Age is a good predictor for the stability of marine fouling communities – Results from a globally replicated study.

Mark Lenz

GAME
Global Approach by Modular Experiments

42nd European Marine Biology Symposium · August 27th – 31st · Kiel

STIFTUNG MERCATOR

IFM-GEOMAR

Invasions in the marine coastal environment

Marine fouling communities

Invasions in the marine coastal environment

Foulers are invaders!

Styela clava (Davis & Davis 2007)

Dreissena polymorpha (Johnson & Carlton 1996)

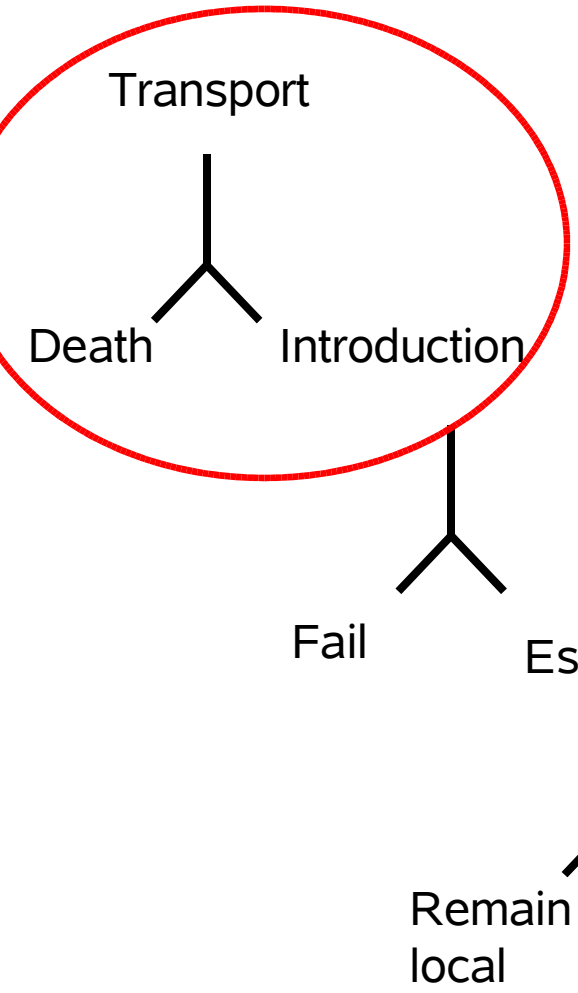
Balanus improvisus (Schories & Selig 2006)

