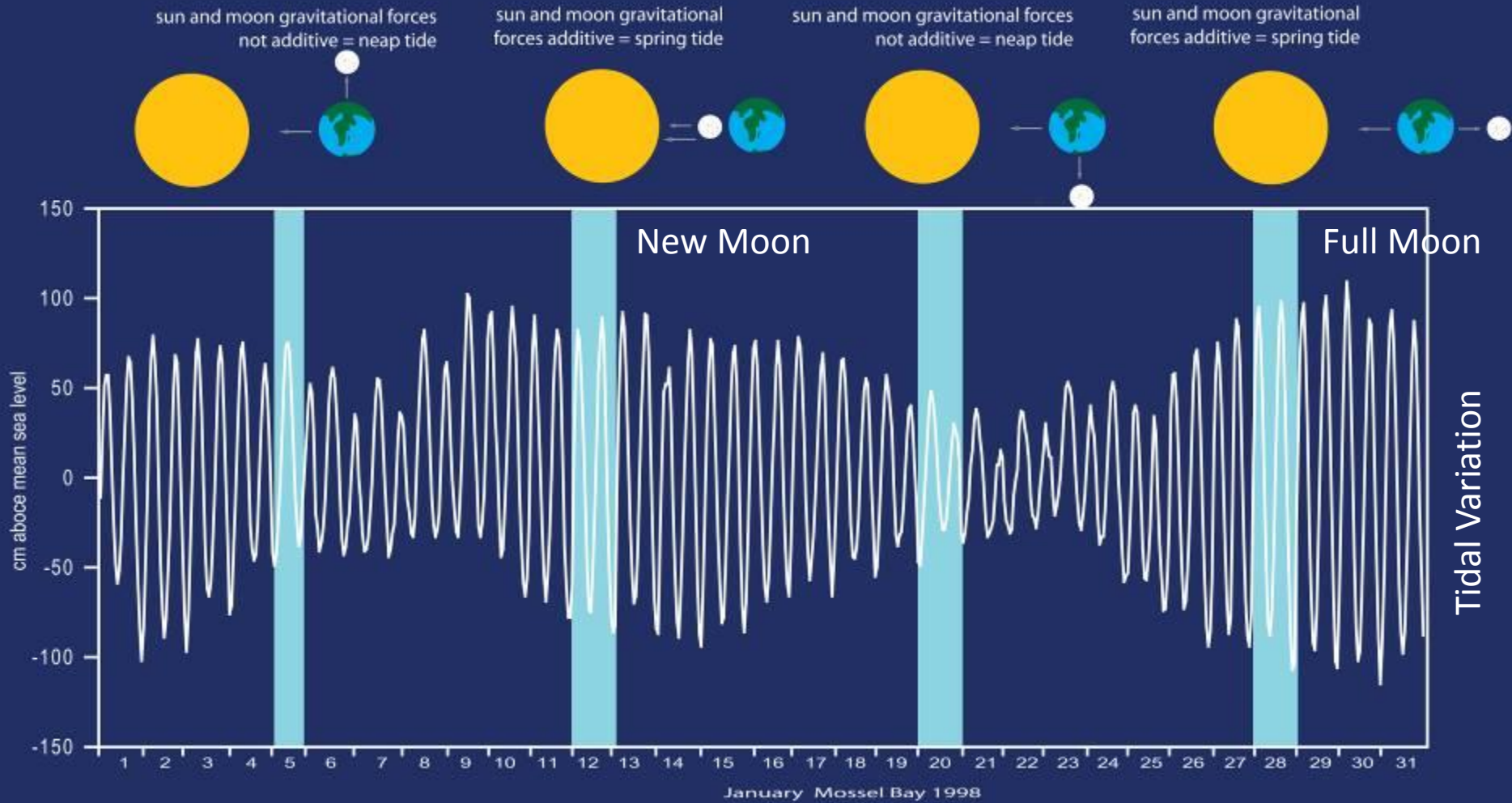
# Is There Tidally Structured Foraging For Shellfish?



## Low Spring Tide *Resource Availability*



# Monthly lunar and tidal cycles





# SAMPLE LOCATIONS



Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image Landsat

Google earth

# COMMUNITIES



Khoe-San coastal communities with a long history of intertidal foraging

# Gourits Mouth near Pinnacle Point









# MARINE HABITAT TYPES

# Table Mountain Sandstone Exposed Rocky Headlands



# Table Mountain Sandstone Wavecut Platforms





# Table Mountain Sandstone Boulders



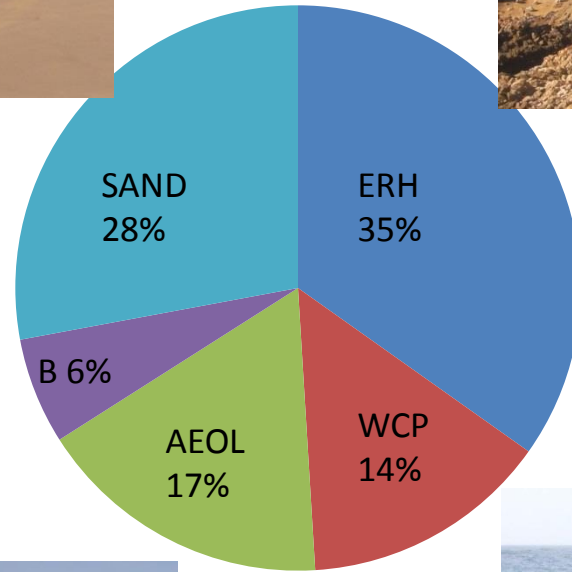
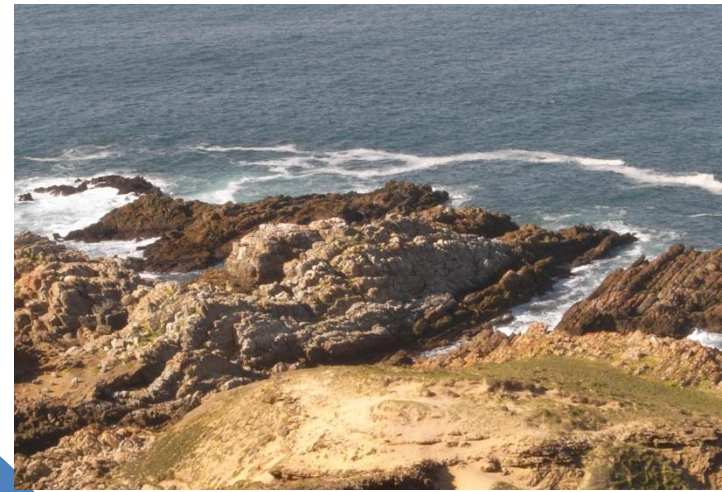
# Aeolianite reefs



