

Primary Succession of arctic hard-bottom assemblages

- Insights from a long-term
in situ experiment

Michael D. Streicher

Pacheco (2009)

Introduction

- Why long-term experiments?
- Benefits of ecological studies?



Experimental set-up

- Kongsfjorden,
Svalbard (Norway)



Experimental set-up

- Kongsfjorden, Svalbard (Norway)
- 40 PE growth-panels
- Dominant Taxa:
 - Balanidae, Corallinaceae, Ascidiaceae & Actiniaria
- Time-span: 2002- 2013
 - Maximum exposition 11 years
 - Minimum exposition 6 years



Methods

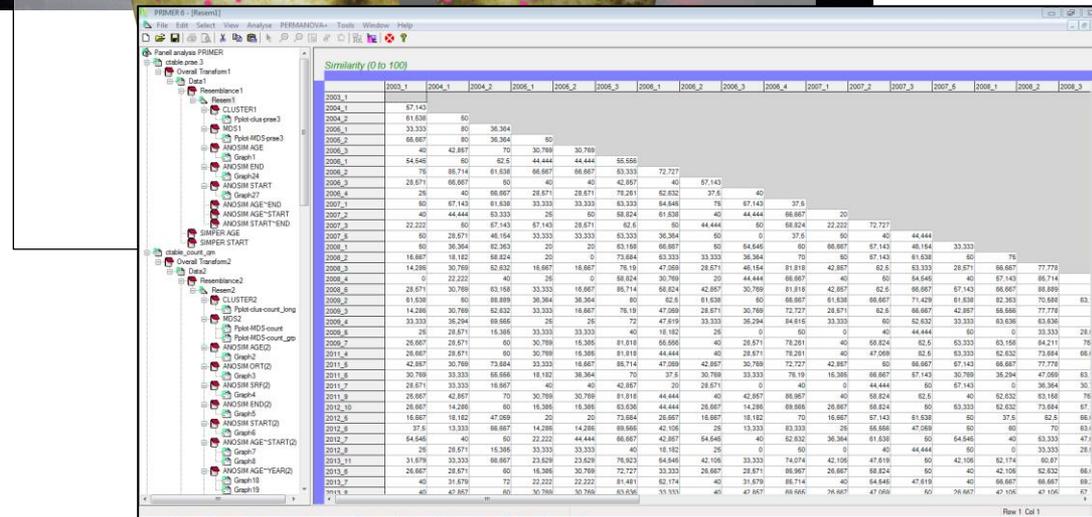
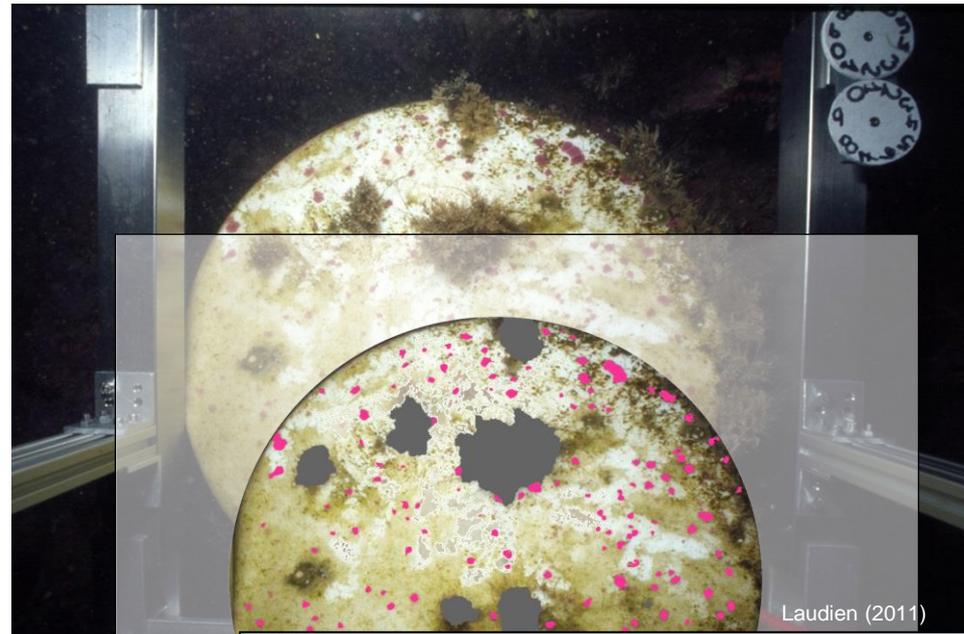
- Photographic documentation



