



SAMFHIRE

Saltmarsh Function and Human Impacts in Relation to Ecological Status

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Issue 2



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Introduction

The **Saltmarsh Function and Human Impacts in Relation to Ecological Status (SAMFHIRE)** project is a 36-month multi-disciplinary collaboration between Botanical, Environmental and Conservation (BEC) Consultants Ltd. and the Department of Botany, Trinity College Dublin (TCD). Through field survey, collation of existing data, modelling and analysis, the project will link anthropogenic pressures to changes in saltmarsh communities and investigate the ecosystems services and ecological functions of saltmarshes in Ireland. By integrating the outputs of this research, it will refine the tool developed by the recent SMAATIE (Saltmarsh Angiosperm Assessment Tool for Ireland) project for the purposes of the Water Framework Directive. The tool, which assesses ecological status for part of the angiosperm Biological Quality Element in coastal and transitional waters, will be tested in the field and applied to a selection of water bodies.

The project consists of three work packages (WPs). There is synergy between WP1 and WP2, with outputs from both feeding into WP3.

Work Package 1: Anthropogenic pressures on Irish saltmarshes

The objectives of this WP are to:

1. Review the literature pertaining to anthropogenic pressures on saltmarshes
2. Collate existing data on anthropogenic pressures on Irish saltmarshes
3. Investigate impacts of grazing pressure on Irish saltmarsh communities
4. Investigate patterns and impacts of eutrophication on Irish saltmarsh communities
5. Identify potential refinements to SMAATIE related to anthropogenic pressures

Work Package 2: Ecosystem services and ecological function of Irish saltmarshes

The objectives of this WP are to:

1. Review the literature pertaining to ecosystem services and ecological function
2. Investigate the regulating services/functions of saltmarshes
3. Investigate the habitat/supporting services/functions of saltmarshes
4. Identify potential refinements to SMAATIE related to function/services

Work Package 3: Refinement and testing of SMAATIE

The objectives of this WP are to:

1. Finalise list of water bodies for which saltmarsh monitoring is needed
2. Record data on under-recorded saltmarsh communities
3. Refine tool and methodology
4. Field test the tool and methodology at a selection of contrasting sites

Expected Outputs:

The SAMFHIRE project outputs will include a fully detailed final report, a non-technical synthesis report and a revised Practitioner's Manual reflecting the revised assessment tool. Other project outputs will include final metric and Ecological Quality Ratio (EQR) data for all assessed water bodies in Microsoft Excel format, vegetation quadrat data in Turboveg format and GIS data in ESRI format defining Potential Saltmarsh Area. At least two oral conference presentations will be made and three to four papers will be published in peer-reviewed journals. TCD will hold two seminars where progress on the project will be presented and feedback can be received, and more newsletters will be produced and disseminated in PDF format.

Project term: January 2016—January 2019

Funder: EPA

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The project team would like to thank the support and advice received from the steering committee: Karen Roche (EPA), Robert Wilkes (EPA), Deirdre Lynn (NPWS), Kate Harrington (Irish Water), Claire Young (DAERA, NI), Clare Scanlan (Scottish EPA), Cilian Roden (Cilian Roden Associates) & João Neto (Universidade de Coimbra).

Work Package 1: Anthropogenic pressures on Irish saltmarshes

Grazing pressure on Irish saltmarshes

Monitoring was conducted in July 2017 of the grazing exclosures constructed in summer 2016 at two nature reserves managed by NPWS: Ballyteige Burrows in Wexford and Sheskinmore in Donegal. The experiment is examining the impacts on vegetation of three grazing treatments: A) no cattle grazing but potential rabbit grazing, B) no cattle or rabbit grazing, C) cattle grazing and potential rabbit grazing.

Ballyteige Burrows

After one year striking differences are apparent in the plots at this site. (Fig. 1). Within the cattle fencing (treatments A and B), cover of *Aster tripolium* (Sea Aster) has increased significantly in comparison with the grazed control plots (treatment C). The expansion of this tall herb has contributed to a significant increase in the height of the vegetation in treatments A and B compared to treatment C (Fig. 2). Species richness has also been affected by the exclusion of cattle with a significant decline in the number of species in treatments A and B compared with treatment C (Fig. 3). This is chiefly due to the loss of the annuals *Salicornia europaea* agg. (Glassworts) and *Suaeda maritima* (Annual Sea-blite) because, in the middle marsh, these species favour the disturbed ground provided by cattle poaching. There were no significant differences between treatments A and B so rabbit grazing is not currently a major impact.