# Sand/Beach

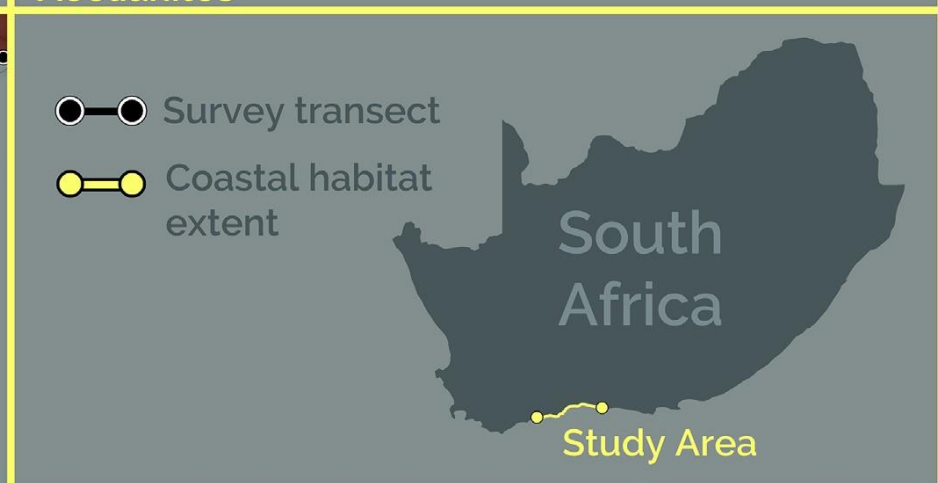
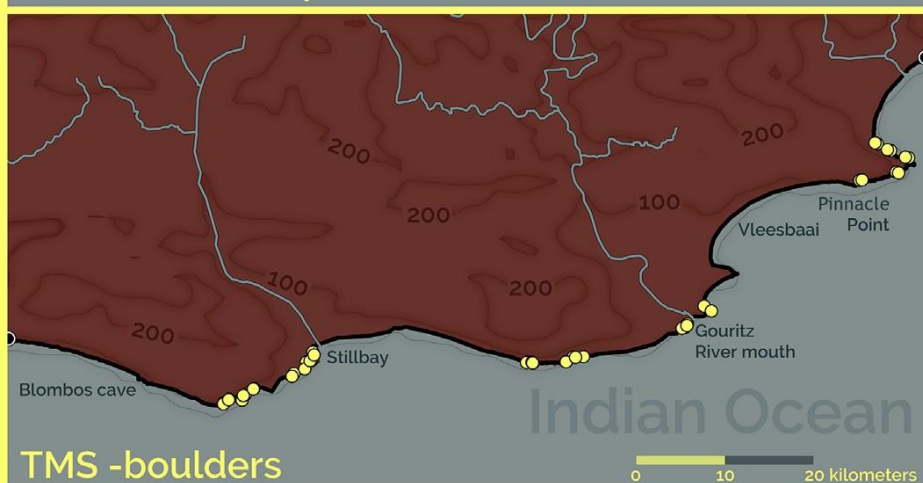
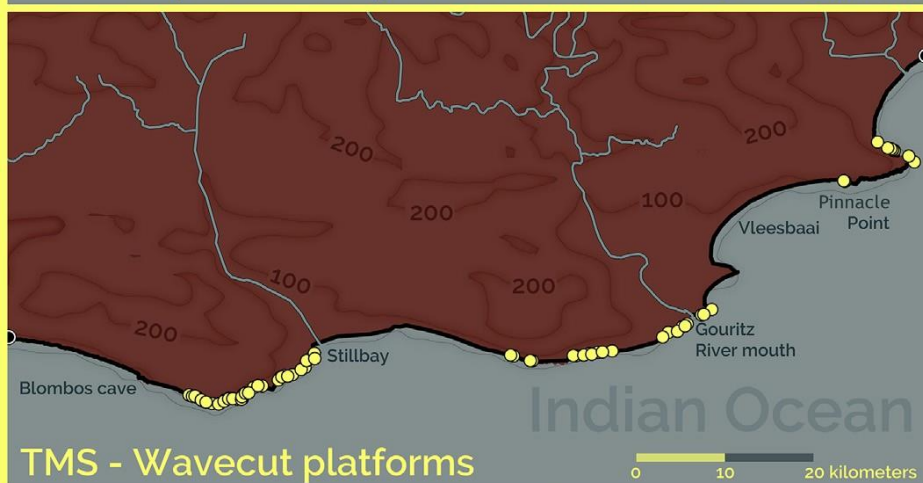
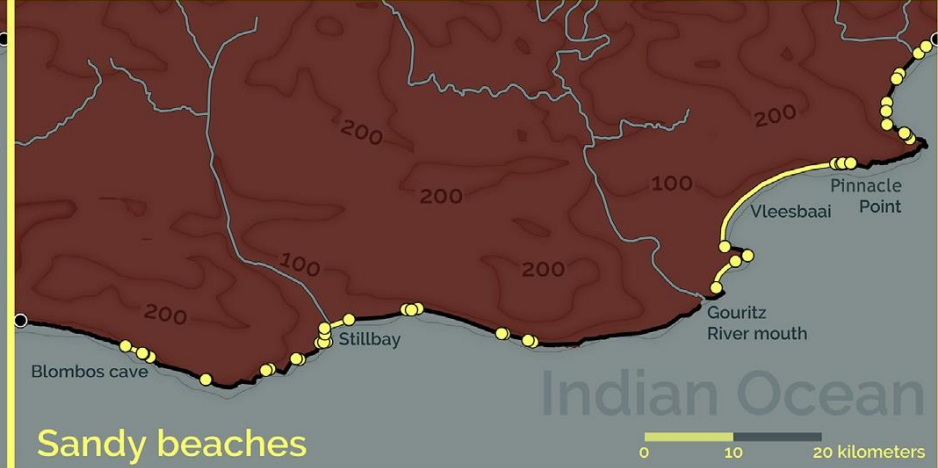
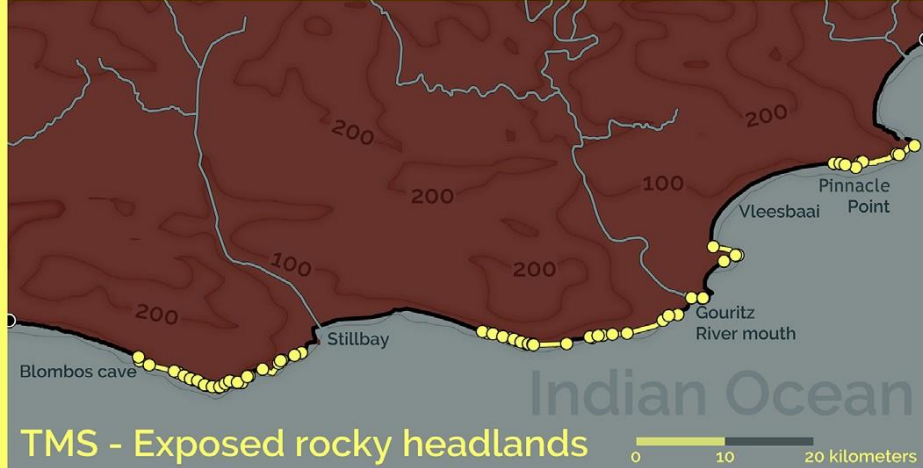
*Donax serra*





