Biogeography influences endolithic parasitism of coexisting invasive and indigenous mussel species

Aldwin Ndhlovu, Christopher McQuaid, Katy Nicastro, Nathalie Marquet, Marcos Gektidis, Cristián J Monaco ,Gerardo Zardi

RHODES UNIVERSITY
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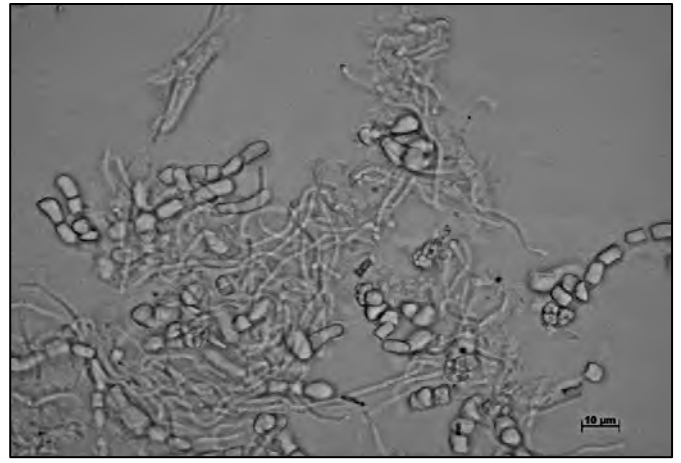
INTRODUCTION

- Endoliths: organisms that live within pore spaces e.g. rocks, attack biological material such as corals and shells of molluscs

- Photosynthetic shell-degrading endoliths (mainly cyanobacteria)

- Endolithic parasite infestation affects intertidal mussels e.g. 50% of adult mussel mortality is attributed to endoliths