Sheskinmore

In contrast with Ballyteige Burrows, there were no significant changes in the vegetation after one year at this site (Fig. 4). This may be due to the more exposed nature of the site and lower fertility of the sandier substrate.

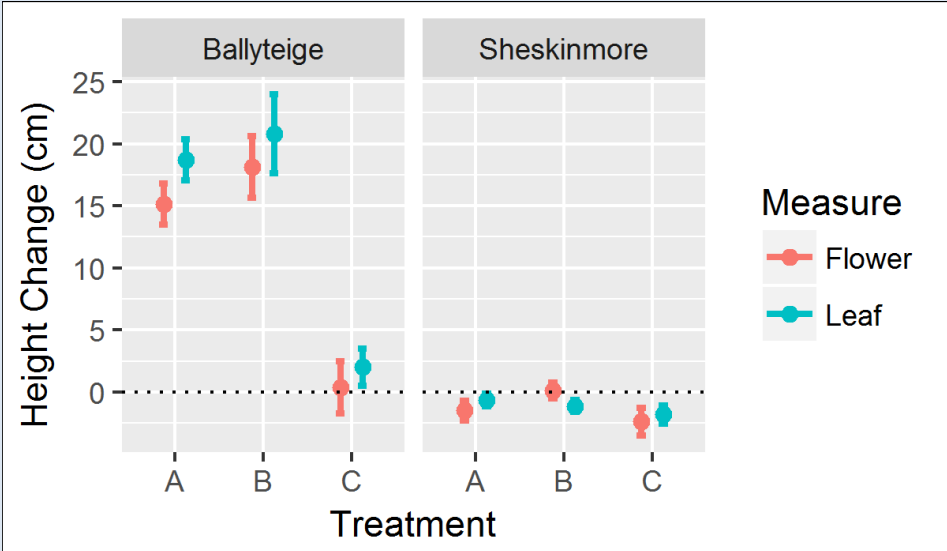


Fig. 2 Change in mean maximum height for flowers and leaves in grazing treatments between summer 2016 and summer 2017.

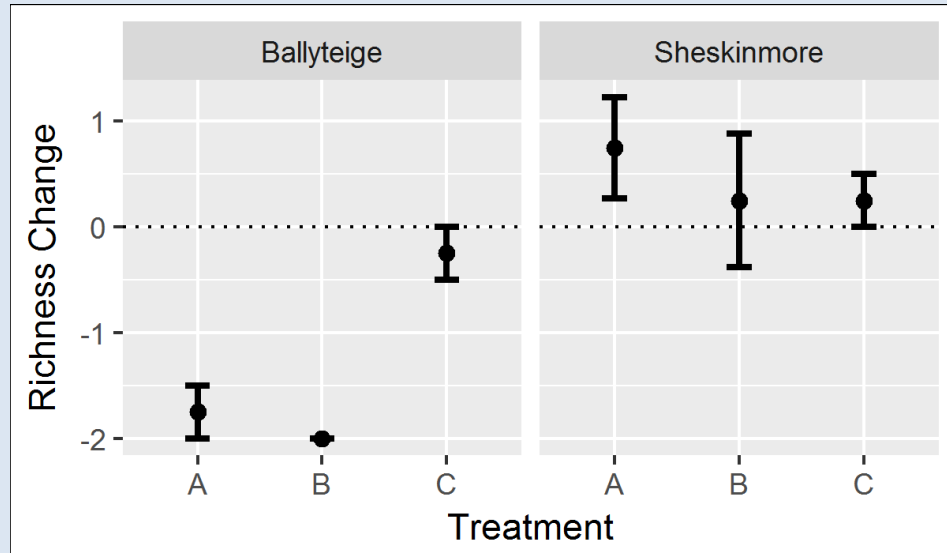


Fig. 3 Change in mean species richness in grazing treatments between summer 2016 and summer 2017.