Present habitat types





# PREY

*Scutellastra tabularis*  
Giant limpet



*Pinctada capensis*  
Cape pearl oyster



*Turbo sarmaticus*  
Giant turban



*Cymbula oculus*  
Goat's eye limpet



*Perna perna*  
Brown mussel



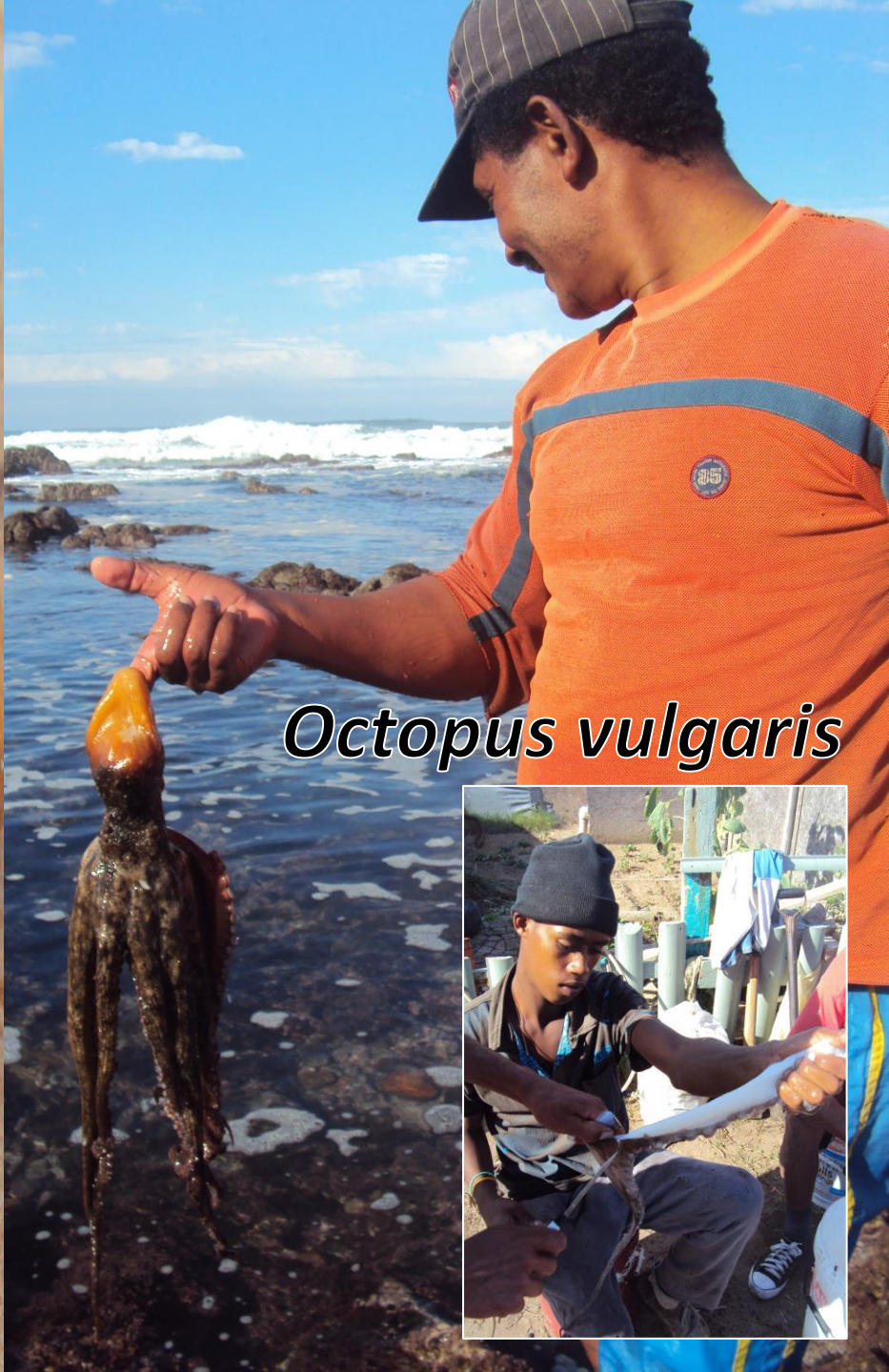
*Haliotis spadicea*  
Venus ear



*Pyura stolonifera*  
Redbait



*Pyura stolonifera* - redbait

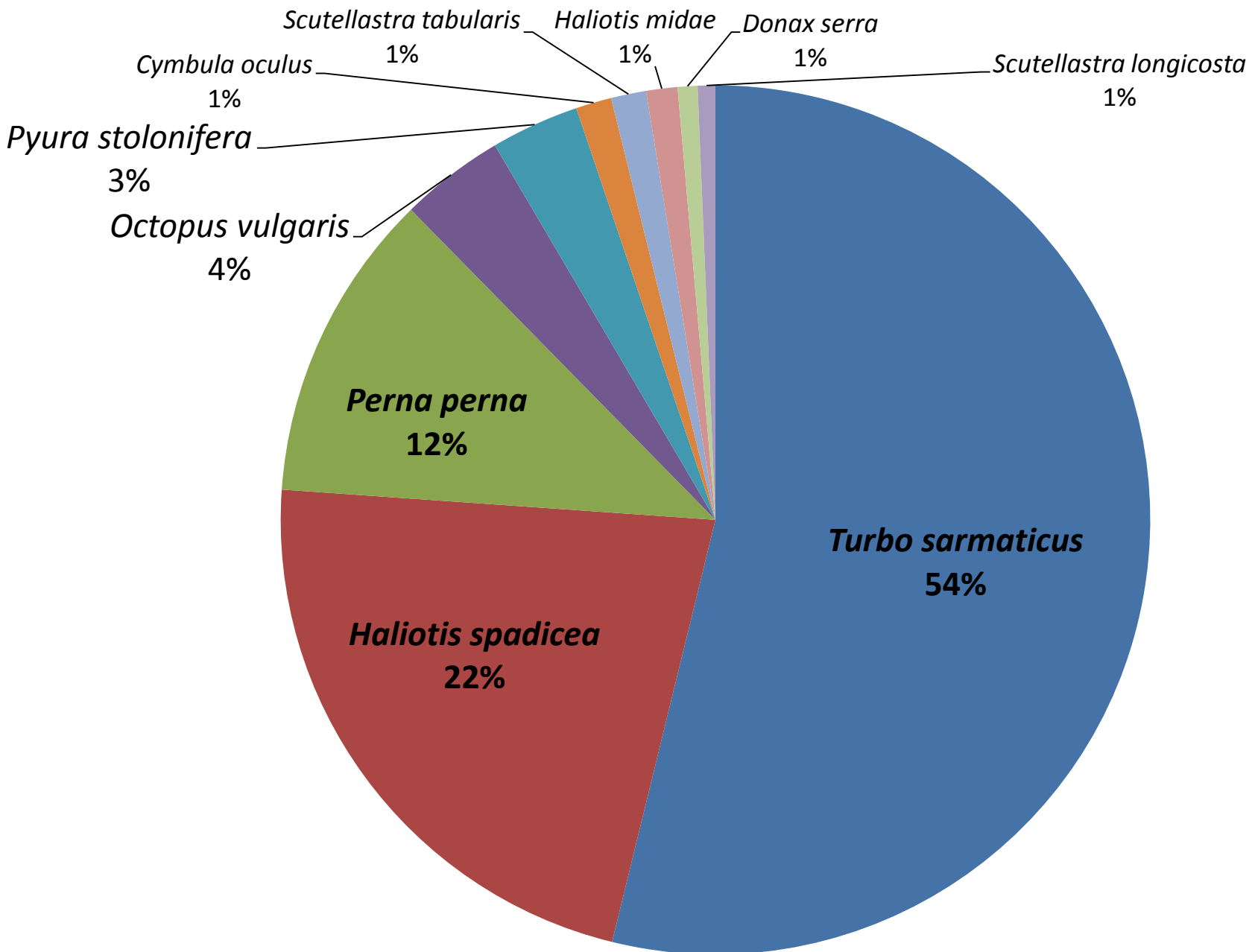


*Octopus vulgaris*

*Turbo sarmaticus*