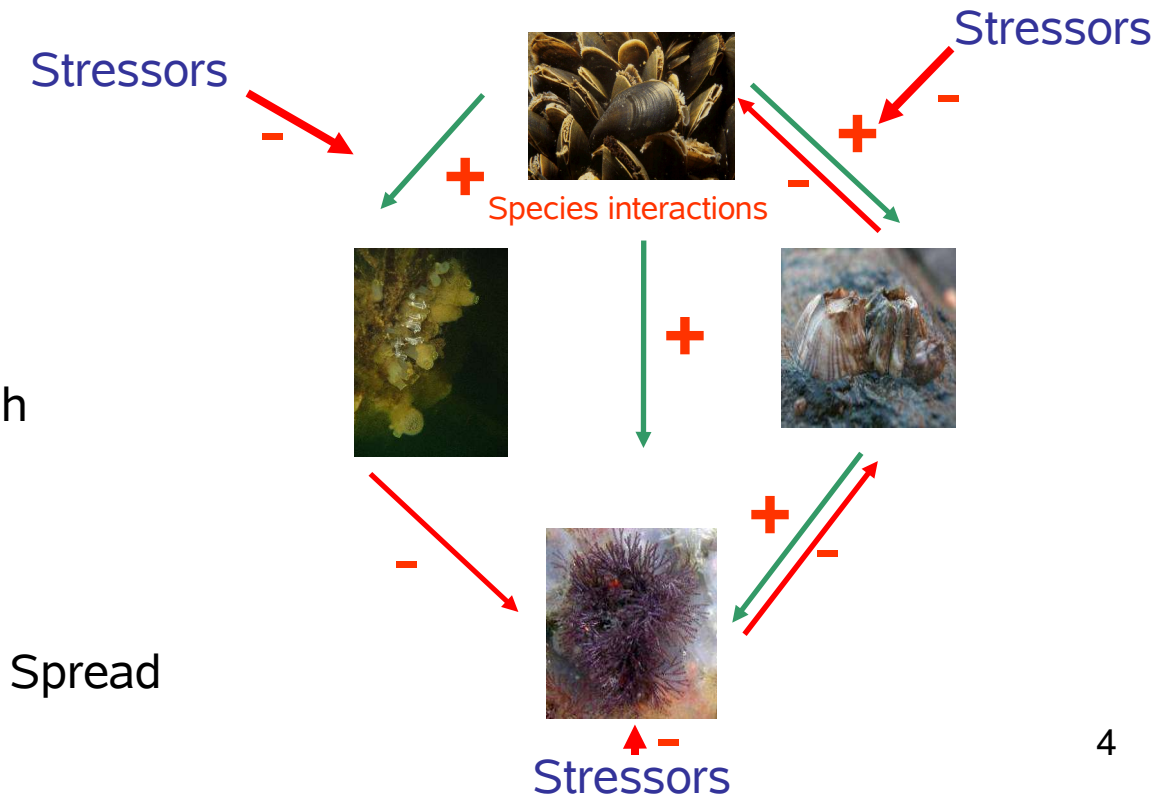
Elminius modestus (Harms 1999)

Invasion process

Fouling organisms are transported:

- as adults
- in multispecies assemblages
- under stressful conditions
- released from predation pressure





Fouling community stability during transport and after arrival

reduces

Stress

Diversity (taxonomical, functional)

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Fouling community stability

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Propagule supply

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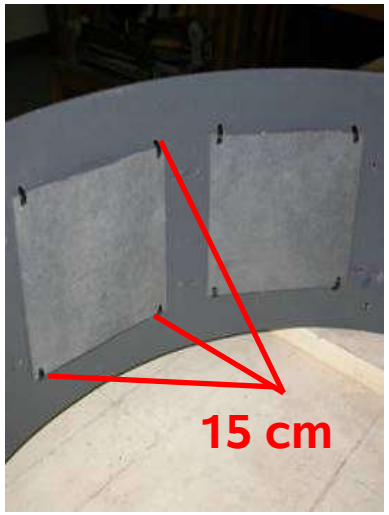
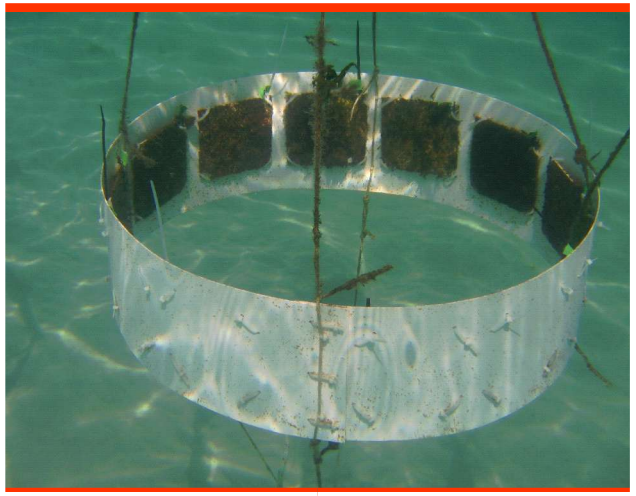
amplifies