Work Package 1: Anthropogenic pressures on Irish saltmarshes

Eutrophication survey

In 2016, a series of 246 plots were established at 15 ungrazed, estuarine saltmarshes on mud substrates along the east and south coasts of Ireland. Vegetation data were recorded and both biomass and sediment samples were taken. In March 2017, all of these plots were revisited and high accuracy elevation data were recorded (vertical error < 5 cm) with GPS surveyor equipment loaned from TCD Geography Department (Fig. 5).



In April 2017, laboratory analysis of the samples collected in 2016 was completed. Sediment parameters measured include: Total Nitrogen (TN), Total Inorganic Nitrogen (TIN), Total Oxidised Nitrogen (TON), NH₃, Total Phosphorous (TP), Olsen-P, Soil Moisture, pH, Sediment Density, Organic Matter (OM), Sand and Gravel. Above-ground and below-ground biomass were also measured.

Overall, there was good variation in the levels of nitrogen compounds across the 15 sites suggesting that there is reasonable variation in trophic status. Preliminary results indicate that vegetation composition might be most strongly associated with land elevation and soil salinity, followed by total oxidised nitrogen in soil (Fig. 6-7). They also indicate some decoupling between soil and water nutrient concentrations (Fig. 8).

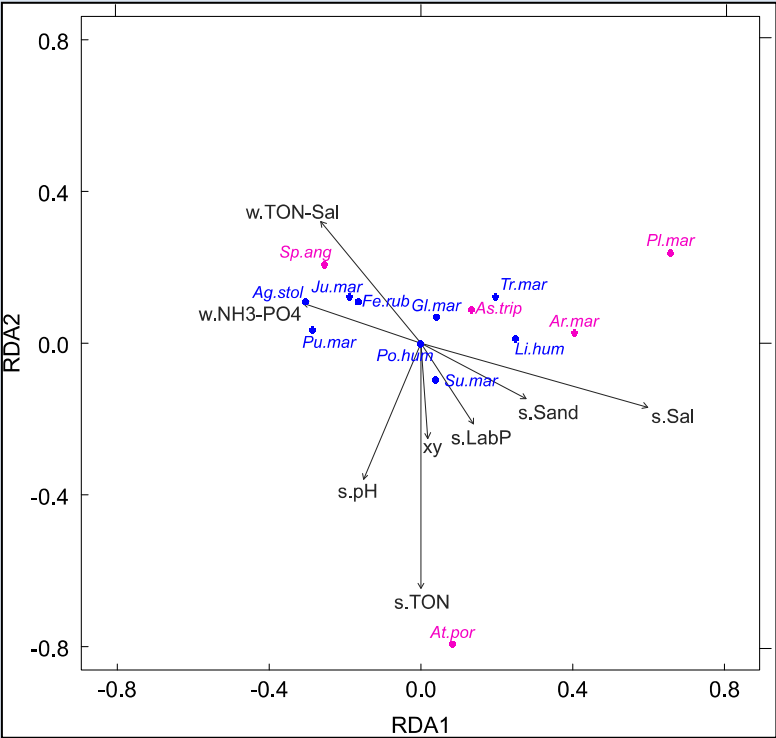


Fig. 6 RDA plot conditioned by elevation with scaling = 2. RDA1 and RDA2 represent 36.4% and 32.0% of the constrained variance, respectively (7.8% and 6.9% of total variance). Only species with ≥10% constrained variance and recorded in ≥ 5 plots are shown. Pink indicates species with ≥ 5% of their variance constrained by nutrients alone.

