By Annabel Everard and Claudia Foster, Highlands Rewilding

Mapping, monitoring, and muddy boots

A trip to Tayvallich Estate to survey vital saltmarsh habitats.

Surveys of saltmarshes on the Tayvallich Estate (Mid-Argyll, Scotland) were used to determine habitat extent, and in-depth assessments of five sites were used to analyse saltmarsh zonation and condition. Transect surveys considered factors such as heterogeneity in species composition, bare ground, sward height and grazing impacts. Here we present some key findings and highlight the importance of undertaking such ground-truthing surveys of saltmarsh habitats.

Figure 1: Saltmarsh on Tayvallich Estate.

Introduction

Saltmarsh habitats are crucial for biodiversity, carbon sequestration and coastal protection. They act as natural buffers against erosion and flooding and support diverse plant and animal communities. Understanding these habitats' compositions, their spatial distribution and condition is essential for improving long-term monitoring and informing

restoration efforts. We conducted surveys of saltmarshes on Tavyallich Estate to provide ground-truth data for comparisons to remotely sensed data and robust AI-development, and to guide future habitat management.

Methodology

Data collected in the field is summarised in Table 1.

Table 1: Data collected during saltmarsh surveys

Level	Data recorded	Additional details
Site	Extent of NVC-types	Recorded during estate-wide NVC surveys
Transect	Total length (m)	Measured from the shoreline to terrestrial transition
Transect	Compass bearing	
Transect	GPS start point	
5 x 1 m zone	Saltmarsh zone	Pioneer, low-mid marsh, mid-upper marsh or terrestrial transition based on vegetation composition
5 x 1 m zone	Herbivores present	Signs of cattle, sheep, geese and deer etc.
5 x 1 m zone	Bare ground cover (%)	
5 x 1 m zone	Comments	Any additional details, including negative indicators such as vehicle damage or pollution
1 m^2 quadrat	Grazing intensity	Light - where most of the standing crop remained present; Moderate - most of the standing crop removed; Heavy - sward height < 10 cm and all standing crop removed; Abandoned - matted vegetation where no standing crop was removed
1 m^2 quadrat	Sward height (cm)	Excluding flowering heads
1 m^2 quadrat	Algae cover (%)	
1 m^2 quadrat	Bare ground cover (%)	
1 m^2 quadrat	Cover of each species present	Recorded on the DAFOR Scale of Dominant, Abundant, Frequent, Occasional or Rare.
1 m^2 quadrat	Georeferenced photo	

In September 2024, saltmarsh extent was recorded during National Vegetation Classification (NVC) surveys of Tayvallich Estate, whilst details of saltmarsh zonation and condition were recorded using transects and quadrat sampling (e.g. Figure 2). Three transects were surveyed per site, with five sites surveyed in total. Transects spanning lower saltmarsh zones were only surveyed at low tide, when fully exposed.

Figure 2: Example saltmarsh survey quadrats and transects.

Results and findings

44 hectares of saltmarsh habitat was identified during NVC surveys (where over 25% of the vegetation polygon area was saltmarsh NVC communities). SM16 (*Festuca rubra* saltmarsh community) dominated – which is typical of Scottish Saltmarsh (Haynes et al., 2016) -, with rare occurrences of SM19 (*Blysmus rufus* saltmarsh community) and SM20 (*Eleocharis uniglumis* saltmarsh community) - all of which are associated with mid-upper saltmarsh zones. Transect surveys identified 93 species, including specialist halophyte (salt-tolerant) saltmarsh pioneers such as glassworts (*Salicornia* spp), Common Saltmarsh-grass (*Puccinellia maritima*) and Sea Aster (*Tripolium pannonicum*) (e.g. Figure 3).

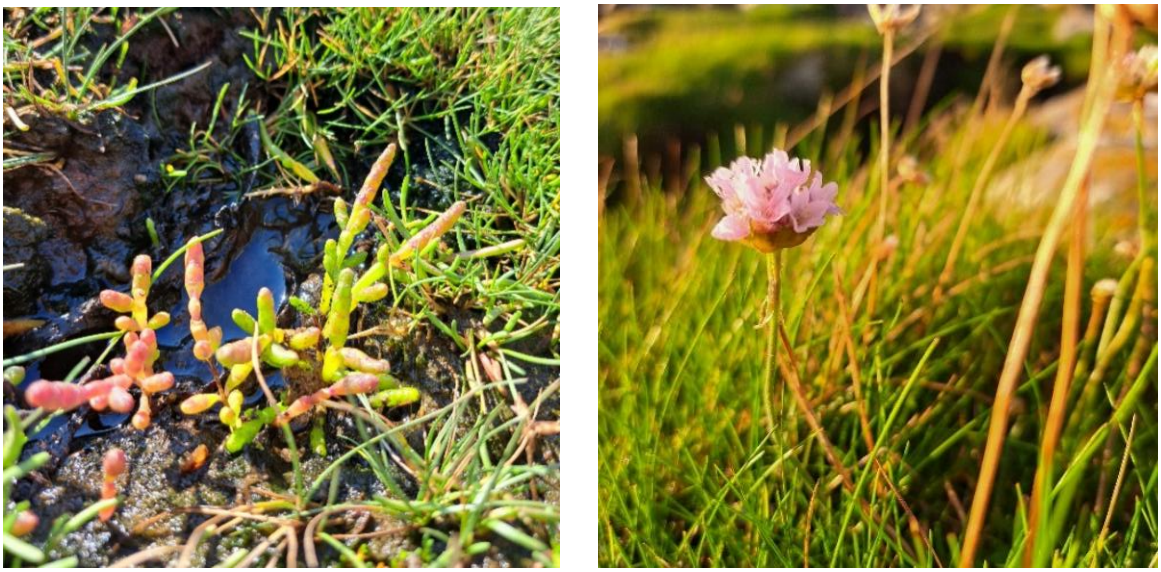

Figure 3. Pioneer species including Glassworts and Sea Aster were detected during surveys

Pioneer saltmarsh zones with these characteristic species were identified in 4 % of transects (Figure 4). Pioneer saltmarsh is relatively rare in Scotland, occurring on ~ 27 % of Scottish Saltmarshes (> 3 ha), with particularly poor coverage on the west coast associated with shingle and coarse gravel substrates (Haynes et al., 2016). This highlights the benefit of our methodological approach of pairing NVC and transect surveys, otherwise these vital habitats may have been overlooked.

