

Intertidal seagrass



Key message

The assessment presents baseline trial sampling of intertidal seagrass communities, a Priority Marine Feature (PMF). There are insufficient repeat monitoring data to determine the ecological status of seagrass beds and whether established targets are being met.



Background

Seagrass communities (Figure 1) are highly productive important biological features. They are used as shelter, nurseries, spawning and feeding areas by birds, fish and invertebrates, and provide attachment for other organisms such as algae (Levinton, 1995). The presence of seagrass beds stabilises the sediment and helps protect coastlines from erosion (Potorougroulou *et al.*, 2017).

For these reasons Scotland has listed seagrass habitats as a Priority Marine Feature (PMF). Seagrasses (*Zostera noltii*, *Zostera angustifolia* and *Zostera marina*) are regarded as indicative of healthy environments and are particularly susceptible to pollution and nutrient enrichment. This makes them useful indicator species for impacted water quality. Although, absence of



Figure 1:
An intertidal seagrass bed at Cuthill Sands in the Dornoch Firth © NatureScot.

seagrass does not necessarily indicate adverse influences and some healthy sites can also show pronounced inter-annual changes.

Other pressures on seagrasses include:

- Coastal development.
- Physical impact e.g. bait digging and anchor damage.
- Habitat loss.
- Animal grazing.
- Non-native invasive species.

This assessment of intertidal seagrass uses results from SEPA's initial trial of the Water Framework Directive (WFD) tool. The tool estimates the change in seagrass bed extent and percentage cover in order to provide an ecological status score for that waterbody. Knowledge of seagrass

around Scottish coasts is poor due to limited historical seagrass records and inconsistent sampling techniques. The data described here provide baseline information, using the [UK Technical Advisory Group \(UKTAG\)](#) approved seagrass tool, against which future data can be assessed.

The sites trialled by SEPA are the Cromarty Firth, Montrose Basin, Eden Estuary, Forth Estuary, Clyde Sea area and Loch Ryan (Figure 2).

