Factors affecting *Saccharina latissima*, concerning growth, recruitment and competition

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UiO : University of Oslo

INSTITUTE OF MARINE RESEARCH
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NIVA
Norwegian Institute for Water Research

Saccharina latissima

- Major set-back discovered during early 2000
- The decline has been estimated to be 80% on the south coast and 40% on the west coast
- The decline is most prominent on the inner coast

S. latissima

- Widely distributed
- Subtidal vegetation from 1 – 30 m, on rocky substrate
- Life span 1 – 4 years
- Large 3D-structure

- Provide a stable environment
- Ideal for shelter and protection
- Important habitat for young fish, crustaceans, mollusk and other groups

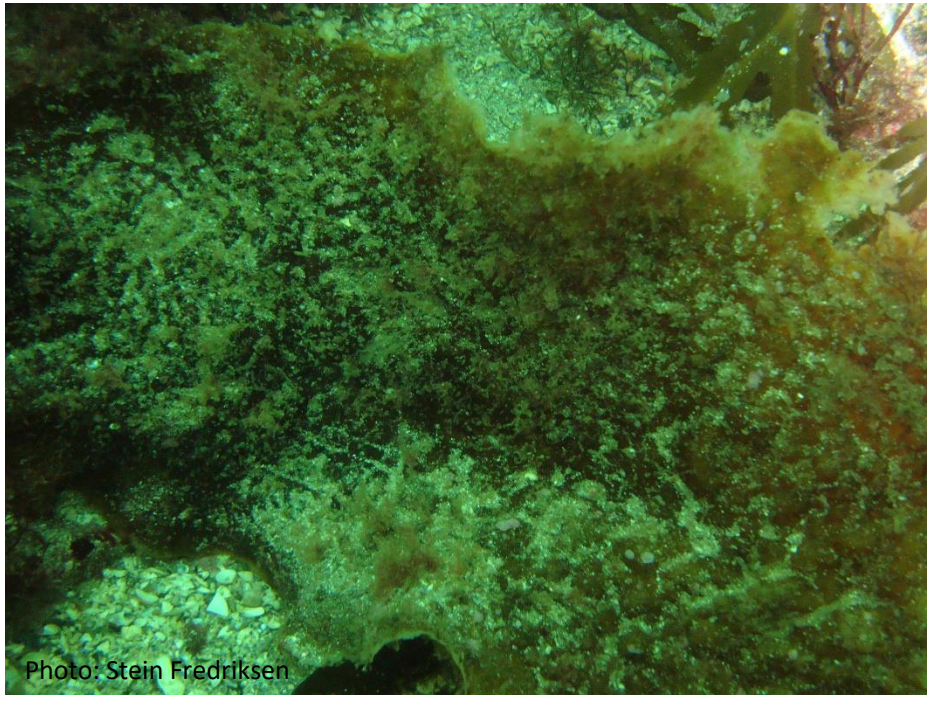
Challenges

- A changing environment brings new challenges to *S. latissima*

- Extreme summer temperatures during the last 10 – 20 years
- Increasing winter temperatures gives a more continuous supply of run-off from land to the ocean
- Nutritional and light attenuation increase
- Changing competition

Challenges

- Temperature – climate change
- Eutrophication – toxic blooms, anoxic bottom fauna
- Sedimentation – due to increasing activity