Grazing pressure is a key indicator of saltmarsh condition. Evidence of cattle, sheep, deer and geese grazing was frequently identified during these surveys, and many transects had been heavily (25%) or moderately grazed (45%) – see Figure 4 – raising concerns regarding saltmarsh condition. Grazing management requires careful balance of grazing intensity to maintain rare species vulnerable to losses from under-grazing, via competitive exclusion, or over-grazing – light to moderate grazing being important for maintaining or promoting structural diversity, plant species diversity and associated valuable bird habitats (JNCC, 2004).

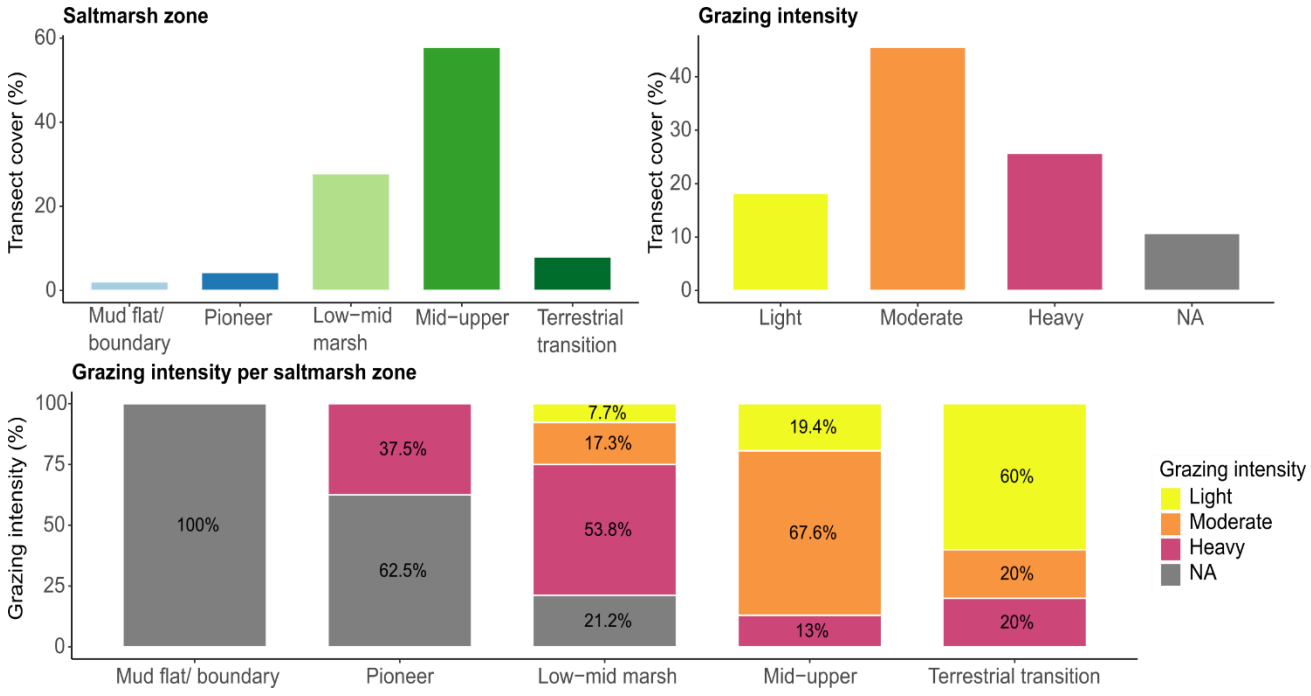

Figure 4. Transect zones per saltmarsh zone (left) and grazing intensity (right). NA occurs where no sward was present.

Poaching (e.g. trampling) by cattle and sheep contributes to saltmarsh erosion, exposing bare ground and causing declines in turf fucoids (Strachan, 2020). Lower saltmarsh zones are vulnerable to poaching at Tayvallich, requiring consideration for future management. Over-grazing and nutrient enrichment associated with dunging can encourage *Festuca* swards (SM16), Autumn Hawkbit (*Scorzoneroides autumnalis*) and White Clover

(*Trifolium repens*) causes decline in key upper-marsh species such as Saltmarsh rush (*Juncus gerardii*), Sea Arrowgrass (*Triglochin maritimum*) and Common Saltmarsh-grass *(Puccinellia)* communities – these nutrient enrichment trends were observed at Tayvallich.

With muddy boots and plenty of data, the paired study design used here has provided valuable insights into saltmarsh extent and health. Surveys have highlighted the ecological value of the saltmarshes, with their remnant pioneer species, laying the groundwork for future monitoring and habitat restoration!

References

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Strachan, I.M. 2020. Saltmarsh survey and assessment of current herbivore impacts for Kentra Bay and Moss Site of Special Scientific Interest. Scottish Natural Heritage Research Report No. 1186.