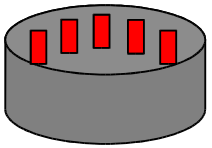
Open space

= function of community age

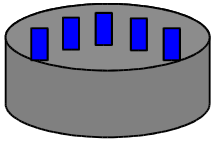
Experimental approach



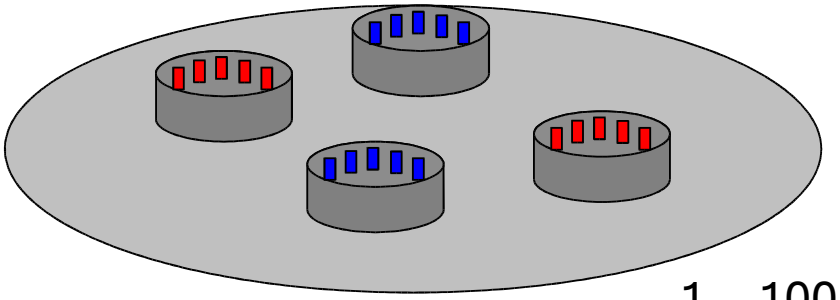




4 months prior to transplantation

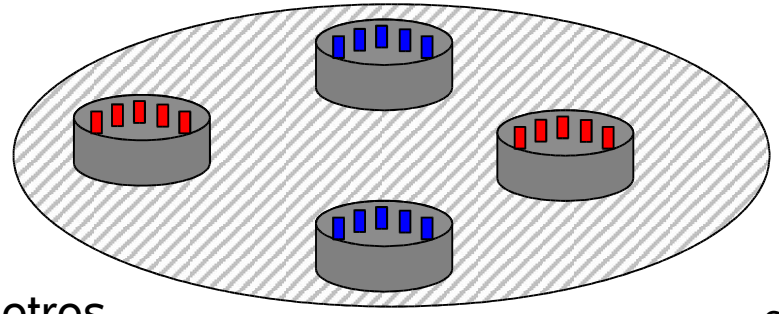


2 months prior to transplantation



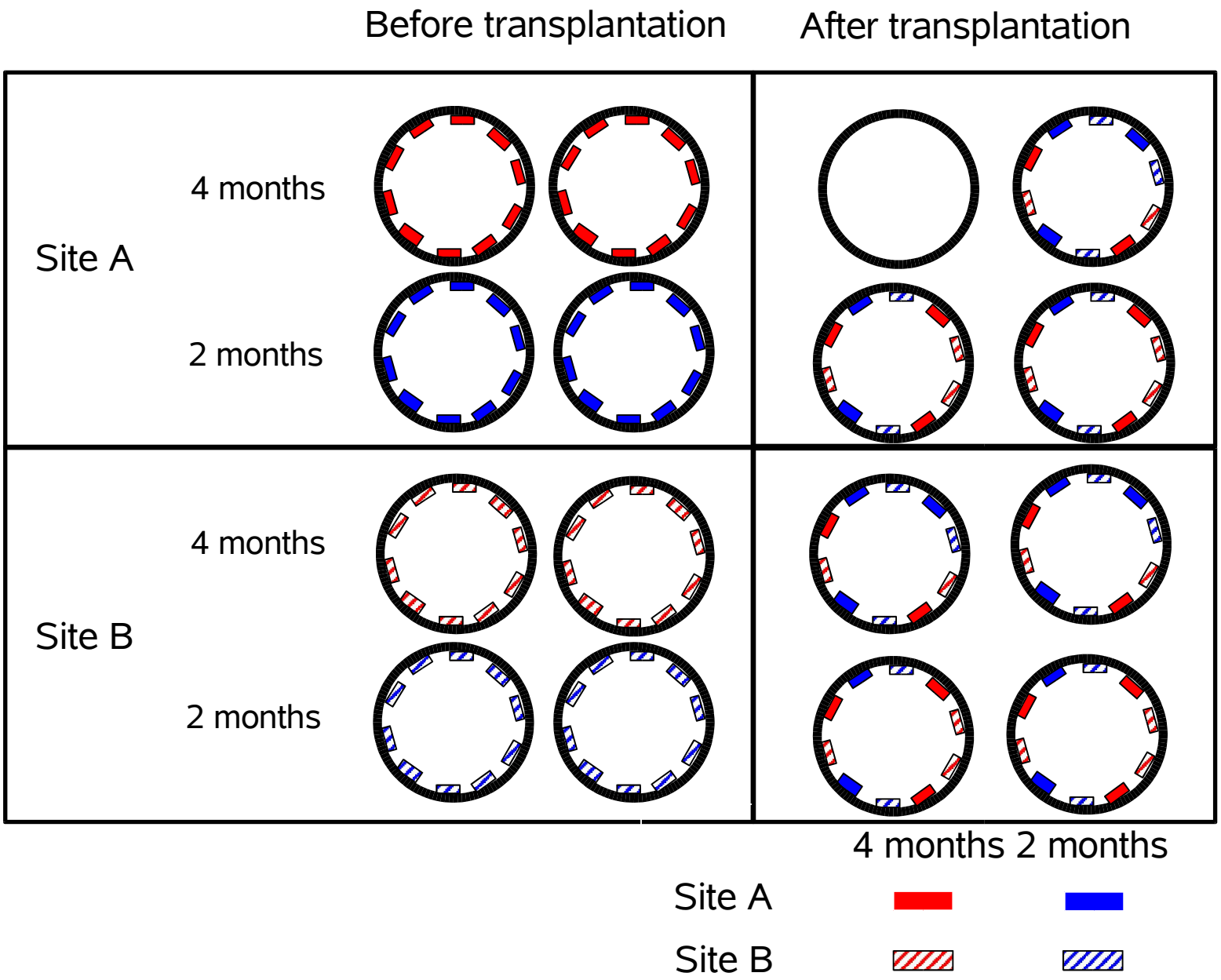
Site A

1 – 100 kilometres



Site B

Experimental approach



Experimental approach

Monitoring

Abundances of sessile taxa

Bray-Curtis Similarity