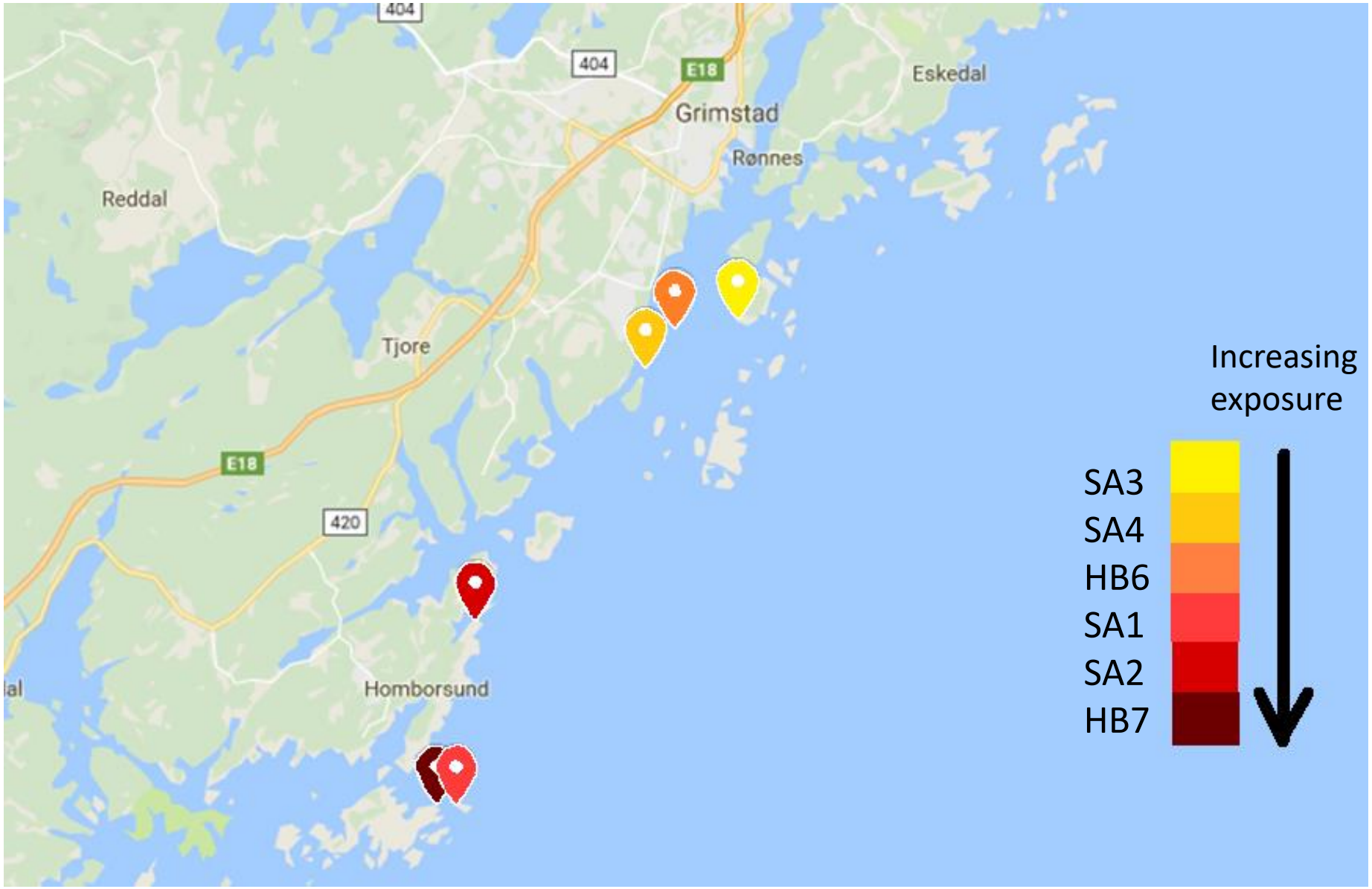
My thesis

- Investigate factors affecting of *S. latissima* survival, growth and recruitment
- Investigate different stressor along an expose gradient

Hypotheses

1) Turf prevents *S. latissima* recruitment
2) Light conditions affects *S. latissima* growth and young sprouts
3) Summer temperature influence *S. latissima* survival
4) Sediments has a negative effect on *S. latissima* recruitment