Harvest composition in Kcal

# WEATHER CONDITIONS

We produced a composite score of 3 factors  
measuring wind, swell and shore aspect



Weather conditions rating

Beaufort scale

Wind kph.

Swell m.

Status



1

0 to 2

0 to 11

0 to 0.3

**GOOD**

2

3

12 to 19

0.4 to 1

**GOOD**

3

4 to 5

20 to 38

1.1 to 2.4

**AVERAGE**

4

6

39 to 50

2.5 to 5.8

**POOR**

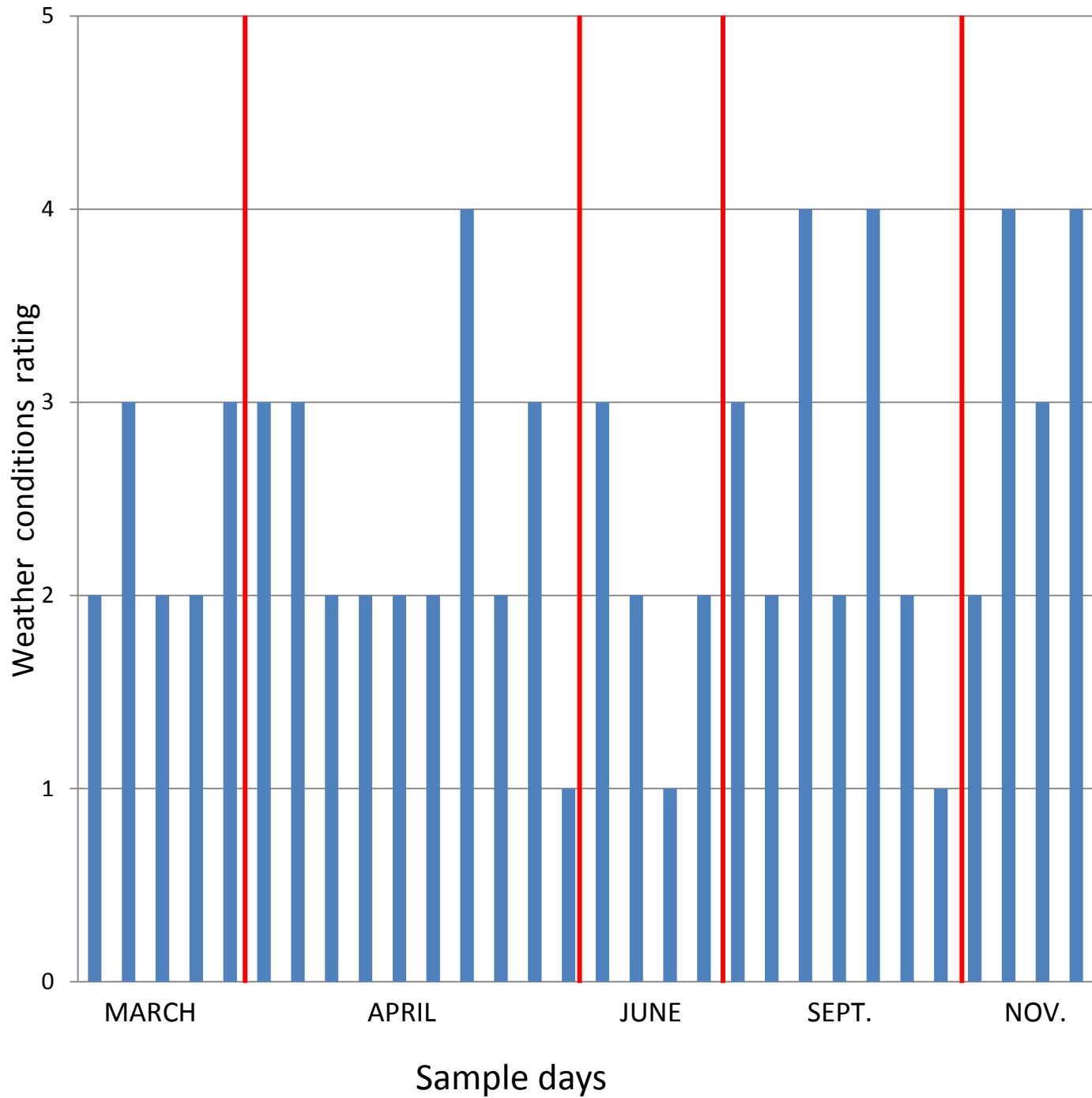
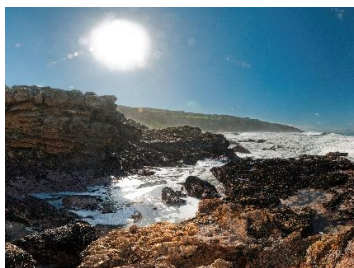
5