- Image analysis



- Statistical analysis



PRIMER 6 - [Results]

Panel analyses PRIMER

Similarity (0 to 100)

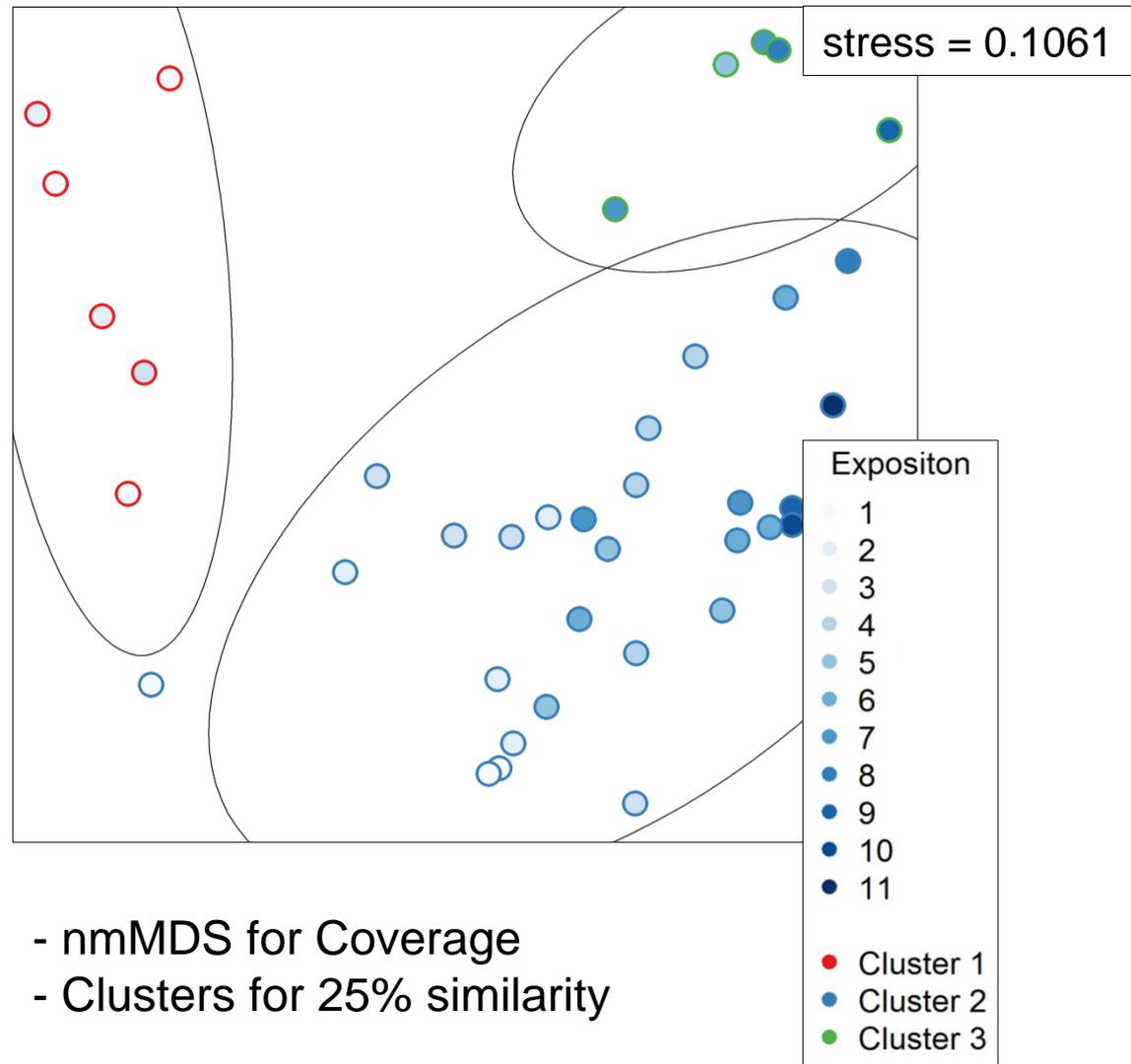
	2003_1	2004_1	2004_2	2005_1	2005_2	2005_3	2006_1	2006_2	2006_3	2006_4	2007_1	2007_2	2007_3	2007_4	2008_1	2008_2	2008_3
2003_1																	
2004_1	87.143																
2004_2	61.638	80															
2005_1	33.333	80	36.364														
2005_2	68.687	80	36.364	80													
2005_3	40	42.857	70	30.769	30.769												
2006_1	54.545	60	62.5	44.444	44.444	55.555											
2006_2	78	89.714	61.638	68.687	68.687	68.687	63.333	72.727									
2006_3	28.571	68.687	60	40	40	42.857	40	57.143	30								
2007_1	28	40	68.687	28.571	28.571	78.281	62.632	37.5	40								
2007_2	80	87.143	61.638	33.333	33.333	63.333	64.648	76	87.143	37.5							
2007_3	40	44.444	63.333	28	60	69.624	61.638	40	44.444	68.687	60						
2007_4	22.222	60	67.143	67.143	28.571	62.632	60	40	44.444	68.687	60	68.687	67.143	48.154	33.333	80.714	
2008_1	80	28.571	48.154	33.333	33.333	63.333	36.364	60	0	37.5	60	40	44.444				
2008_2	60	36.364	62.5	20	0	61.638	68.687	80	64.648	60	68.687	67.143	48.154	33.333	80.714		
2008_3	14.286	18.182	68.624	20	0	73.684	63.333	33.333	36.364	70	60	67.143	61.638	60	78		
2008_4	0	22.222	40	28	0	69.624	30.769	20	44.444	68.687	60	60	64.648	40	57.143	80.714	
2008_5	28.571	30.769	63.156	33.333	18.687	66.714	68.624	42.857	30.769	61.638	42.857	62.5	63.333	28.571	68.687	77.778	
2008_6	14.286	30.769	62.632	33.333	18.687	76.19	47.069	28.571	28.571	72.727	28.571	62.5	68.687	67.143	48.154	33.333	77.778
2008_7	61.638	80	88.889	36.364	36.364	60	62.632	61.638	68.687	61.638	68.687	71.429	61.638	62.5	63.333	68.687	88.889
2008_8	14.286	30.769	62.632	33.333	18.687	76.19	47.069	28.571	30.769	72.727	28.571	62.5	68.687	67.143	48.154	33.333	77.778
2008_9	33.333	36.364	69.646	28	28	72	67.619	33.333	36.294	64.616	63.333	60	62.632	33.333	63.636	63.636	63.636
2009_1	28	28.571	18.368	33.333	33.333	40	18.182	28	0	60	0	40	44.444	60	0	33.333	28.571
2009_2	28.687	28.571	60	30.769	18.368	61.638	65.566	40	28.571	78.281	40	68.624	62.5	63.333	63.156	84.211	76
2009_3	28.687	28.571	60	30.769	18.368	61.638	65.566	40	28.571	78.281	40	47.069	62.5	63.333	62.632	73.684	66.666