Species richness

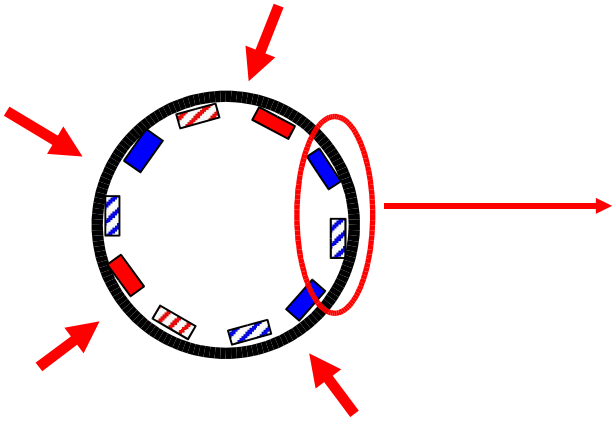
Functional richness

Open space

North Sea fouling community

Experimental approach

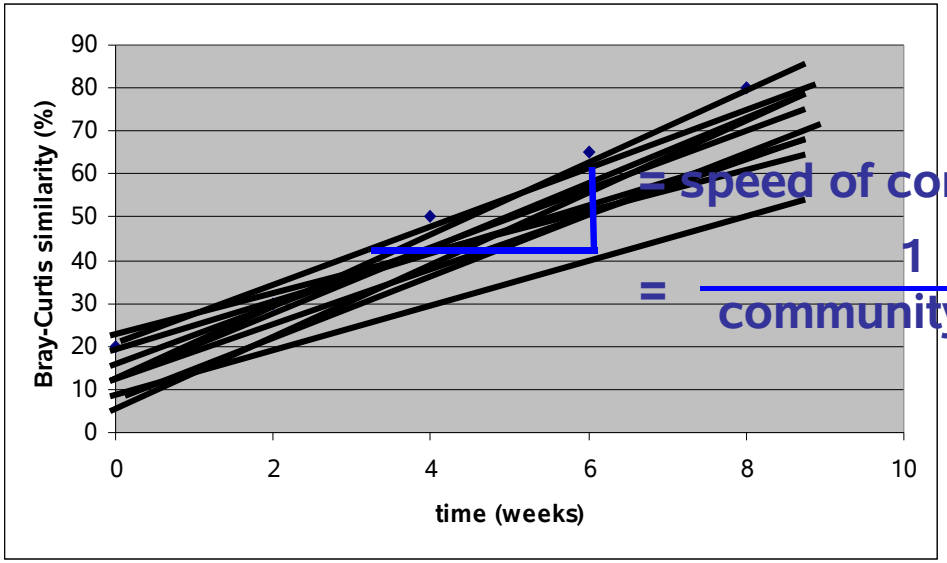
Monitoring



2 wks 4 wks 6 wks 8 wks 10 wks

20 % 30 % 50% 65 % 80 %

Bray-Curtis Similarity Index



= speed of convergence

$= \frac{1}{\text{community stability}}$

Global replication

Coquimbo, Chile

Niterói, Brazil

Funchal, Portugal

Newcastle, England

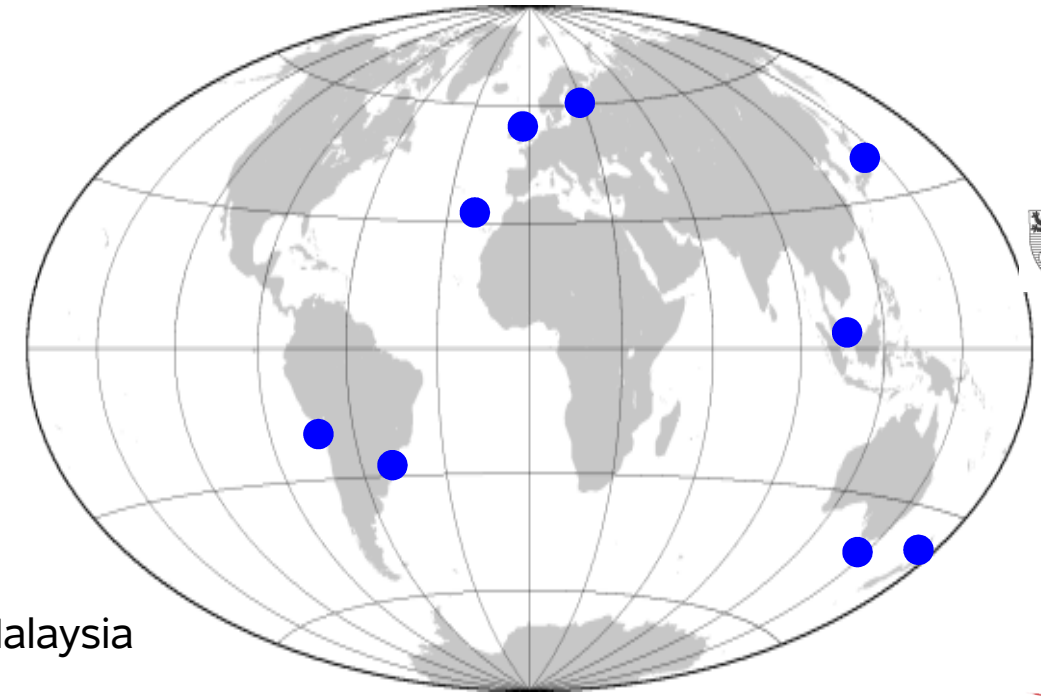
Tvaerminne, Finland

Kuala Terengganu, Malaysia

Hobart, Australia

Tokyo, Japan

Leigh, New Zealand



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UTAS

GAME Global Approach by Modular Experiments

THE UNIVERSITY OF AUCKLAND NEW ZEALAND Te Whare Wānanga o Tāmaki Makaurau

Replication in space and time

Country	Spring – early summer	Summer – early autumn
Australia	✓	
Brazil	✓	✓
Chile	✓	✓
England	✓	✓
Finland		✓
Japan	✓	✓
Malaysia		✓
New Zealand	✓	✓
Portugal	✓	✓