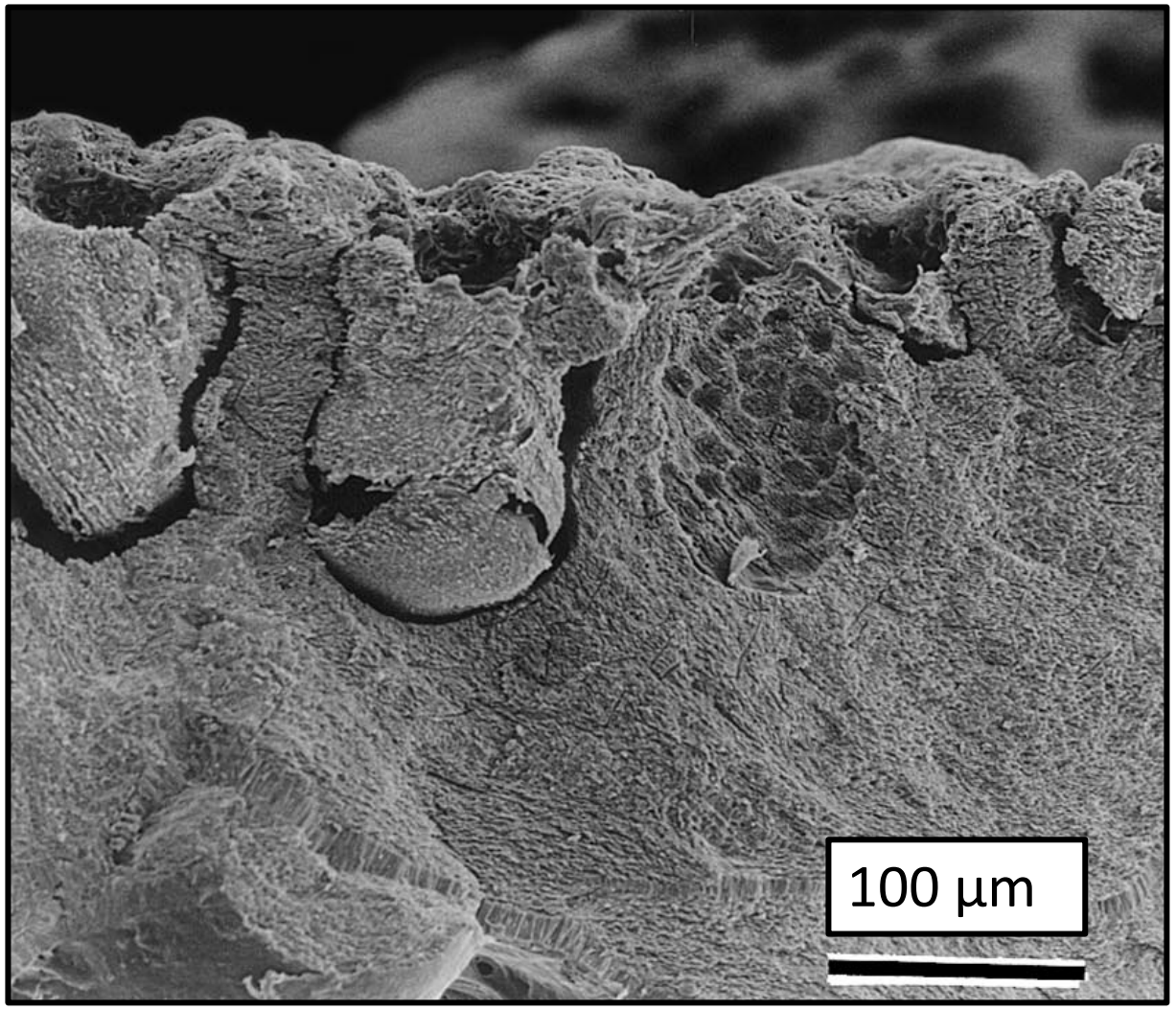
INTRODUCTION

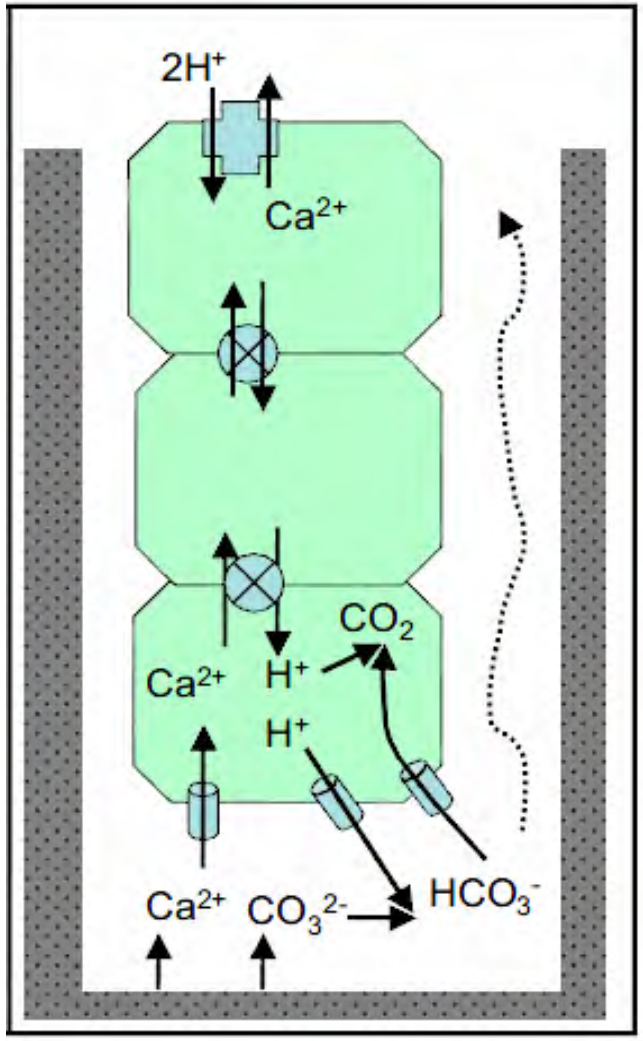
COOL TEMPERATE WEST COAST

WARM TEMPERATE SOUTH COAST

SUBTROPICAL EAST COAST

Pleurocapsa sp. penetrating *Perna perna* shell

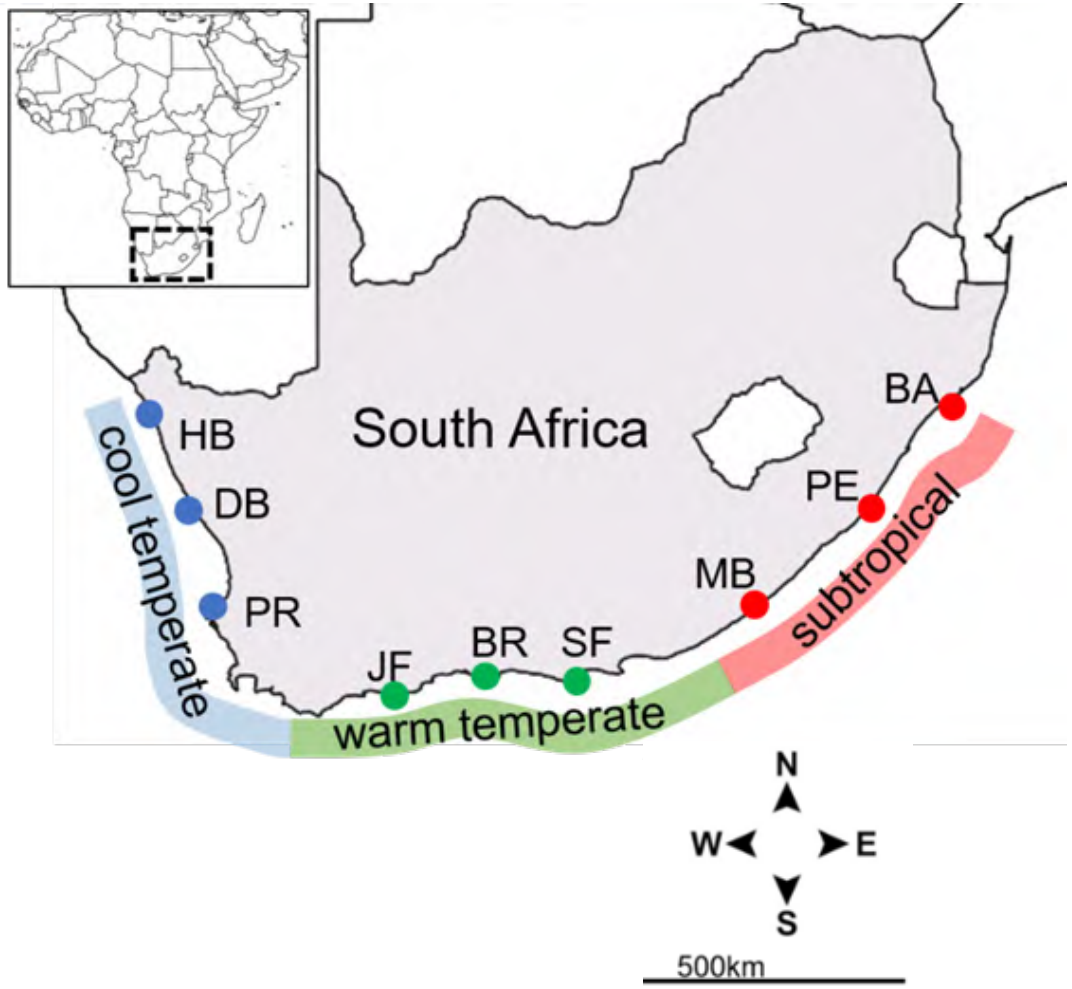




- Ca2+ channels allow entry of extracellular Ca2+ into the apical cell, lowering interstitial extracellular concentration below that of calcite saturation, and promoting mineral dissolution.