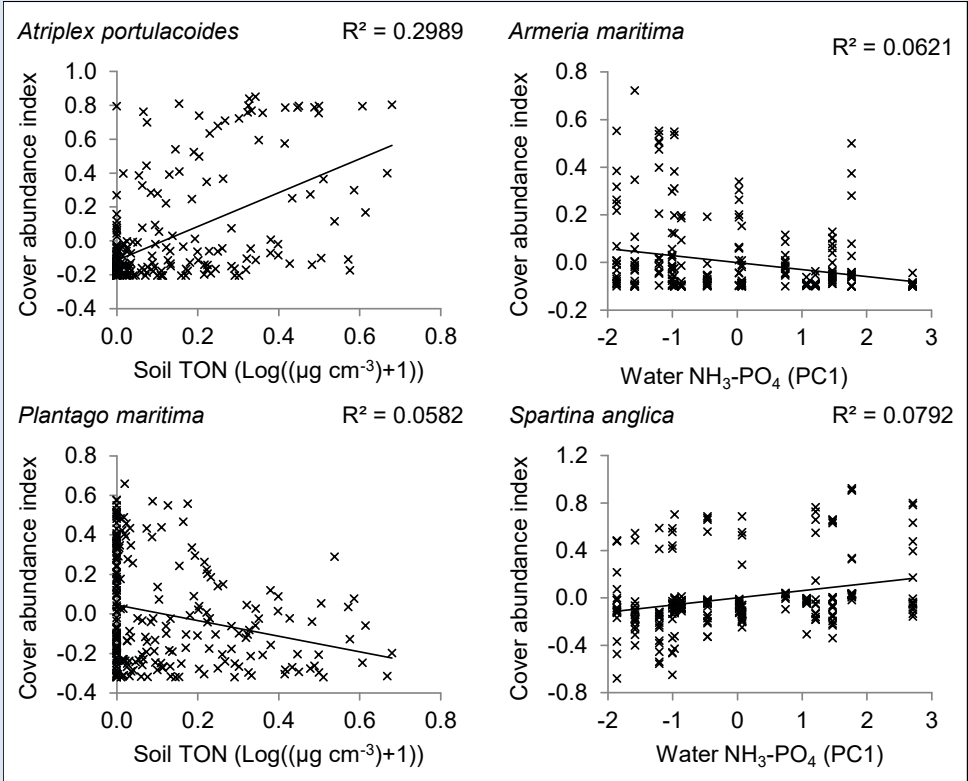


Fig. 7 (above) Hellinger-transformed cover abundance of selected individual plant species, detrended for elevation, in relation to nutrients in the parsimonious model. Trendline indicates significant ($P \geq 0.05$) univariate regression.

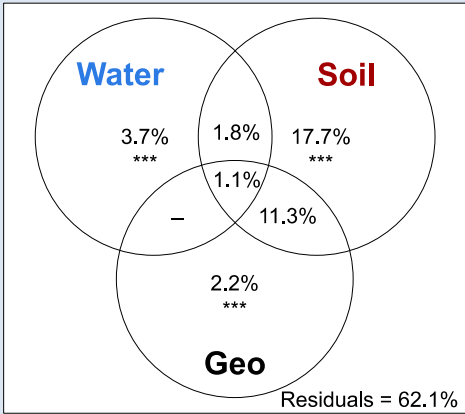


Fig. 8 (left) Partitioning of influences on plant community composition.

Work Package 3: Refinement and testing of SMAATIE

Recording of rare communities

Under-recorded saltmarsh communities are being surveyed as part of the SAMFHIREs project to better understand how they fit into the overall zonation of saltmarsh habitat and to address gaps in the saltmarsh section of the [Irish Vegetation Classification](#). During summer 2017, a number of these communities have been recorded through relevés: *Ruppia maritima* on mudflats (Fig. 9), *Beta vulgaris* and *Atriplex* spp. on saltmarsh driftlines (Fig. 10), *Blasmus rufus* communities of the middle marsh (Fig. 11) and *Juncus acutus* stands of the upper marsh/dune interface (Fig. 12). In addition, *Elytrigia atherica* swards and *Elytrigia repens* swards have been recorded

Fig. 10



Fig. 12



Field testing of the SMAATIE tool

Habitat mapping and the recording of monitoring stops is close to completion for five sites located across the country: Bull Island, Sheskinmore, Ballyteige Burrows, Barleycove Dunes and Dundalk. Data have been collected for the assessment of saltmarsh condition for both the Habitats Directive and the Water Framework Directive. Previous mapping at these sites has been improved by the use of recently defined saltmarsh vegetation groups from the Irish Vegetation Classification. We are now processing the collected data to test the SMAATIE tool.

Fig. 9



Fig. 11



Milestones for the next 6 months

- * Complete analysis of eutrophication data
- * Conduct preliminary analysis of observational grazing data that have been collected from several sites
- * Process mapping and assessment data from the five test sites
- * Plan fieldwork for the final field season in 2018.

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