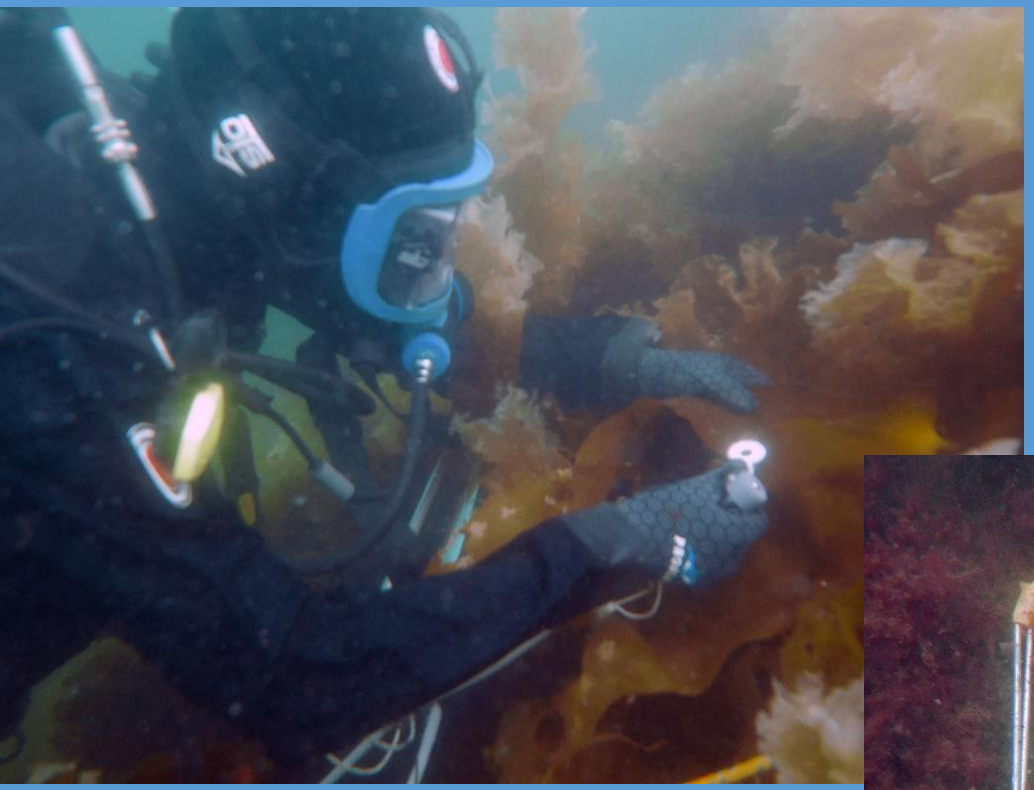
Material and methods



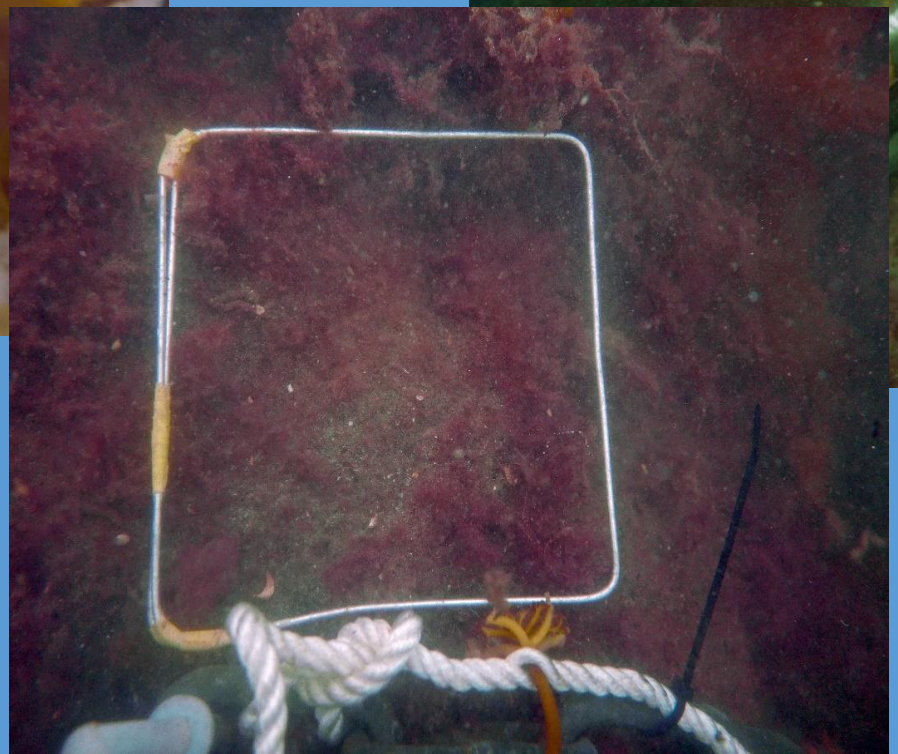
Material and method

6 fixed stations for biological and hydrochemical data	
Biological	Square measurement: measuring density and life stages of *S. latissima*
Biological	Transplantation of adult sugar kelp: survival and growth (puncture method)
Biological	Local sugar kelp: survival and growth (puncture method)
Biological	Bottom scrap: collecting turf fauna from every station
Biological	Laboratory analysis: determine species from bottom scrap with microscope
Biological	PAM-data: interpret *S. latissima* physiological state
Hydrochemical	Temperature: is there any extreme values during the summer season
Hydrochemical	Light attenuation: is there adequate light conditions for photosynthesis
Hydrochemical	Wave exposure: is the fetches satisfactory for *S. latissima*
In total, 9 different types of observations	