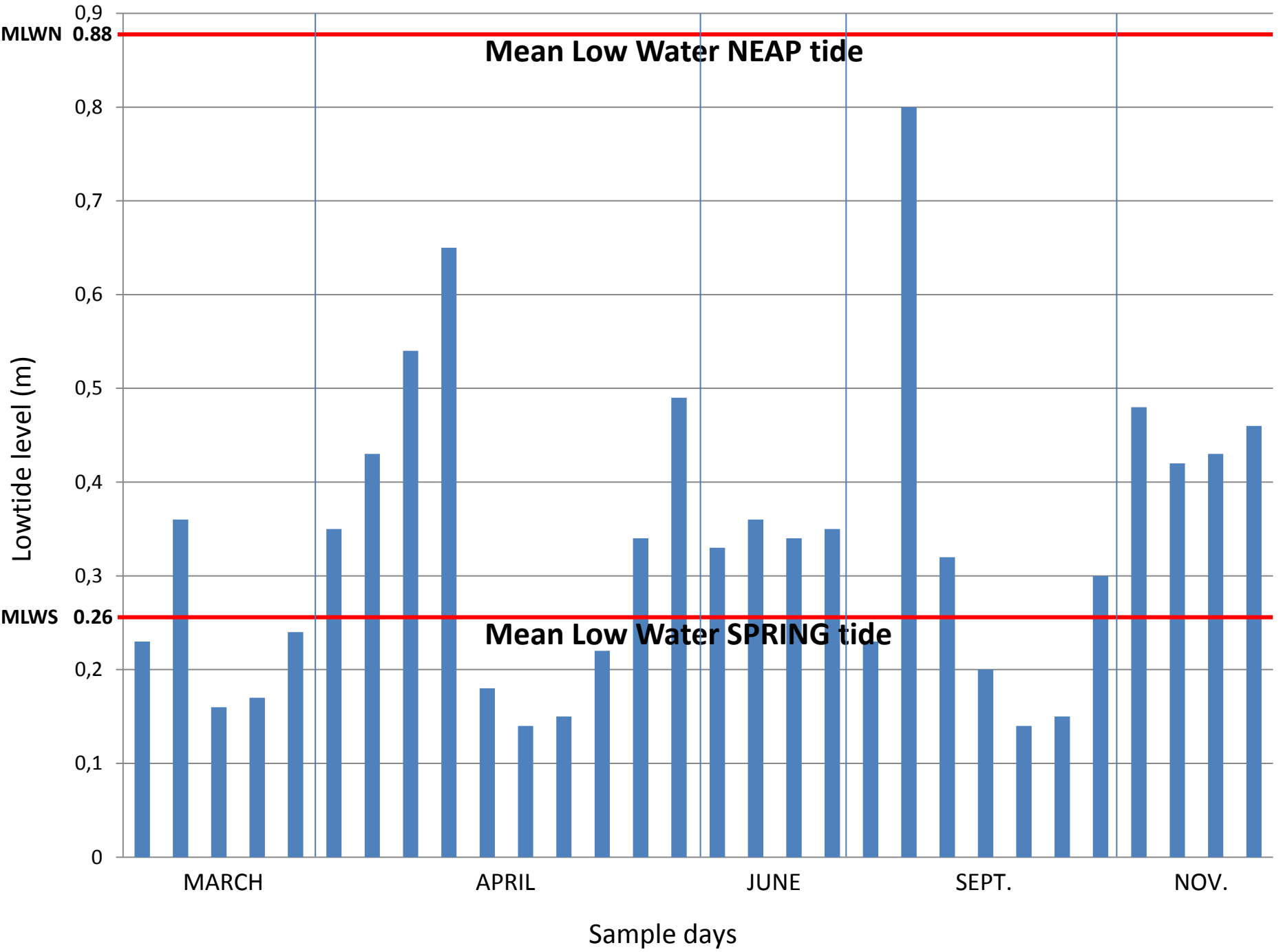
7 to 12

51 +

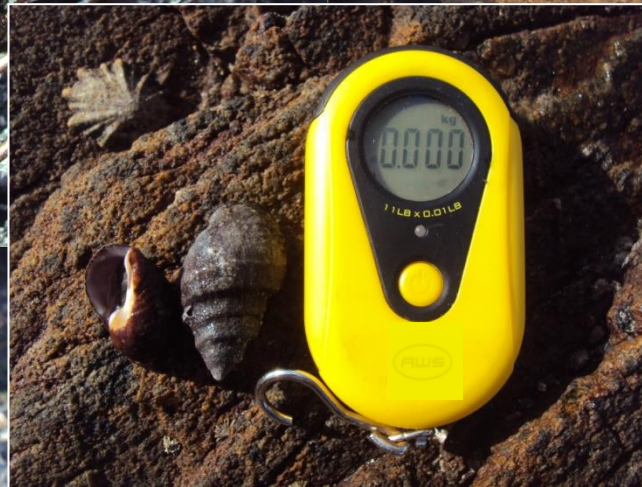
5.9 +

**STAY HOME**



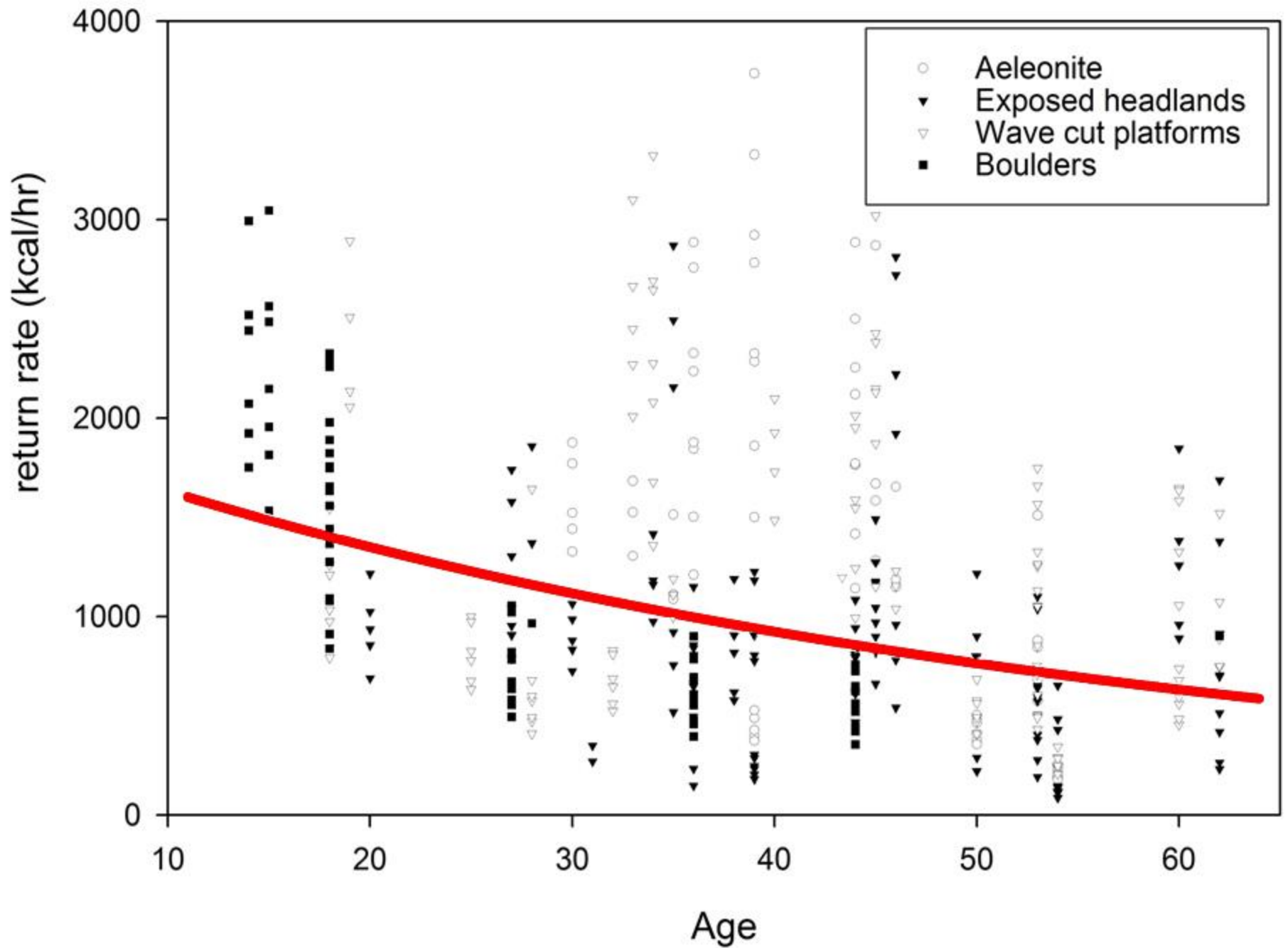


- We weighed everything
- Bouts were approximately 30 minutes
- We experimentally calculated the edible portions
- Published values for edible portions