- Counter transported protons promote the conversion of carbonate ions released from calcite into CO_2.
- CO_2 is then used in photosynthesis.

Garcia-Pichel et al. 2010 - PNAS, Vol 50

METHODOLOGY



Study sites classified according to biogeography

- Three main questions are addressed:

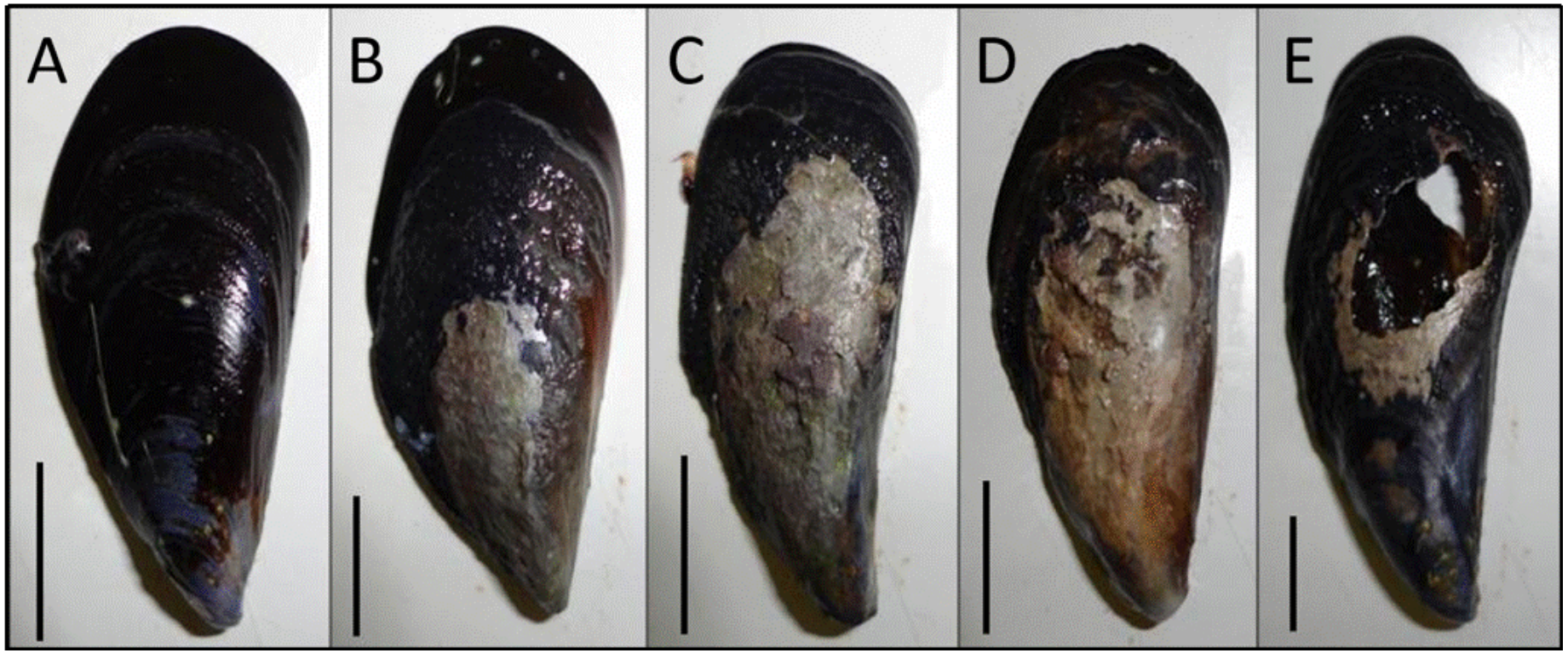
  1. Does endolithic species richness change with bioregion?