Material & methods



Diving-PAM measurements



Collection of turf

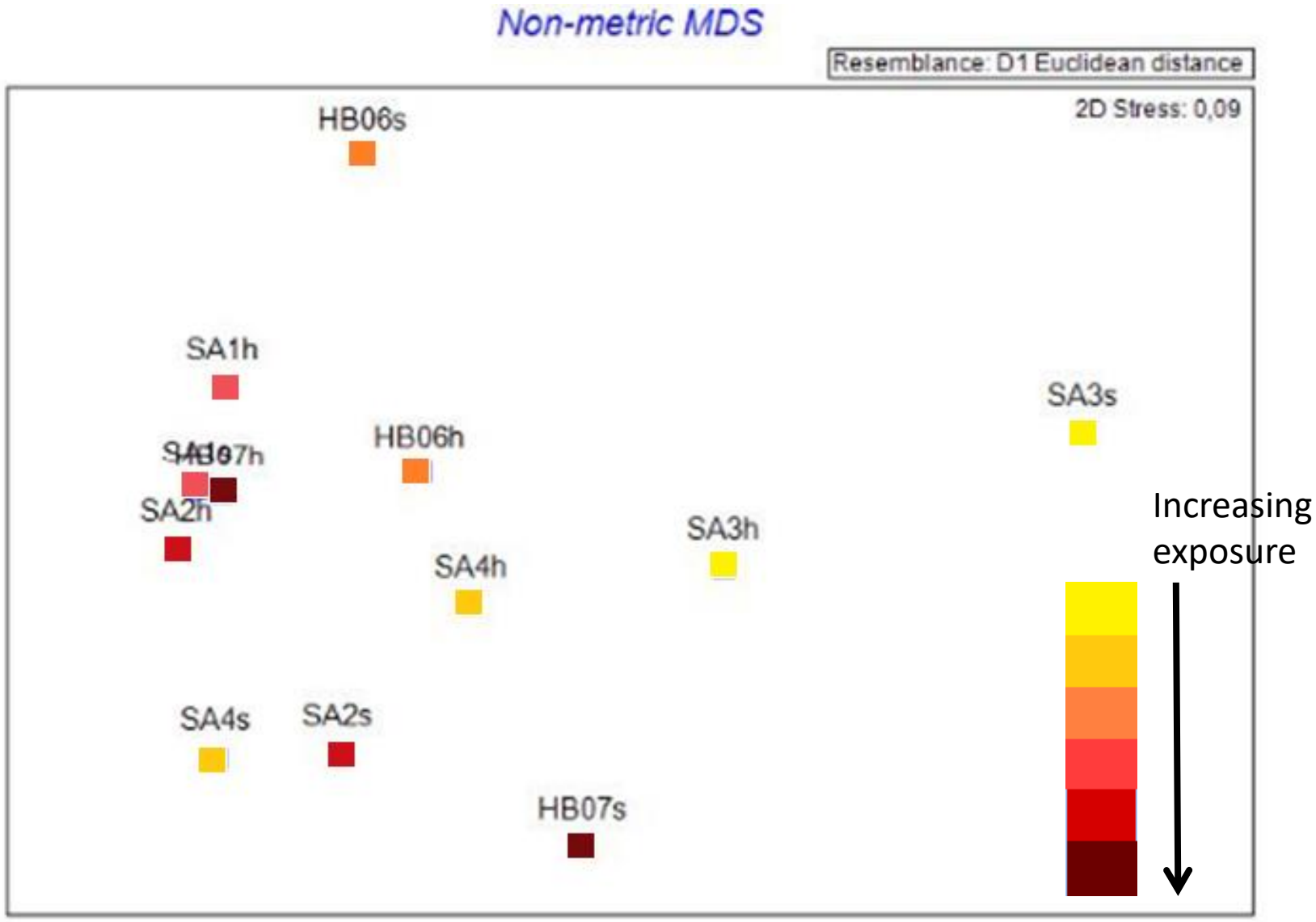
Transplanted adult *S. latissima*

Photo: Niva

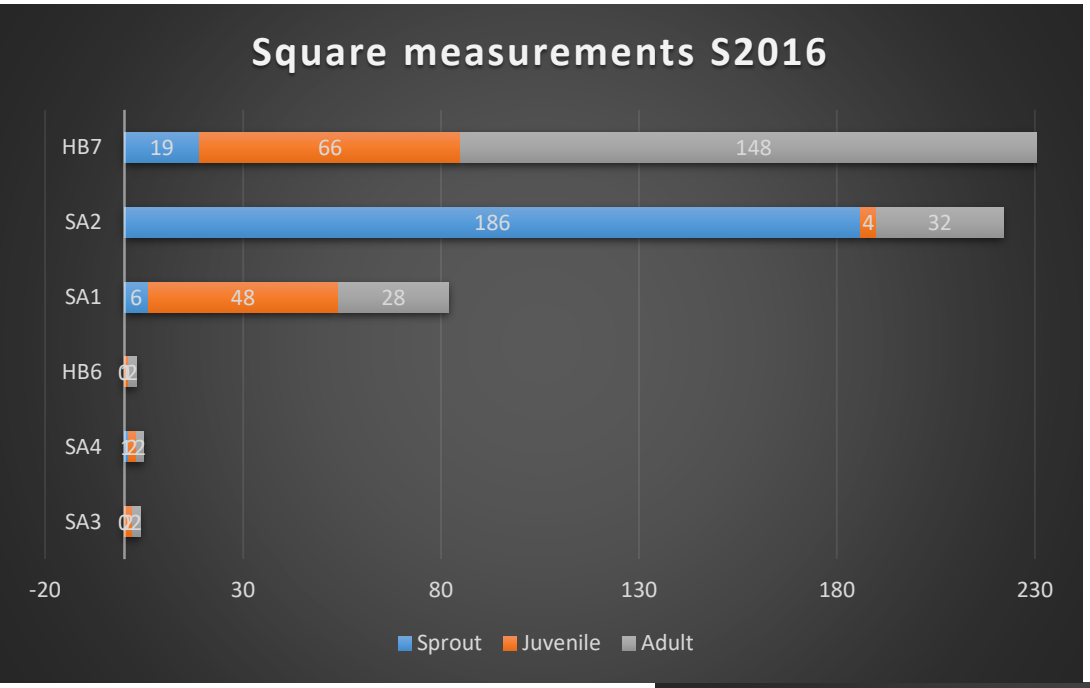
Turf community

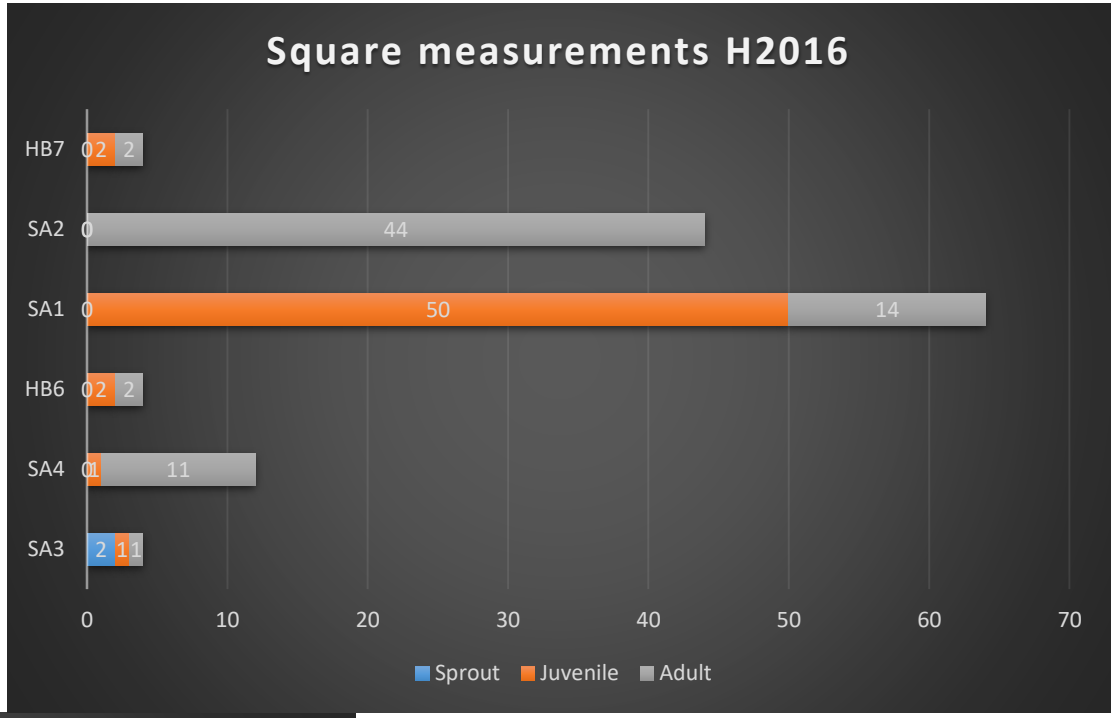