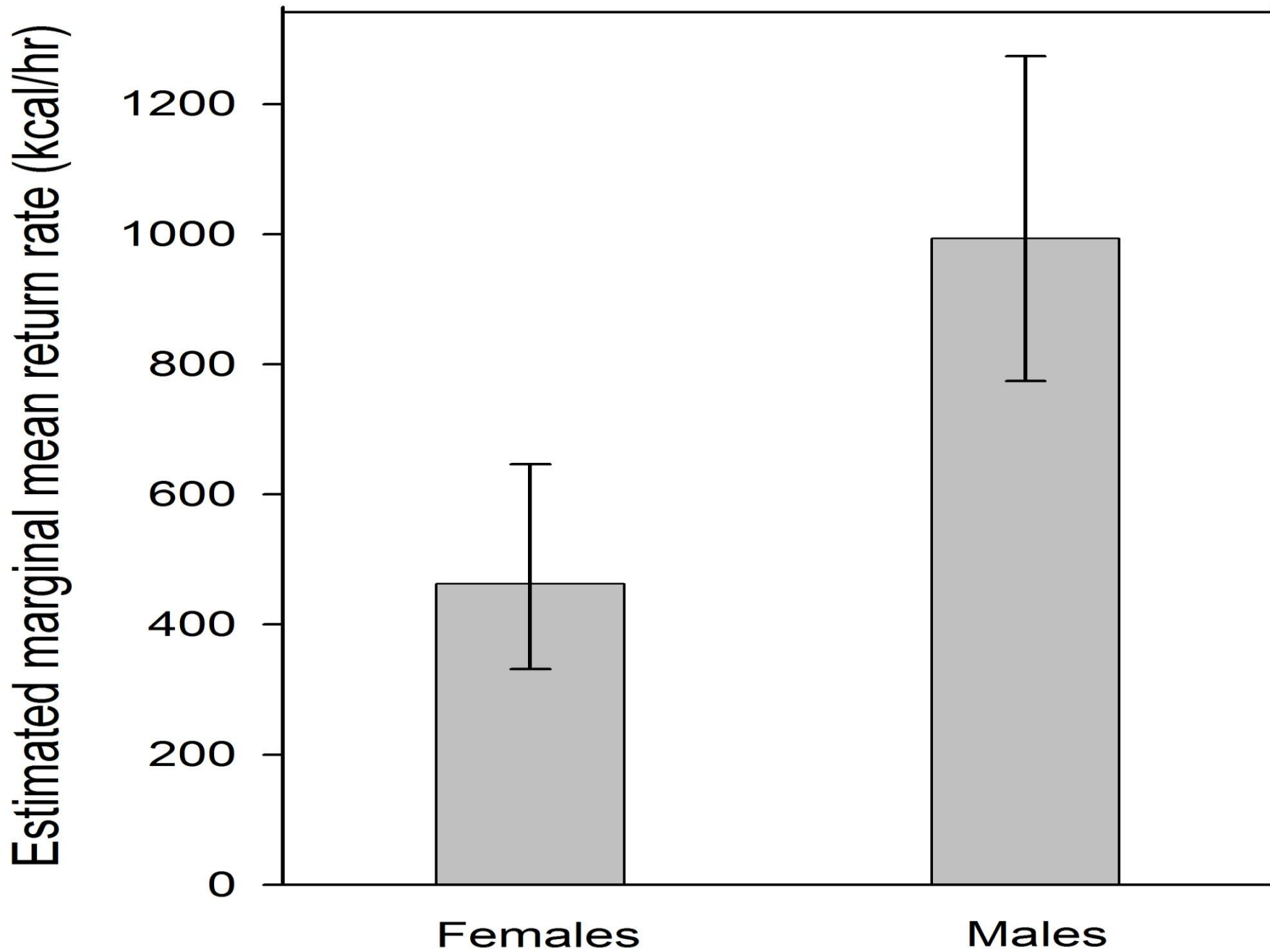


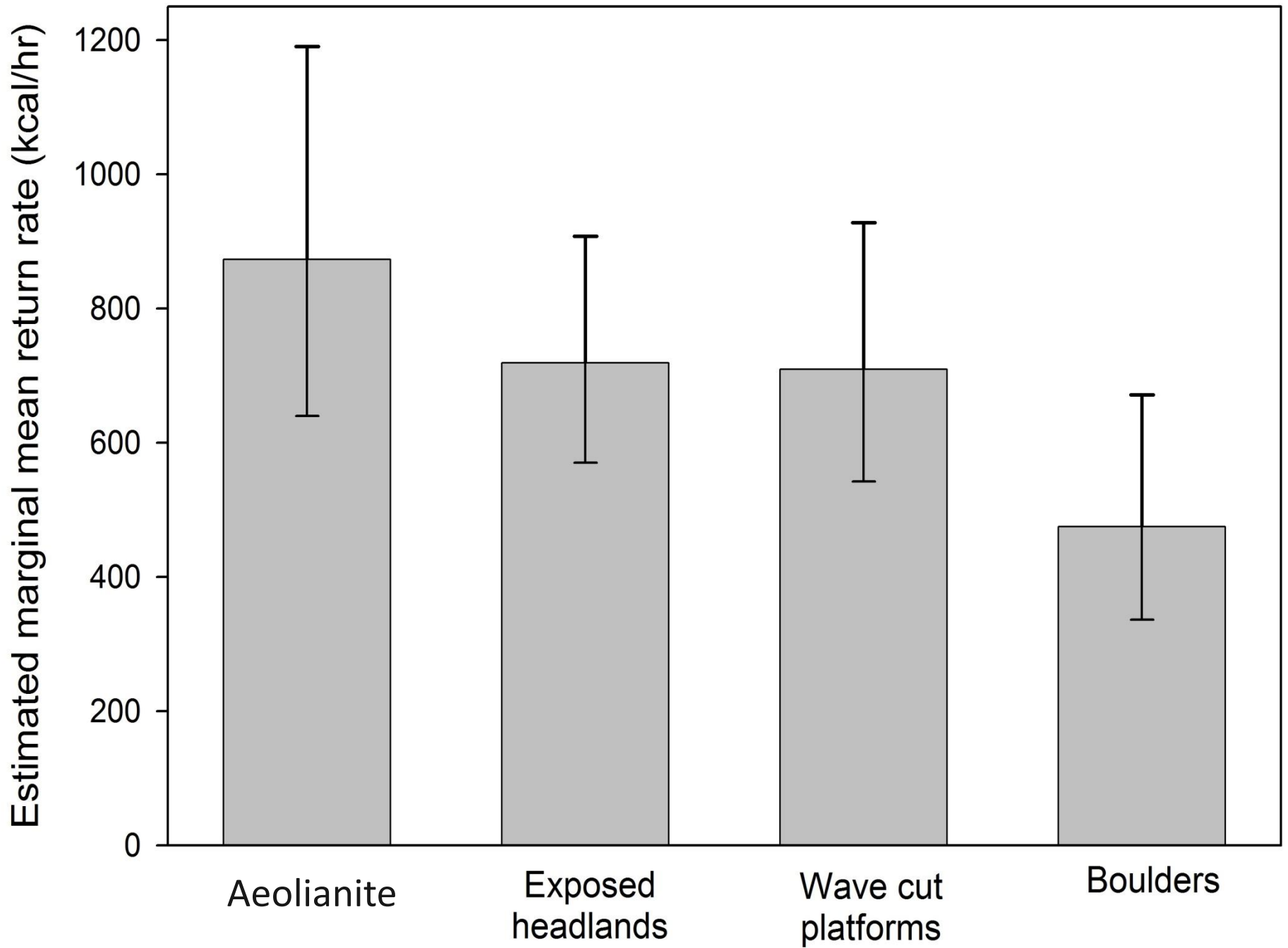
# Results

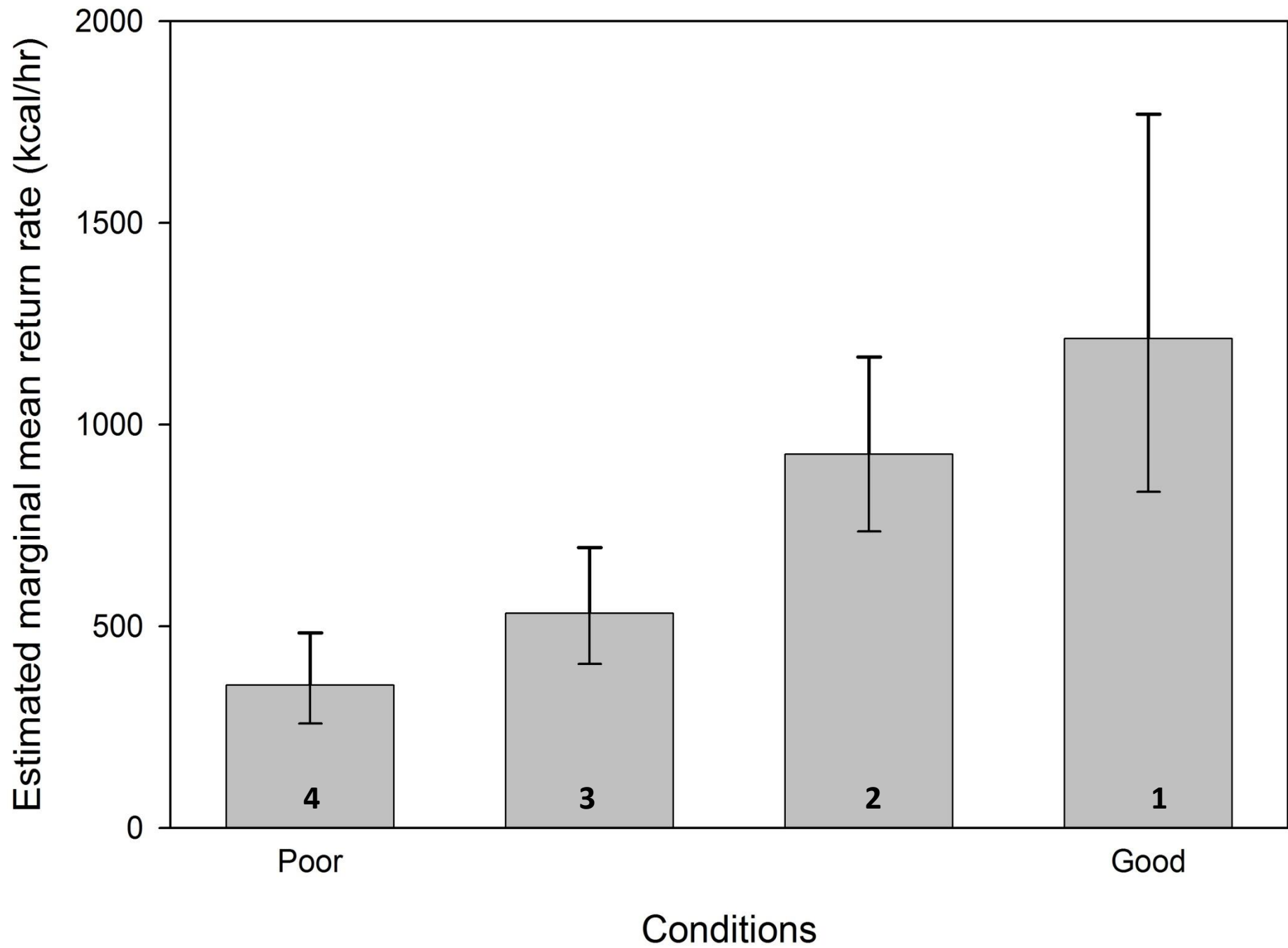
- Return rates calculated in kilocalories per hour
- Foraging bouts of variable lengths
- Multi-variate non-linear regression
- The effect of a single variable with all other variables controlled to their mean value