  2. Does the identity of the host drive parasite diversity?

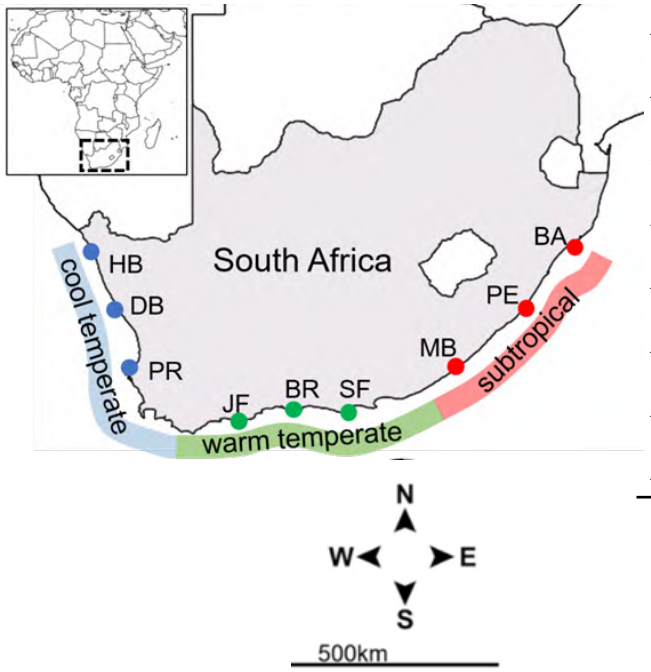
  3. Does the mortality due to cyanobacterial infestation and proportion of cyanobacteria infestation vary across bioregions?

METHODOLOGY

- Prevalence of Endolithic Infestation - 4 size classes and assigned to different levels of infestation
- Identification of Endolithic Organisms - heavily infested (Group D or E)
- Lethal Effects of Endolithic Infestation