Ordination diagram

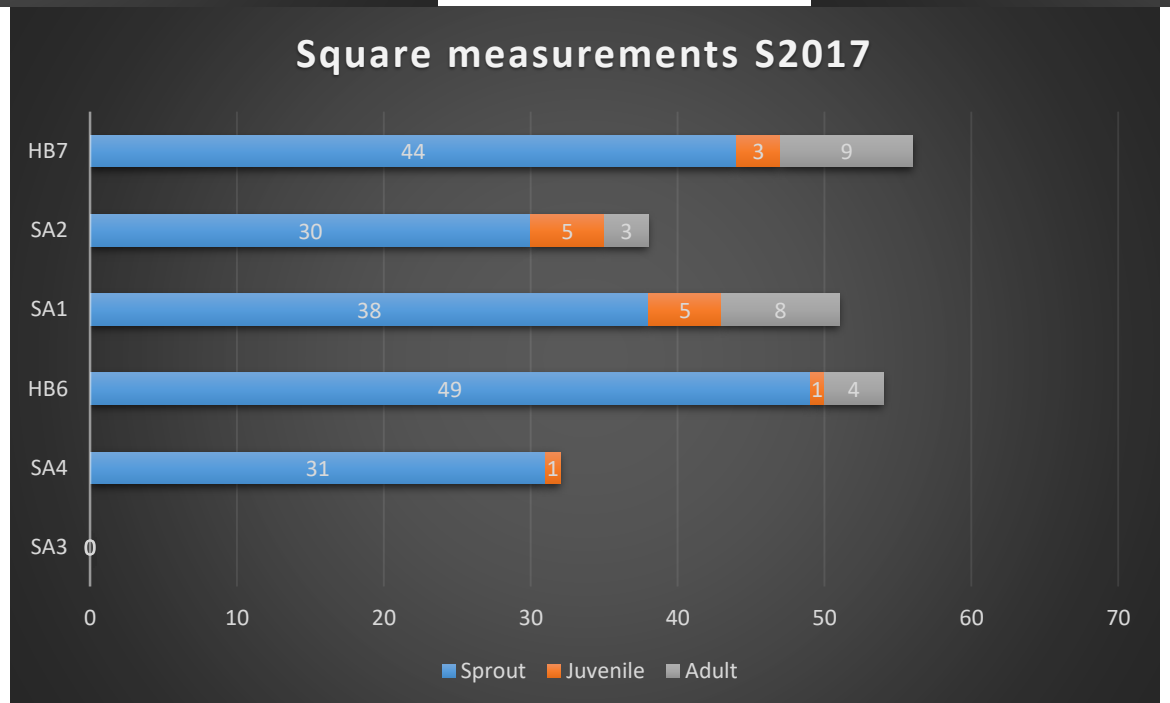
- Illustrate similarity in turf communities in relation to exposure
- Similar stations will group together
- Dissimilar groups will be divided by increasing distance