Study questions

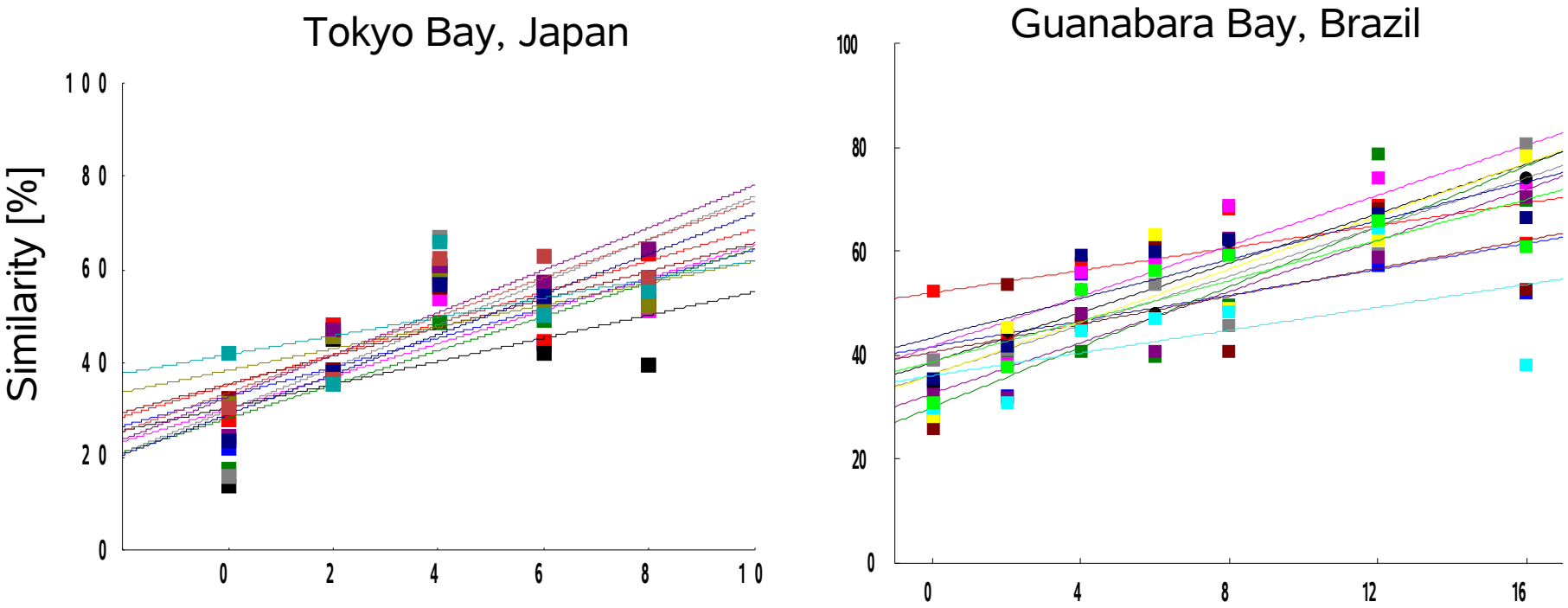
- Do communities converge?
  → Bray-Curtis Similarity Index

- Is the speed of convergence a function of community age?
  → Analysis of Variance

- Which factors influence the convergence process?
  → Partial Correlation Analyses

Results

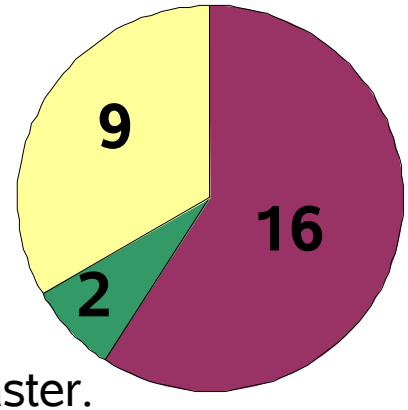
- At 8 out of 9 stations communities converged after transplantation. No divergence was observed.



Results

- In the majority of studies young communities converged faster (ANOVA: $p \leq 0.05$).

No difference between successional stages.