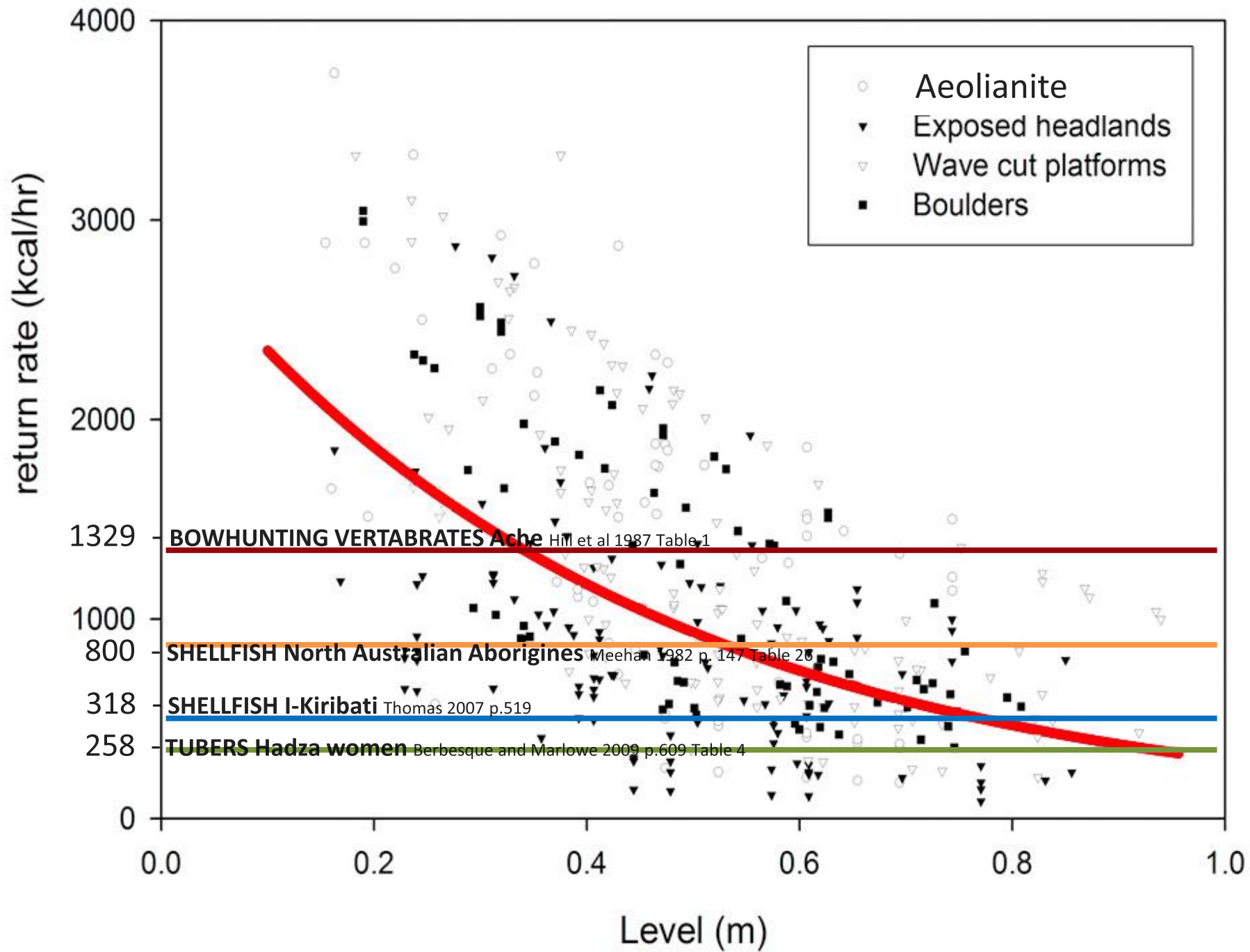


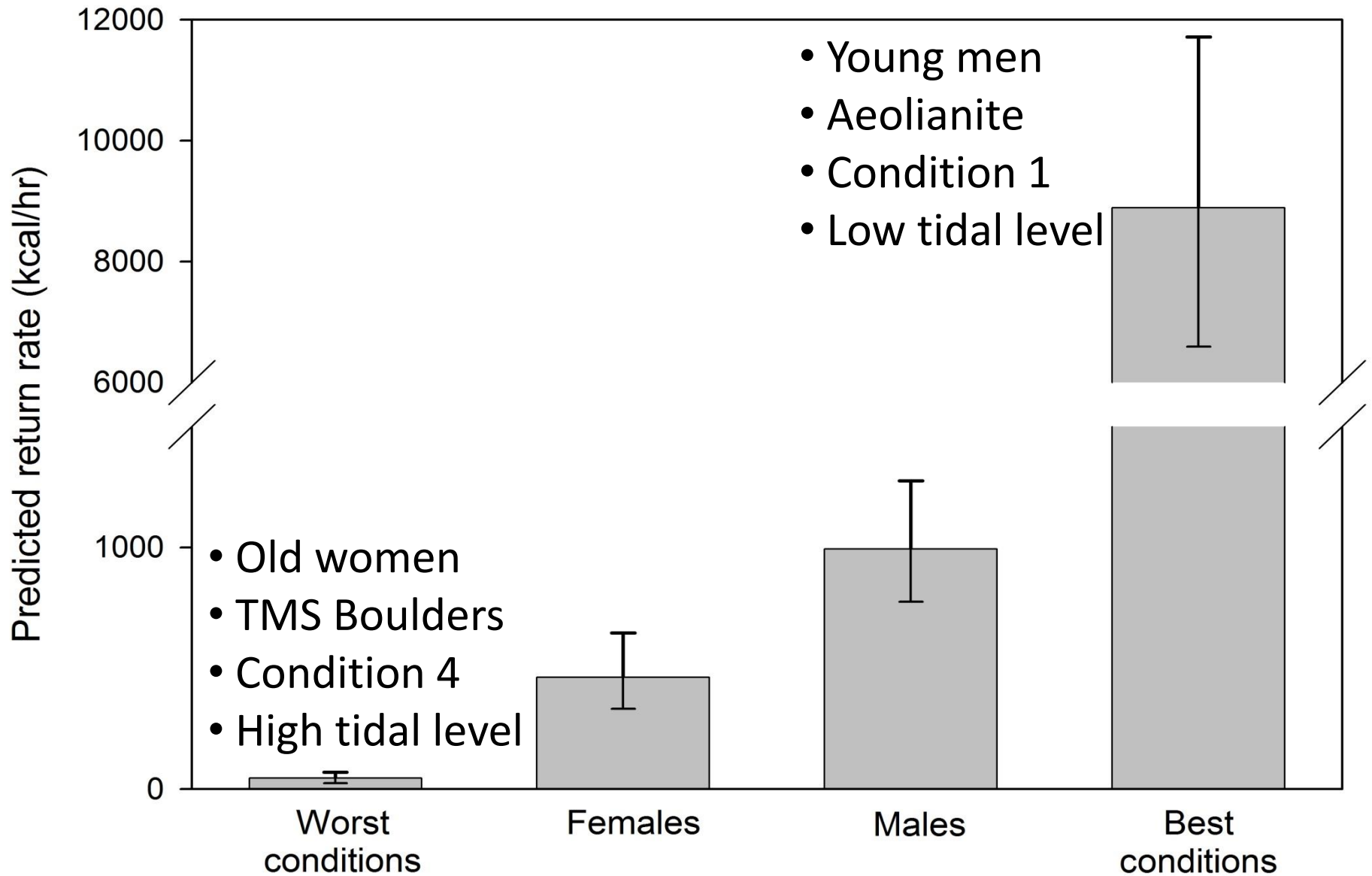












Foraging return rates under best and worst combination of conditions compared to the male and female mean.



Depletion experiments

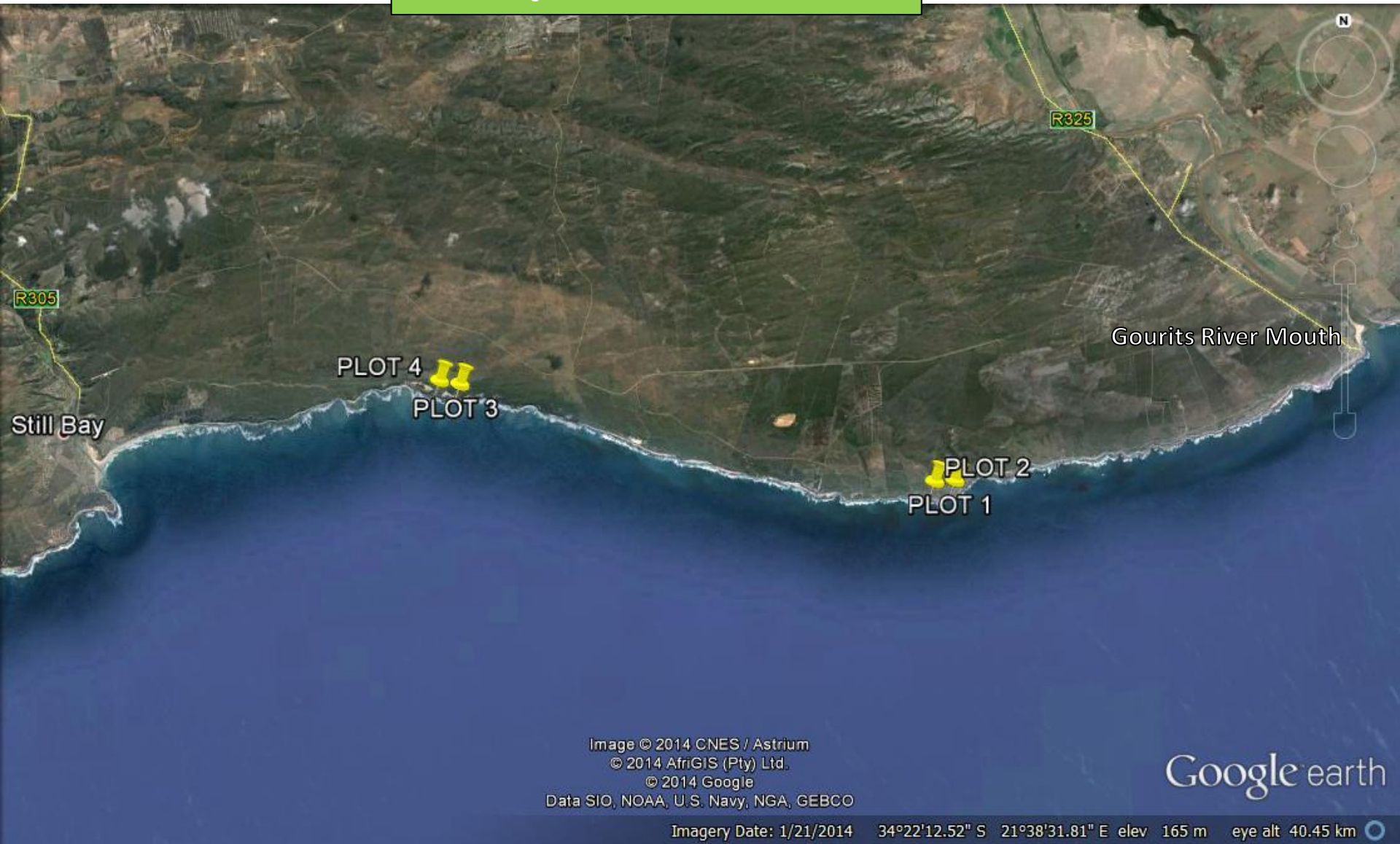
Three subjects

Two-weekly plots in both Aeolianite and Table Mountain Sandstone (18 harvests)