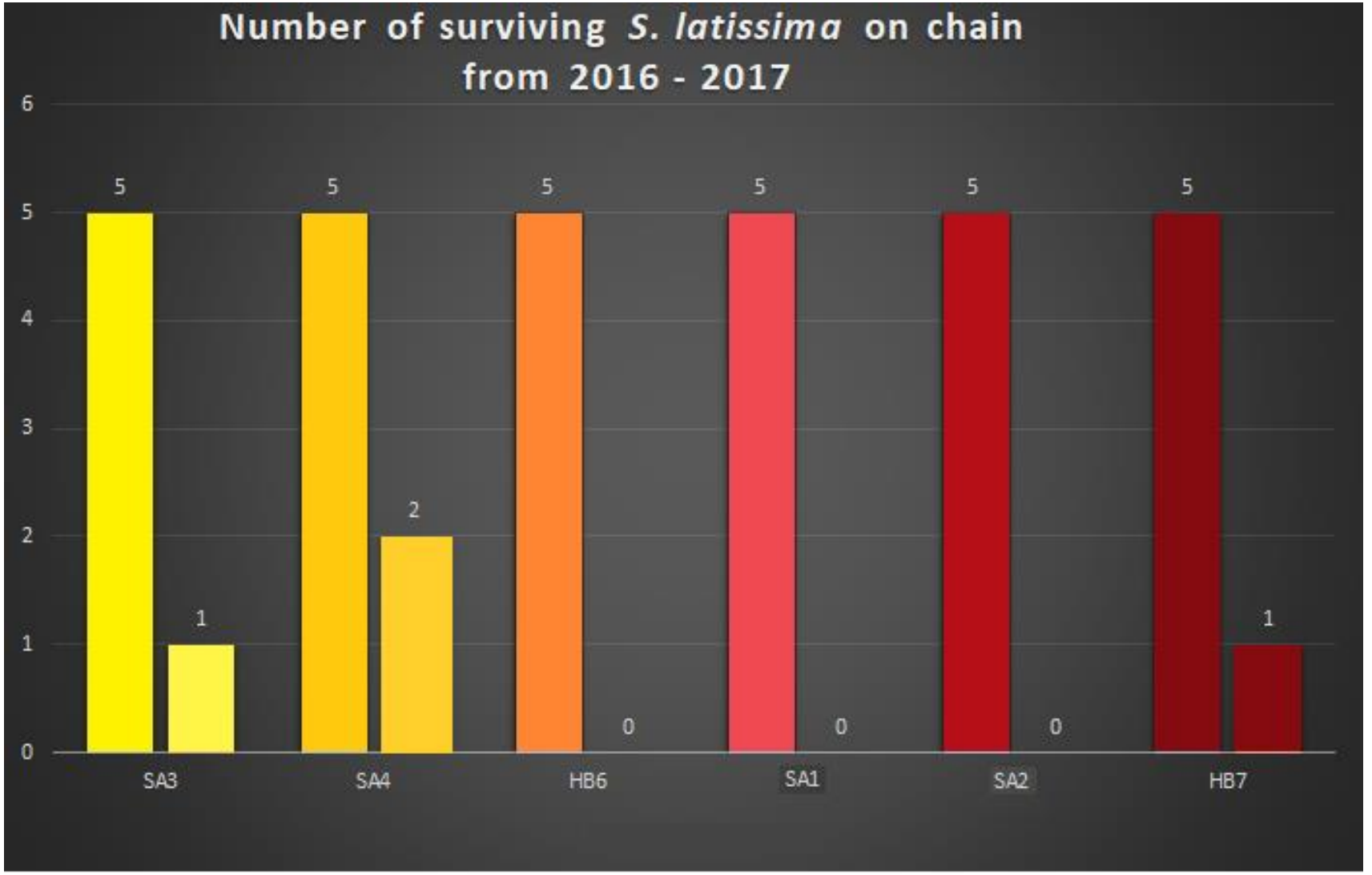
Results


Square measurements S2016
HB7
SA2
SA1
HB6
SA4
SA3
19
66
148
186
4
32
6
48
28
0
2
1
2
0
2
-20
30
80
130
180
230
Sprout
Juvenile
Adult


Square measurements H2016
HB7
SA2
SA1
HB6
SA4
SA3
0
2
2
0
44
0
50
14
0
2
2
0
1
11
2
1
1
0
10
20
30
40
50
60
70
Sprout
Juvenile
Adult

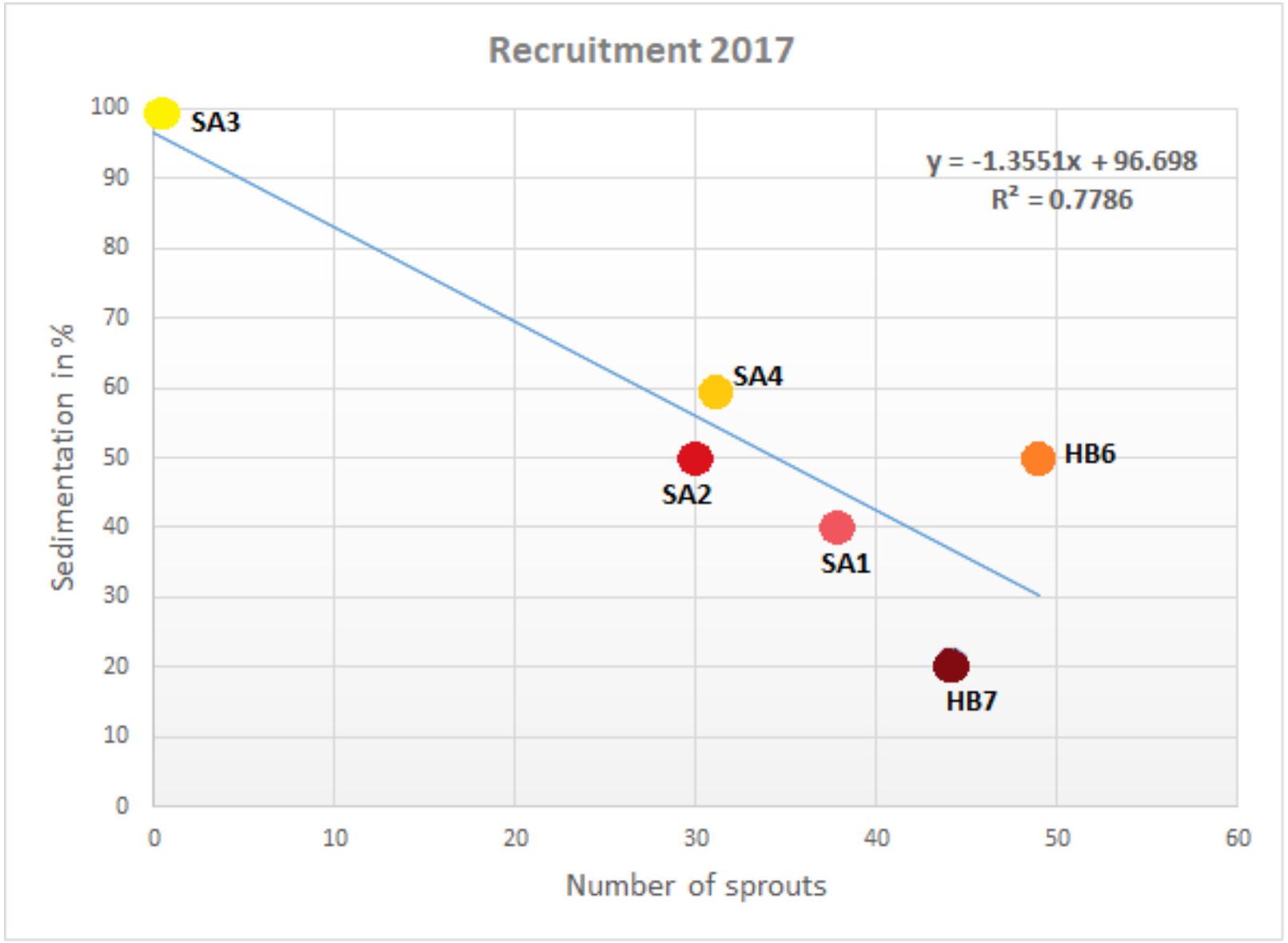

Square measurements S2017
HB7
SA2
SA1
HB6
SA4
SA3
44
3
9
30
5
3
38
5
8
49
1
4
31
1
0
0
10
20
30
40
50
60
70
Sprout
Juvenile
Adult

Results


Number of surviving S. latissima on chain from 2016 - 2017
6
5
4
3
2
1
0
5
1
5
2
5
0
5
0
5
0
5
1
SA3
SA4
HB6
SA1
SA2
HB7