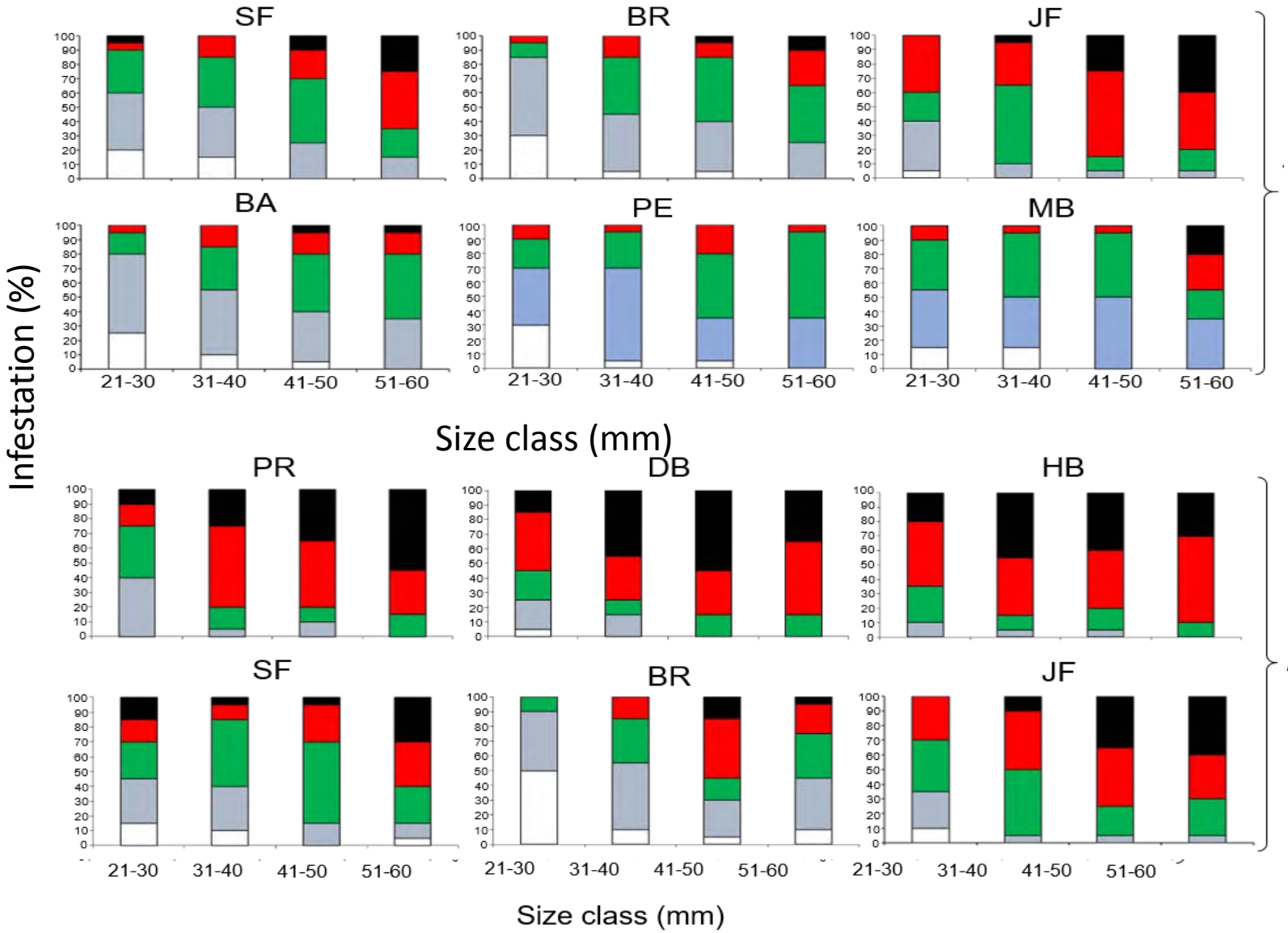
RESULTS



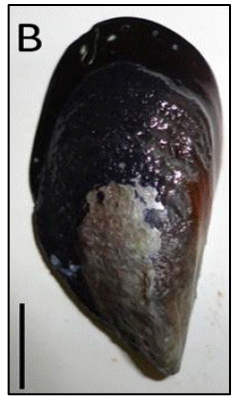
Cyanobacterium Species	*Mytilus galloprovincialis* HB	DB	PR	JF	BR	SF
Hyella balani	X	X	X	X	X	X
Mastigocoleus testarum	X	X	X	X	X	X
Solentia stratosa	X	X	X	X	X	X
Plectonema terebrans	X	X	X	X	X	X
Hyella caespitosa	X	X	X	X	X	X
Kyrthutrix dalmatica	X	X	X	X	X	X
Hormathonema luteo brunneum	X	X	X	X		
Hormathonema violaceo-nigrum		X				

Cyanobacterium species	*Perna perna* JF	BR	SF	MB	PE	BA
Hyella balani	X	X	X	X	X	X
Mastigocoleus testarum	X	X	X	X	X	X
Solentia stratosa	X	X	X	X	X	X
Plectonema terebrans	X	X	X	X	X	X
Hyella caespitosa	X	X	X	X	X	X
Kyrthutrix dalmatica	X	X	X			
Hormathonema luteo brunneum	X					

RESULTS


SF
BR
JF
BA
PE
MB
PR
DB
HB
SF
BR
JF
Infestation (%)
21-30
31-40
41-50
51-60
Size class (mm)
A
B
C
D
E
Perna perna
Mytilus galloprovincialis