2009_4	42.857	30.769	73.684	33.333	18.687	66.714	47.069	42.857	30.769	72.727	42.857	60	68.687	67.143	68.687	77.778	63.636
2009_5	30.769	33.333	68.688	18.182	36.364	70	37.5	30.769	33.333	78.10	18.368	68.687	67.143	30.769	36.294	47.069	63.636
2010_1	28.687	33.333	18.687	40	40	42.857	20	28.571	0	40	0	44.444	60	67.143	36.364	30	62.5
2010_2	42.857	30.769	73.684	33.333	18.687	66.714	47.069	42.857	30.769	72.727	42.857	60	68.687	67.143	68.687	77.778	63.636
2010_3	30.769	33.333	68.688	18.182	36.364	70	37.5	30.769	33.333	78.10	18.368	68.687	67.143	30.769	36.294	47.069	63.636
2010_4	28.687	18.182	47.069	20	20	73.684	28.687	18.687	18.182	70	18.687	67.143	61.638	60	37.5	62.5	66.666
2010_5	28.687	42.857	70	30.769	30.769	61.638	44.444	40	42.857	68.687	40	58.824	62.5	40	62.632	63.156	76
2010_6	28.687	14.286	40	18.368	18.368	63.636	44.444	28.687	14.286	69.688	28.687	68.624	60	63.333	62.632	73.684	67
2010_7	18.687	18.182	47.069	20	20	73.684	28.687	18.687	18.182	70	18.687	67.143	61.638	60	37.5	62.5	66.666
2010_8	28.687	42.857	70	30.769	30.769	61.638	44.444	40	42.857	68.687	40	58.824	62.5	40	62.632	63.156	76
2010_9	28.687	14.286	40	18.368	18.368	63.636	44.444	28.687	14.286	69.688	28.687	68.624	60	63.333	62.632	73.684	67
2010_10	28.687	18.182	47.069	20	20	73.684	28.687	18.687	18.182	70	18.687	67.143	61.638	60	37.5	62.5	66.666
2010_11	28.687	42.857	70	30.769	30.769	61.638	44.444	40	42.857	68.687	40	58.824	62.5	40	62.632	63.156	76
2010_12	37.5	13.333	68.687	14.286	14.286	68.688	42.106	28	13.333	63.333	28	66.666	47.069	60	80	70	63.636
2011_1	64.648	40	40	22.222	44.444	68.687	42.857	64.648	40	62.632	36.364	61.638	60	64.648	60	63.333	47.5
2011_2	28	28.571	18.368	33.333	33.333	40	18.182	28	0	60	0	40	44.444	60	0	33.333	28.571
2011_3	31.678	33.333	68.687	23.629	23.629	78.923	64.648	42.106	33.333	74.074	42.106	47.819	60	42.106	62.174	60.627	68.1
2011_4	28.687	28.571	60	18.368	30.769	72.727	33.333	28.687	28.571	68.687	28.687	68.624	60	40	42.106	62.632	66.666
2011_5	40	31.678	72	22.222	22.222	61.481	62.174	40	31.678	68.714	40	64.648	47.819	40	68.687	68.687	68.2
2011_6	40	42.857	80	30.769	30.769	63.636	33.333	40	42.857	69.688	36.667	47.069	60	28.687	47.106	47.106	67.1