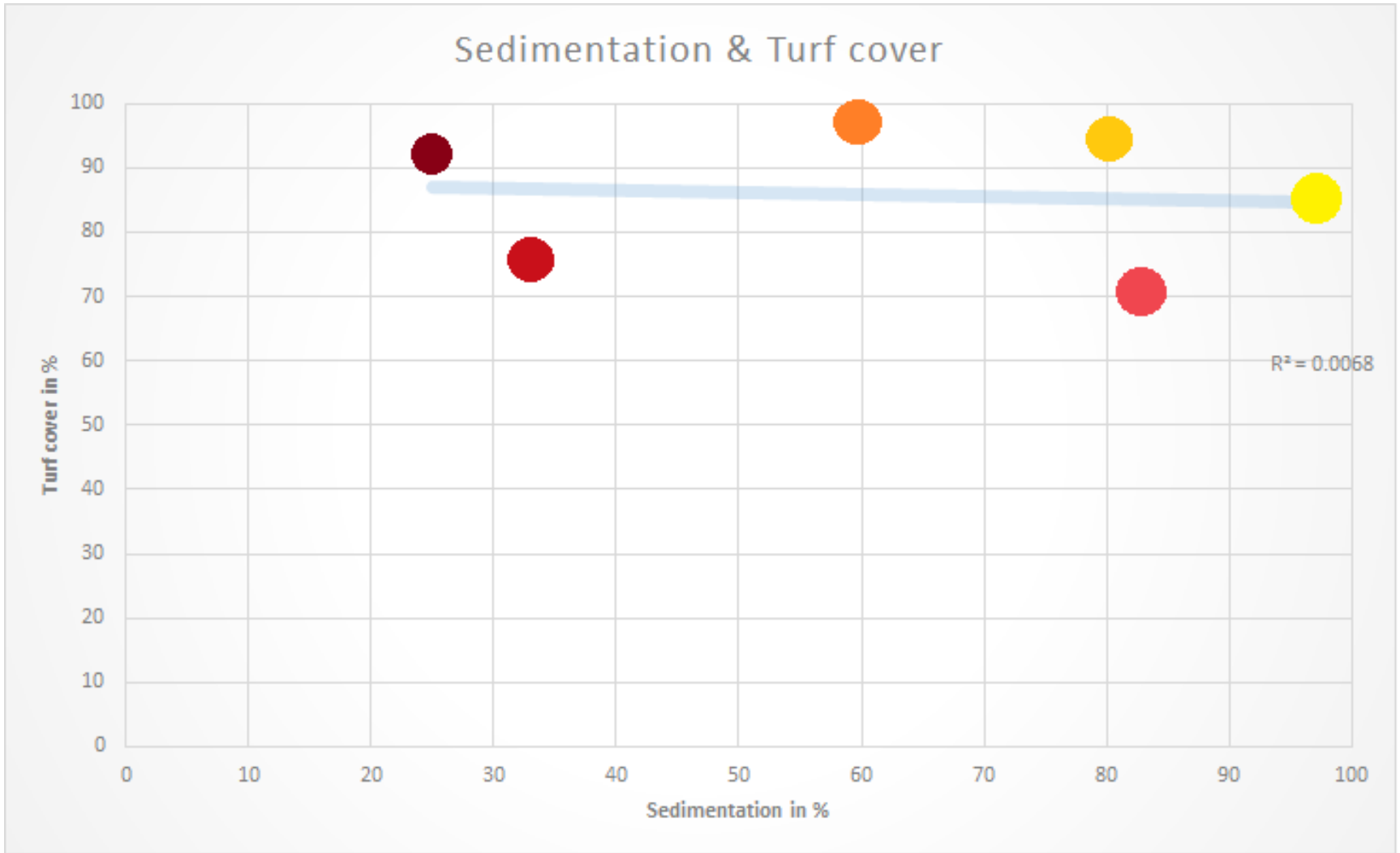
Conclusion

- *S. latissima* is ..