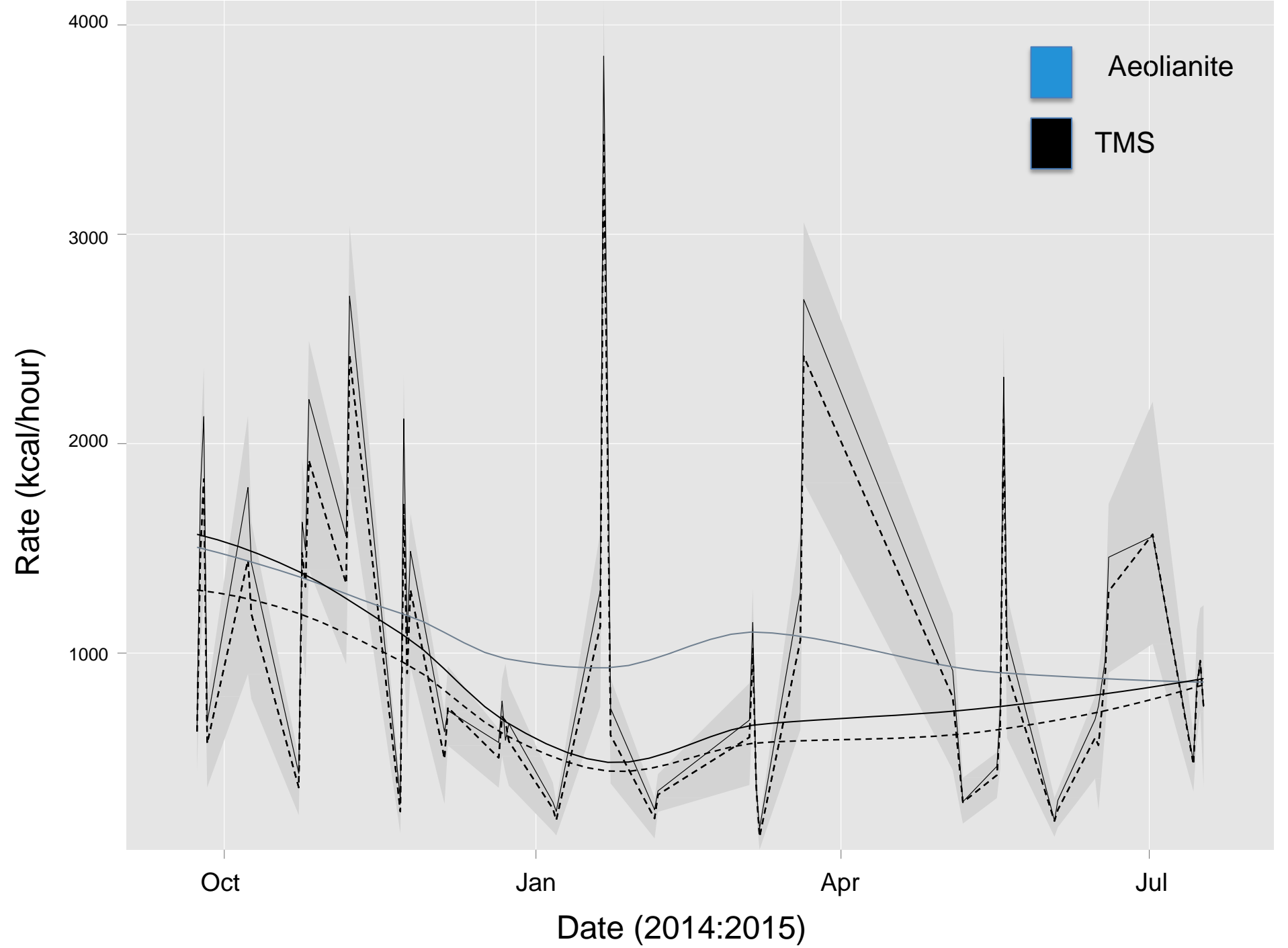
Four-weekly plots in both Aeolianite and Table Mountain Sandstone (nine harvests)

100 m	100 m	100 m
a  30 minutes.....> <.....15 minutes	b  30 minutes.....> <.....15 minutes	c  30 minutes.....> <.....15 minutes ↓

# Sample locations

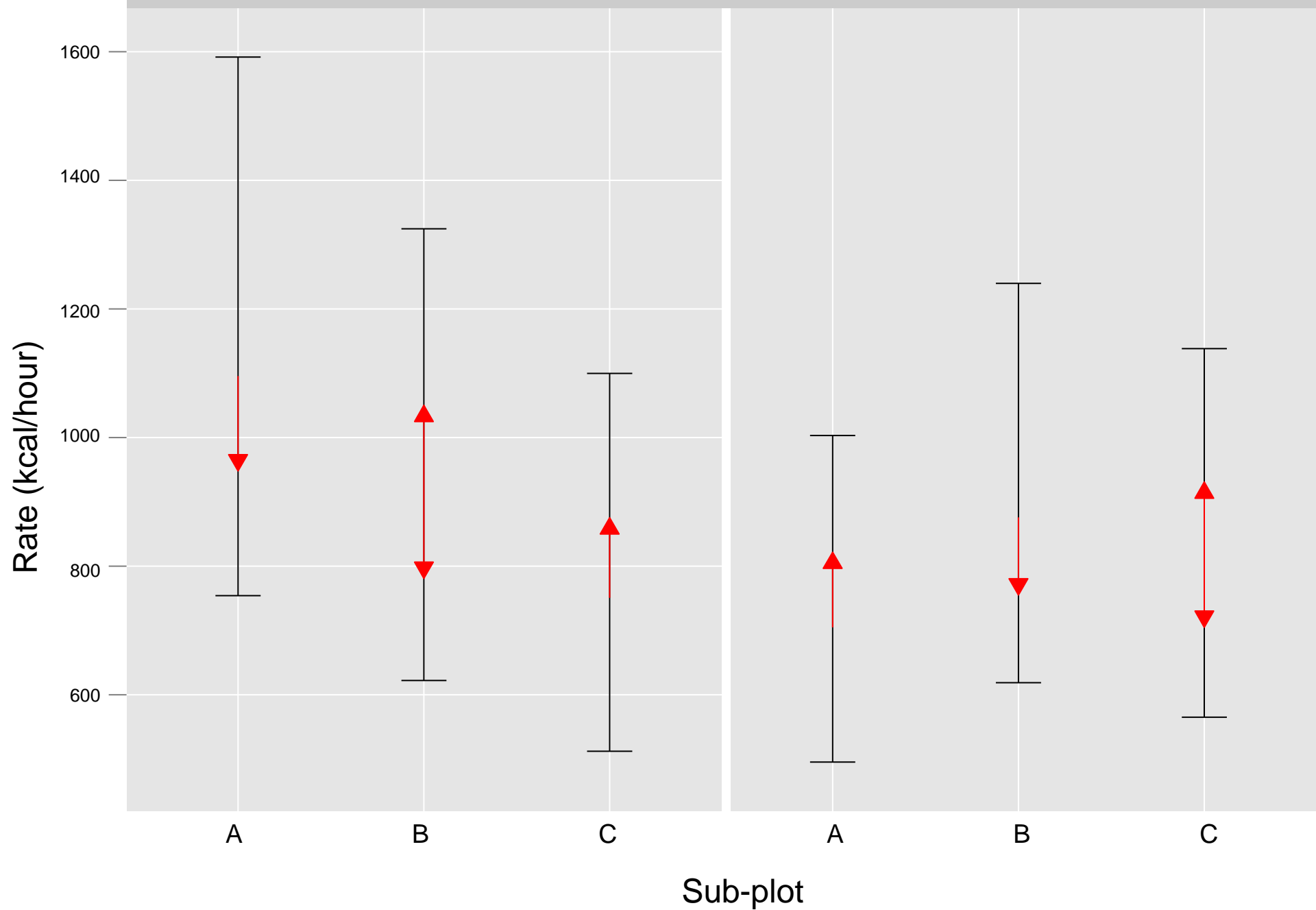






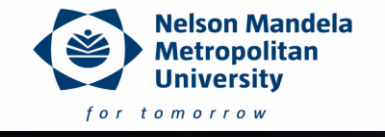
# Aeolianite

# Table Mountain Sandstone



# Summary

- Intertidal return rates can be very high on the South African coast
- Tidal variation has a strong influence on intertidal return rates
- Weather conditions have a strong influence on return rates
- Men harvest twice the return rates than women
- The different Marine Habitat Types have moderately different return rates
- Age has a modest influence on return rates
- Intertidal resources on the southern Cape coast can be highly dependable



# Acknowledgments:

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