Development of assemblages



Effect of exposition time

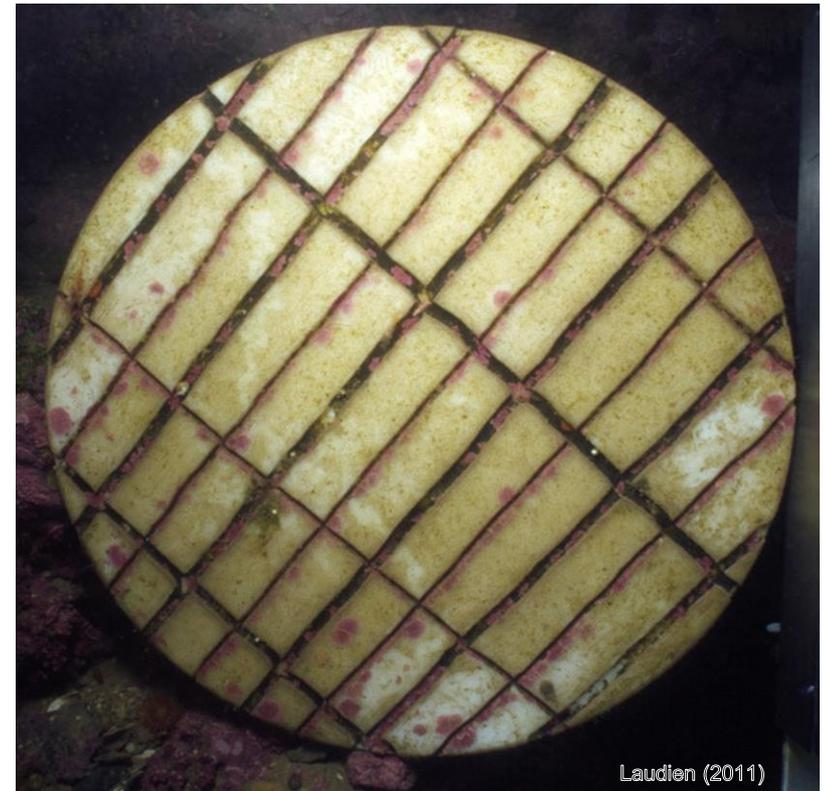
- Statistical analysis further shows influence of:
 - age group &
 - sampling year
- Climax community not yet reached