A

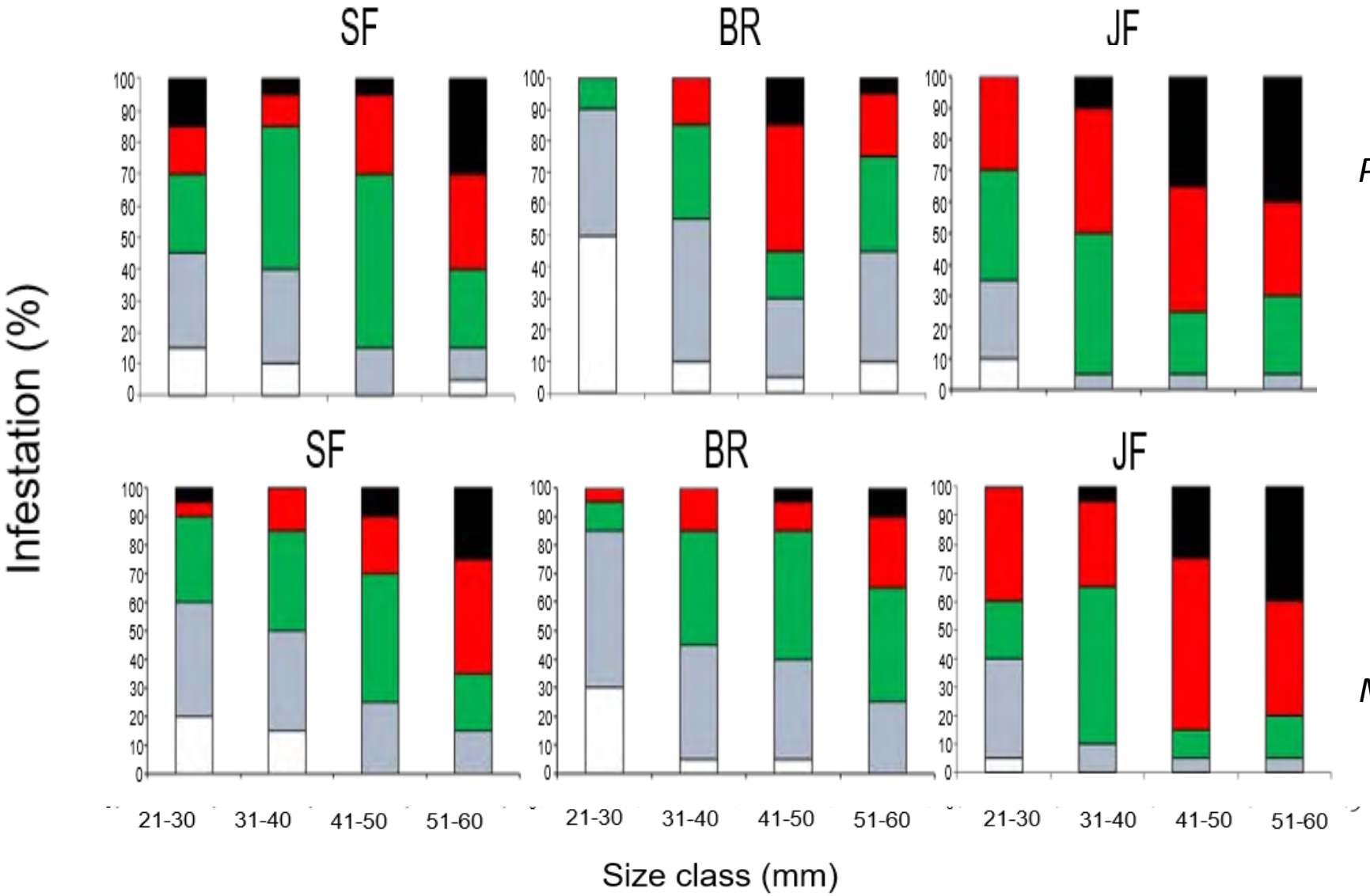

B

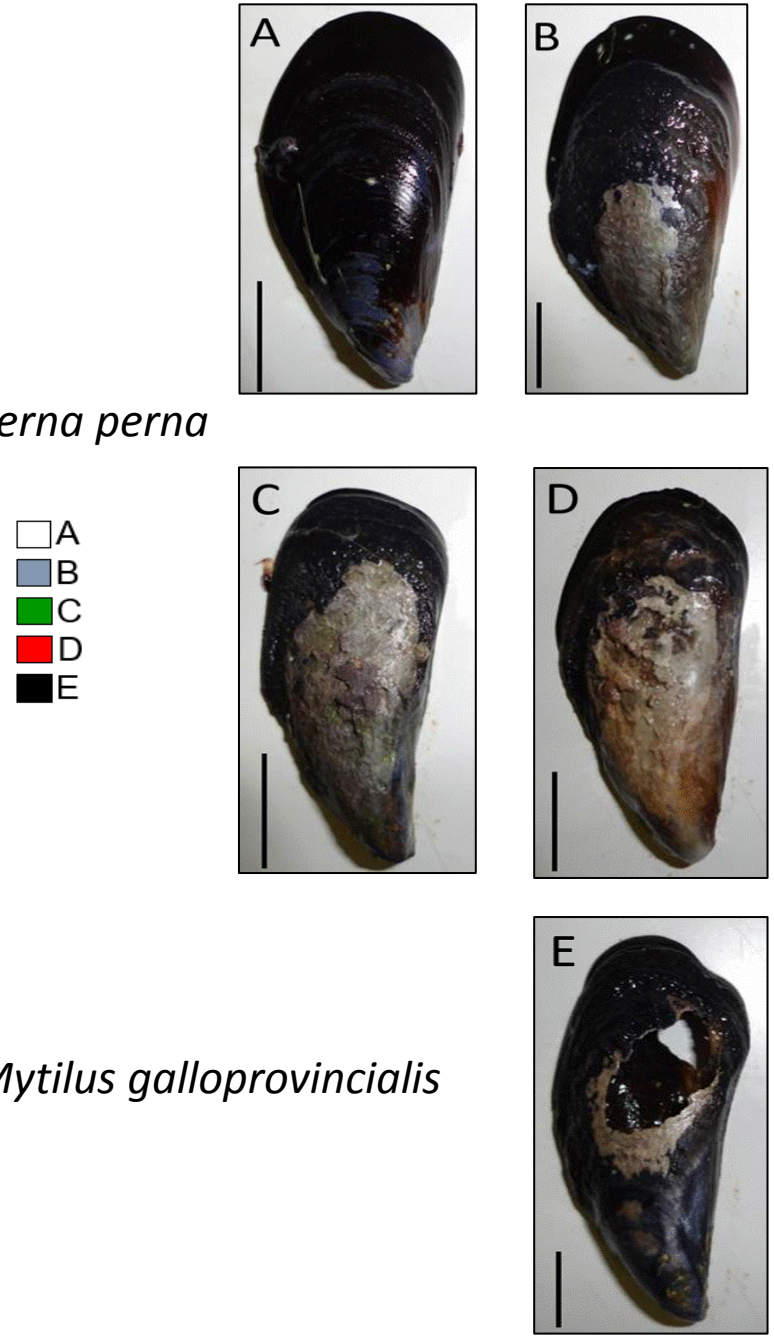

C


D


E

RESULTS

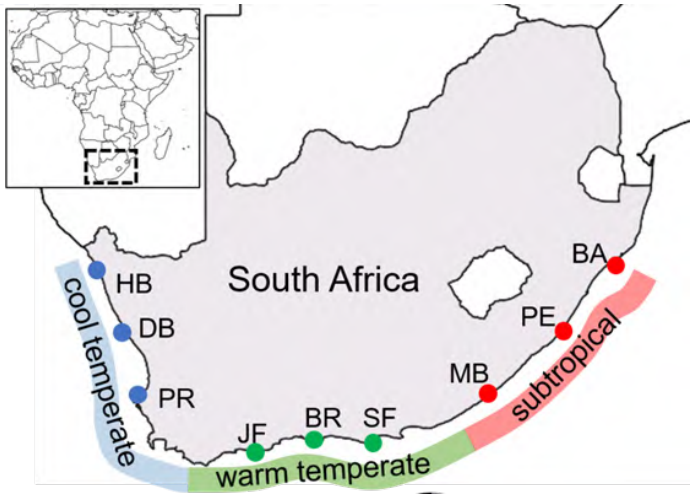


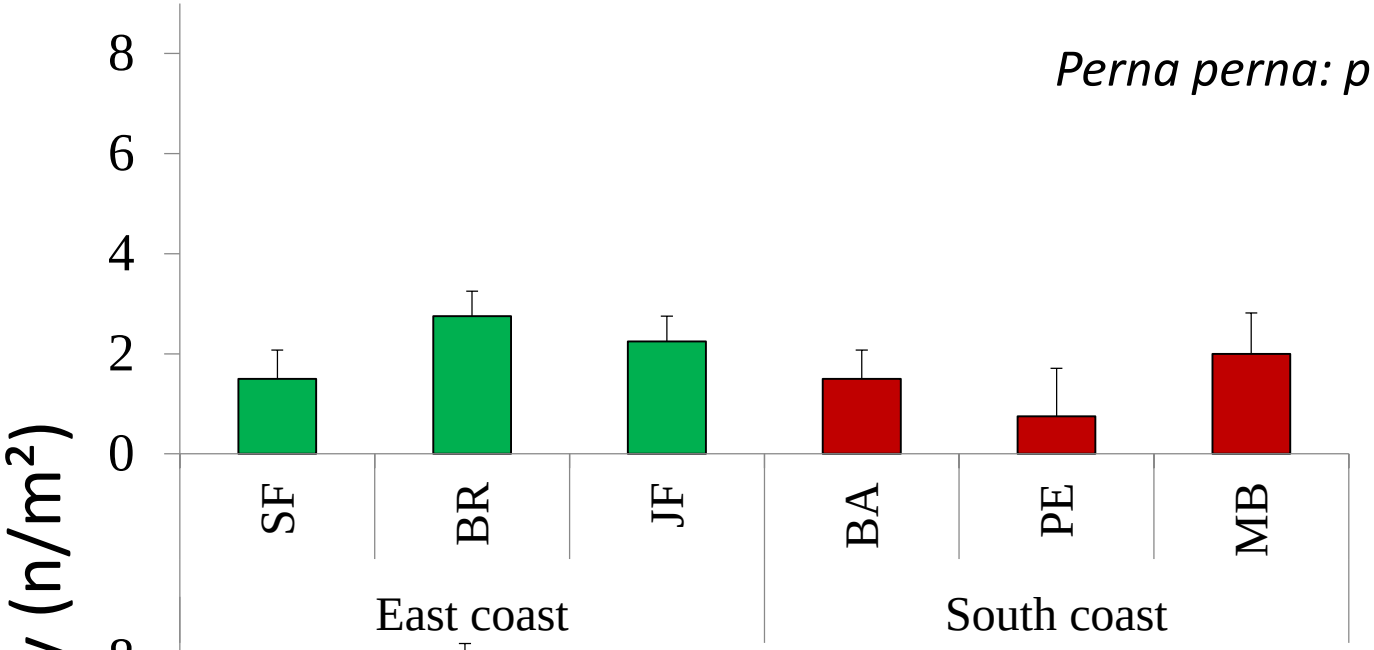


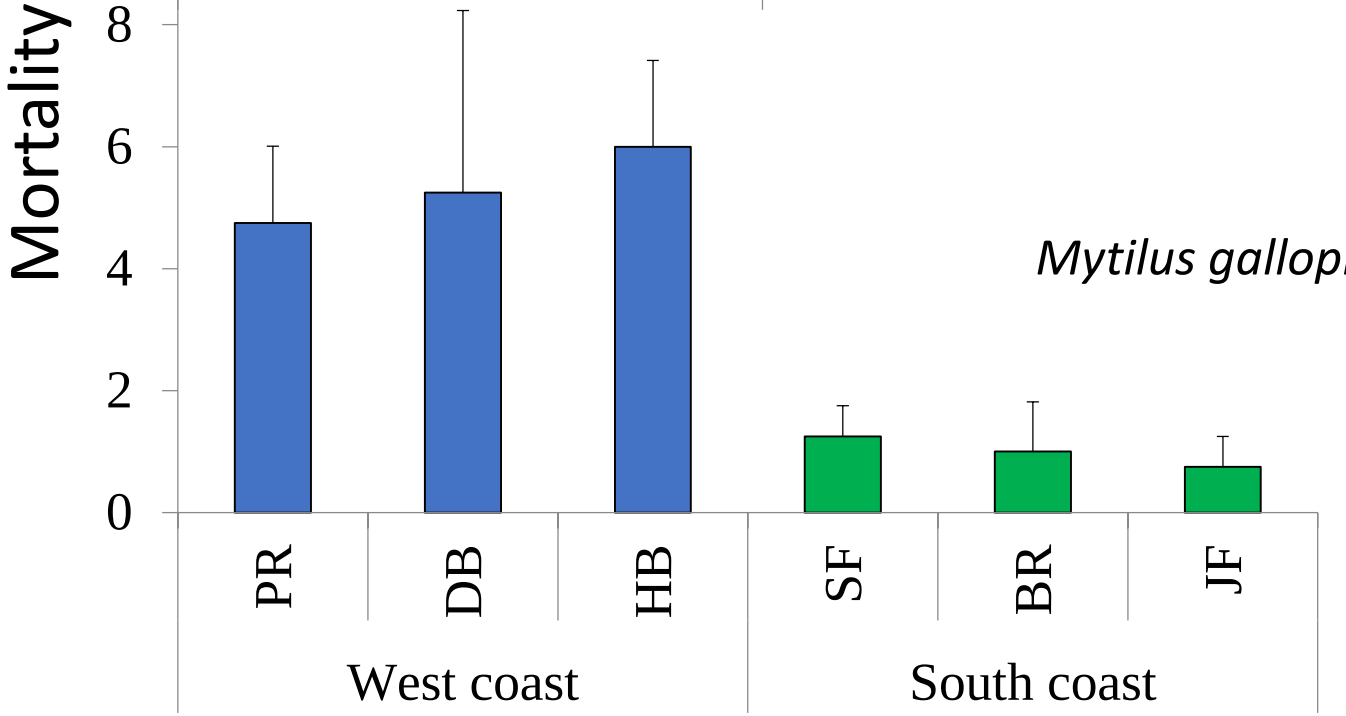
Perna perna

Mytilus galloprovincialis

RESULTS


South Africa
HB
DB
PR
JF
BR
SF
MB
PE
BA
cool temperate
warm temperate
subtropical
N
W
E
S
500km

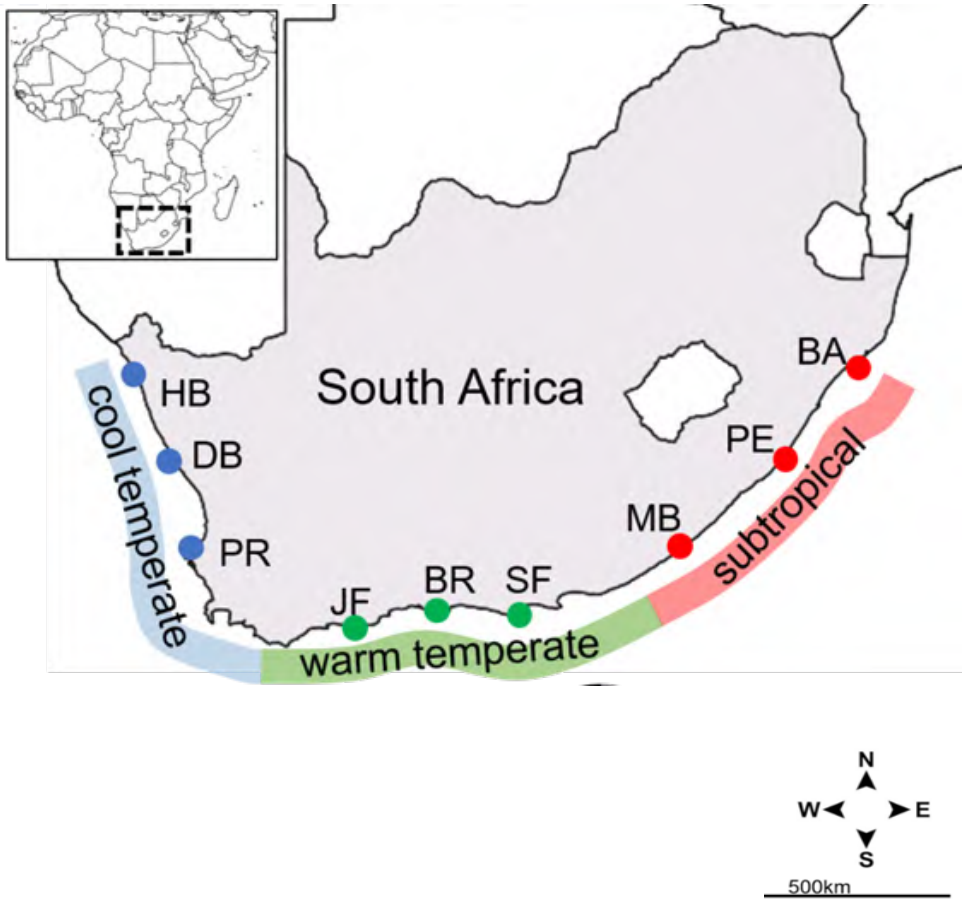

Perna perna: p = 0.06
Mortality (n/m²)
8
6
4
2
0
SF
BR
JF
BA
PE
MB
East coast
South coast


Mytilus galloprovincialis: p = 0.01
8
6
4
2
0
PR
DB
HB
SF
BR
JF
West coast
South coast

CONCLUSION

Endolithic induced erosion is intense and ubiquitous in intertidal mussel aggregations. Prevalence of infestation > 75%, with infested individuals hosting between three and eight spp. of cyanobacteria each.

CONCLUSION



Study sites classified according to biogeography

1. Does endolithic species richness change with bioregion?

Biogeography is a strong driver of endolithic spp.

2. Does host drive parasite diversity?

No significant difference between the two mussel spp. where they co-occur

3. Does mortality due to cyanobacterial infestation and proportion of cyanobacteria infestation vary across bioregions?

High mortality and more infestation in the cool temperate bioregion

Thank you