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

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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

Increasing exposure

SA3, SA4, HB6, SA1, SA2, HB7
### Material and method

<table>
<thead>
<tr>
<th>6 fixed stations for biological and hydrochemical data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Biological</strong></td>
</tr>
<tr>
<td>Square measurement: measuring density and life stages of <em>S. latissima</em></td>
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<tr>
<td>Transplantation of adult sugar kelp: survival and growth (puncture method)</td>
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<tr>
<td>Local sugar kelp: survival and growth (puncture method)</td>
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<tr>
<td>Bottom scrap: collecting turf fauna from every station</td>
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<tr>
<td>Laboratory analysis: determine species from bottom scrap with microscope</td>
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<tr>
<td>PAM-data: interpret <em>S. latissima</em> physiological state</td>
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<tr>
<td><strong>Hydrochemical</strong></td>
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<td>Temperature: is there any extreme values during the summer season</td>
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<td>Light attenuation: is there adequate light conditions for photosynthesis</td>
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<tr>
<td>Wave exposure: is the fetches satisfactory for <em>S. latissima</em></td>
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</tbody>
</table>

In total, 9 different types of observations
Material & methods

**Diving-PAM measurements**

**Collection of turf**

**Transplanted adult *S. latissima***
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

Square measurements H2016

Square measurements S2017

Legend:
- Sprout
- Juvenile
- Adult

Bar charts showing the distribution of sprouts, juveniles, and adults in different squares for the years 2016 and 2017.
Results

Number of surviving *S. latissima* on chain from 2016 - 2017

<table>
<thead>
<tr>
<th>Sample</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA3</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>SA4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>HB6</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>SA1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>SA2</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>HB7</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>
Conclusion

- *S. latissima* is ..
Conclusion
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