Effects of structure-diversity

- no evidence found...
 - ... but possibility of small scale shifts of distribution

- Grooves seem preferred for settlement
- Similar results for marine assemblages in Canada (Bourget 1994)



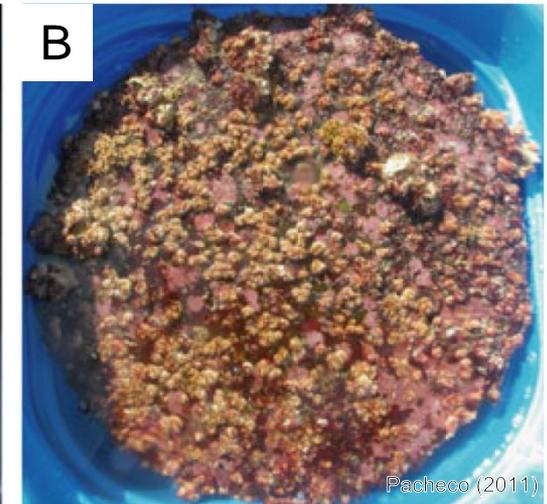
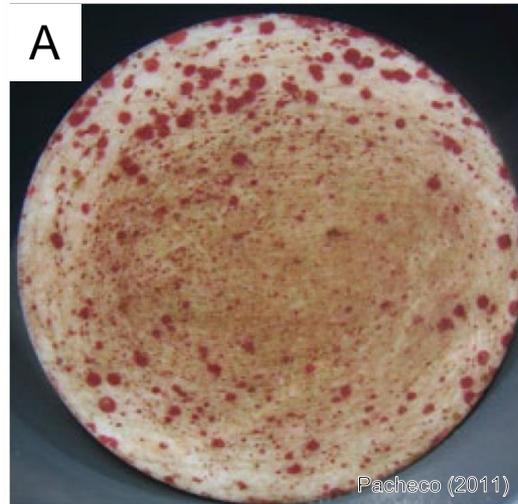
Comparison of climate zones

Chile

→ Temperate

A = 0.5 years

B = 1 year

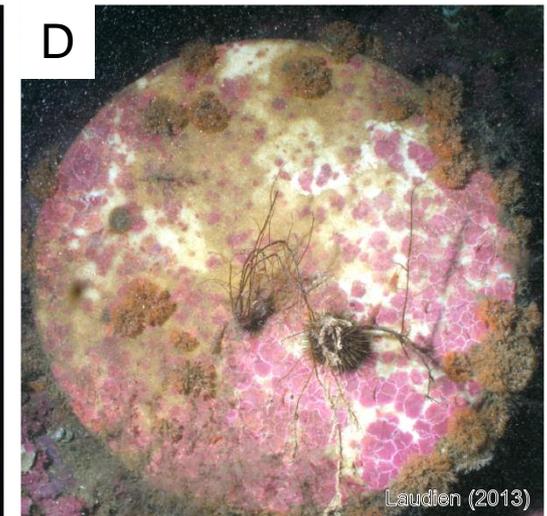
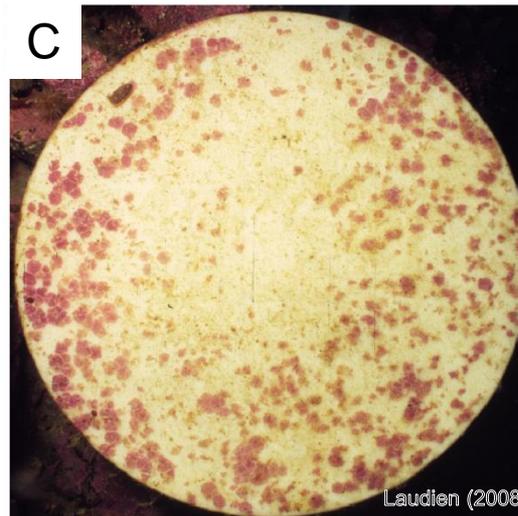


Svalbard

→ Arctic

C = 6 years

D = 7 years



- Exposition time, date of installation and sampling year influence benthic hard-bottom assemblages in the arctic
- Resilience time exceeds a decade
- Substrate Diversity does not seem to influence assemblage structure
- Succession is much slower in comparison to temperate zones

Thank you for your attention!

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