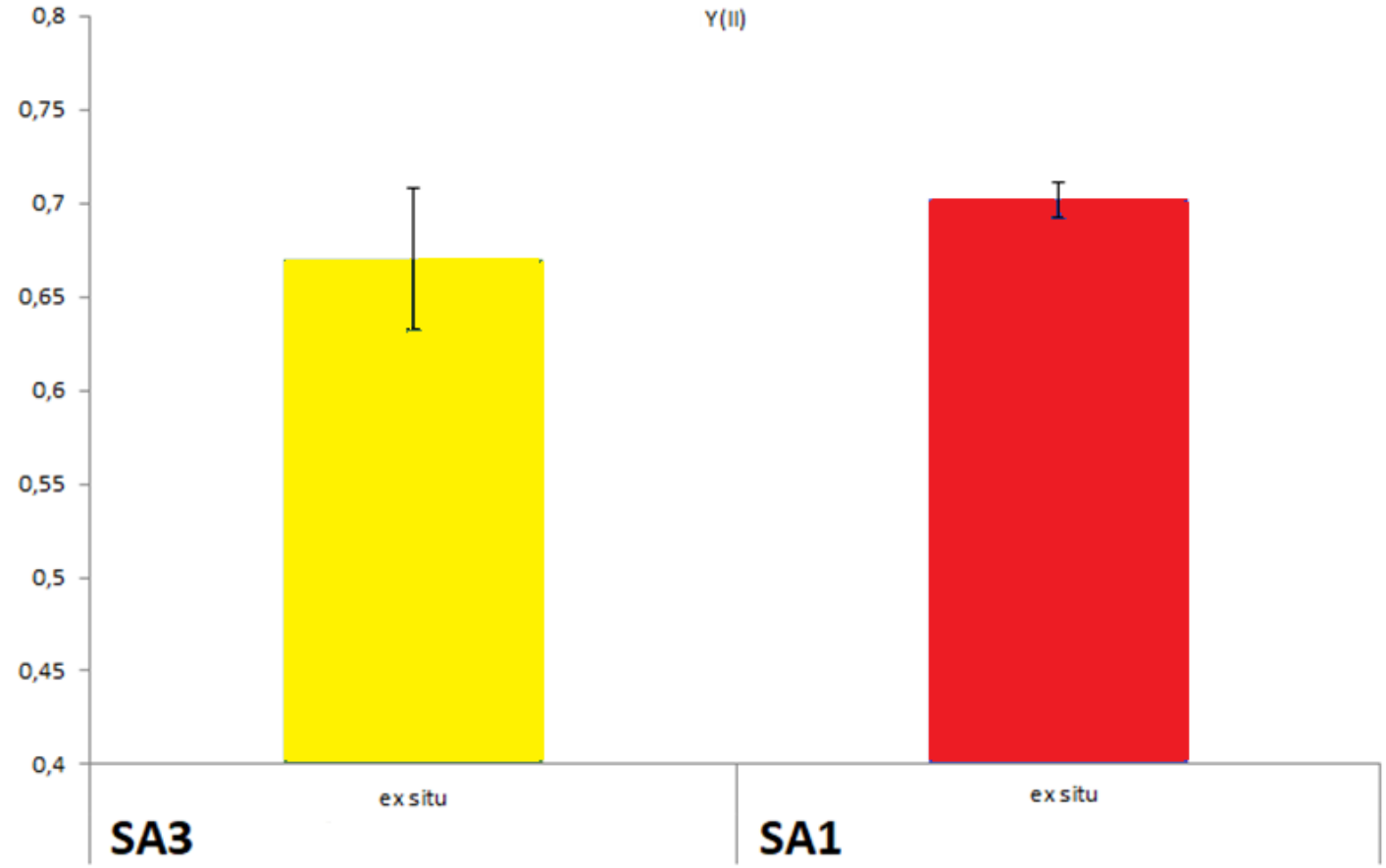
Increasing exposure

Conclusion


Sedimentation & Turf cover
Turf cover in %
Sedimentation in %
R² = 0.0068
0
10
20
30
40
50
60
70
80
90
100

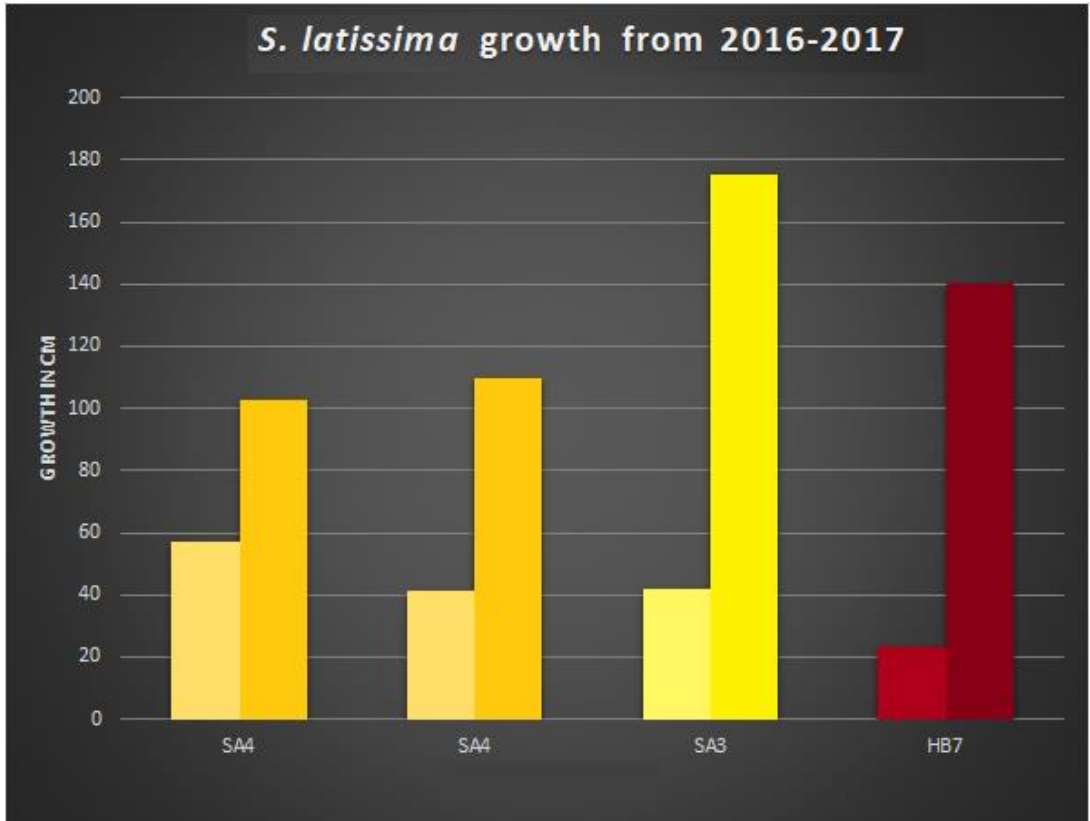
Conclusion

PAM - Pulse amplitude modulated fluorometry



- Test photosynthetic ability
- Indicate the algae physiological state

- *S. latissima* from both inner and outer coast has adequate photosynthesis



Conclusion

- *S. latissima* is able to recruit and grow on various exposures
- Photosynthetic ability is adequate, the sugar kelp is healthy

- Sedimentation alone can not explain differences
- Temperature and turf analysis could reveal other variations

Hypotheses

1) Turf and sedimentation alter *S. latissima* recruitment ☑
2) Light condition affects *S. latissima* growth and sprouts ☐
3) Summer temperature influence *S. latissima* survival ☐