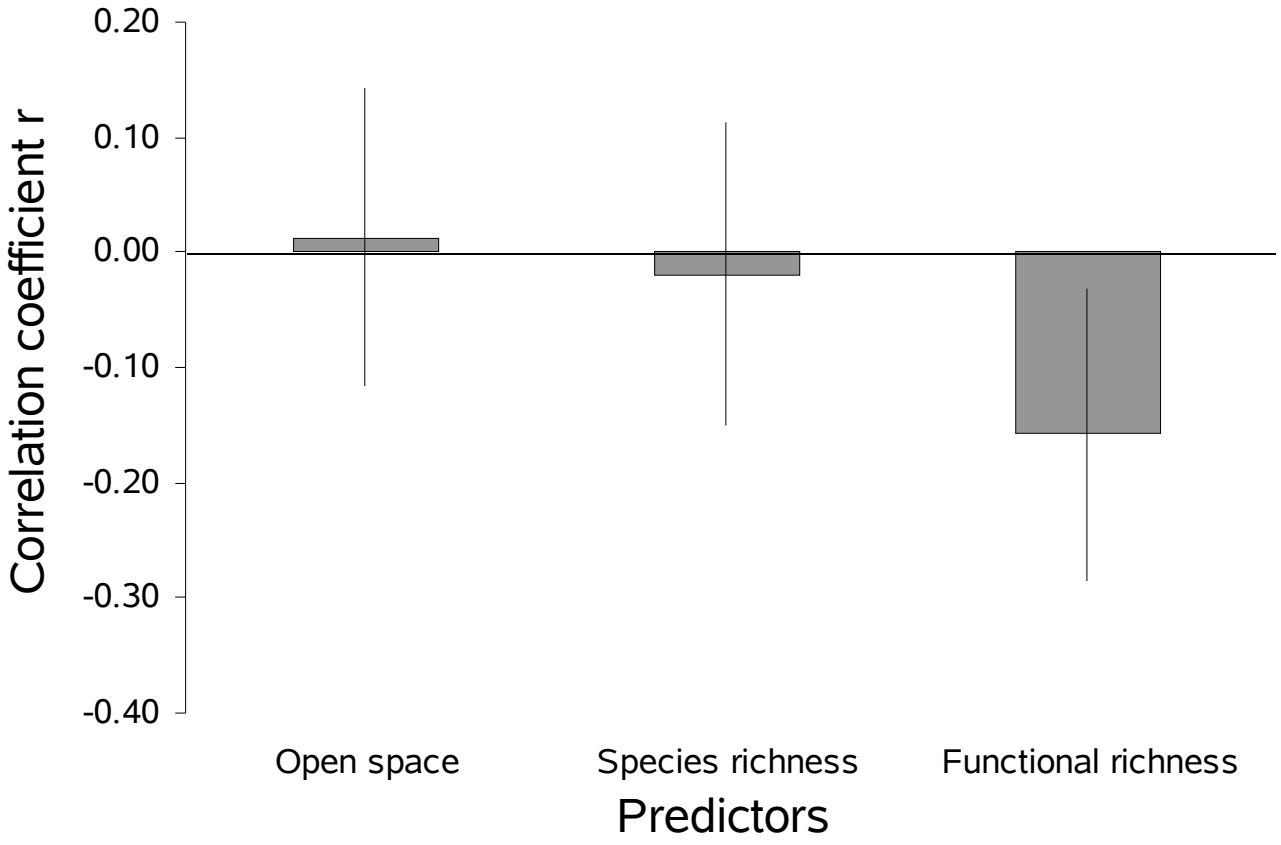


Older communities converged faster.

Younger communities converged faster.

Results

- Factors significantly correlated with convergence speed.



± 95 % CI

Conclusions

- Founders did not determine the course of succession.
- Age matters: older fouling communities were more stable.
- Amount of open space and species richness did not affect community stability.
- Functional diversity matters: more functional groups made communities more stable.
- GAME matters: replication in space identifies relevant factors.
- Cleaning of ship hulls: the more often the better.
- Special attention should be paid to the transport of constructions with long residence times: e.g. platforms.

The people who did all the work….

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