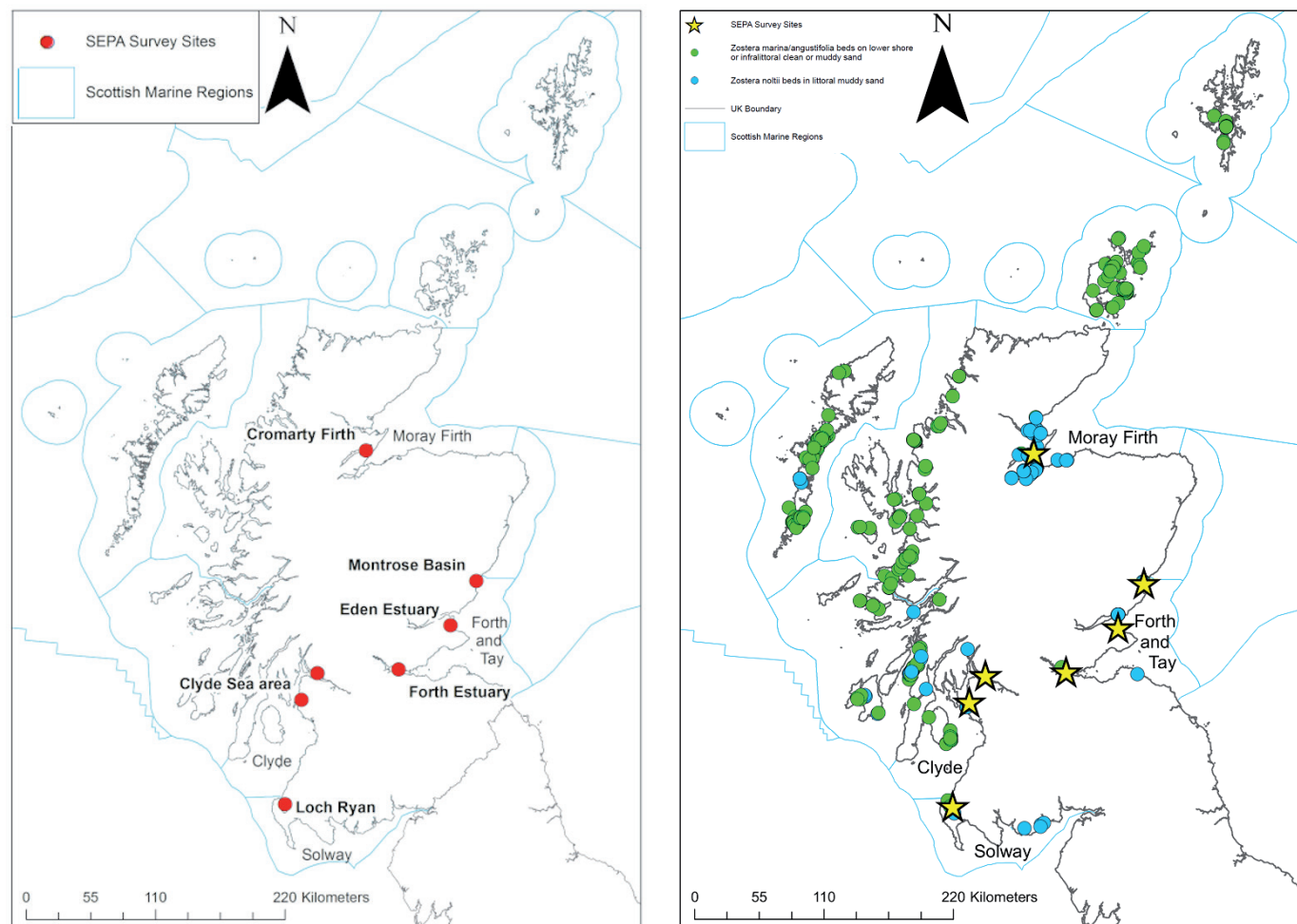


Figure 2:
(left) Scottish Marine Regions (SMRs) showing seagrass sites sampled. (right) Sites surveyed for seagrass by SEPA and records of *Zostera* spp. from GeMS (data from 2019-04-26)

Results

Hiscock *et al.* (2004) stated that seagrass beds were especially well developed in Scotland compared to other parts of Britain and Ireland with “...development most likely due to the presence of extensive suitable habitats and possibly uncontaminated waters”. However, in general there is limited verifiable information regarding the extent of intertidal seagrass beds especially on the west coast.

Cleaver (1993) described two types of *Zostera* communities - intertidal and subtidal. The most widespread being intertidal mixed *Z. noltii* and *Z. angustifolia* on the east coast and in estuaries. This is typical of what SEPA surveys found in the Montrose Basin and Eden Estuary with the addition of extensive cover of opportunistic algal growth. Excessive cover of opportunistic algae can outcompete seagrass, compromising its health and inhibiting or eliminating it completely (Dennison *et al.*, 1993).

Sites in the Forth Estuary were overall smaller and, therefore, supported much smaller patches of seagrass compared to the rest of Scotland but the average percentage cover of seagrass was higher than at other sites. This higher percentage cover may be due to the much lower amount of opportunistic algae present, which was observed in small areas at the top of shores or near freshwater input.

Table 1: Classification and extent of seagrass coverage and average percentage cover in waterbodies surveyed by SEPA (grey cells = insufficient data for classification).

Water body	Month/Year surveyed	Area (m ²)	Average % cover	EQR	Class
Loch Ryan	Aug-2013	104,800	33.3		
Eden Estuary	Jul-2013	172,200	28.2	1.00	High
	Aug-2015	558,800	29.0		
Montrose Basin	Jul-2013	1,747,000	41.8	0.92	High
	Aug-2017	2,793,416	36.0		
Lower Forth Estuary	Aug-2014	349,264	57.6	0.87	High
	Aug-2018	331,475	44.9		
Middle Forth Estuary	Aug-2014	201,339	53.3	0.89	High
	Aug-2018	192,299	50.7		
Cromarty Firth	Aug-2015	3,238,571	36.5		
Clyde Estuary Outer (Ardoch & Cardross)	Aug-2016	108,009	32.2		
Largs Channel (Hunterston)	Aug-2016	192,895	32.6		

In Loch Ryan seagrass occurred with minor amounts of algae but the substrate may not have been as suitable for promoting growth as some of the other sites surveyed. For example, in places, historic mussel beds, or mussel scalps inhibited growth, whilst in others no seagrass was present on a shell/gravel/sand substrate.

Table 1 shows the extent of seagrass coverage and the average percent cover of patches in each water body surveyed. The Forth Estuary is spread over multiple water bodies due to its size and variation in morphology.

The results presented are the baseline survey data SEPA will use to run WFD trial classification in future years. Trial classification was completed on three of the sites where

time series data exists; with them all being classed as High. The EQR for the Forth Estuary is calculated for the Lower Estuary and the Middle Estuary as it is spread over multiple water bodies due to its size and variation in morphology. More data is needed for the remaining sites surveyed in order to complete classification.

Any real changes to seagrass brought about by human disturbance may take at least 5-10 years (Duarte & Kirkman, 2001) to appear. Therefore, long term monitoring is essential to provide robust data for classifying ecological status as per WFD guidelines. Natural variation in the seagrass beds is mitigated by classifying the data based on a rolling mean, which also allows the identification of underlying trends as well as minimising natural variability.

Conclusion

The information described is the first attempt to gain an understanding of the ecological status of Scottish intertidal seagrass. Of the six waterbodies surveyed by SEPA, classification can only be run on three, which are all at high ecological status. This gives a good indicator to the health of seagrass within the Forth and Tay Scottish Marine Region but there is insufficient information to have high confidence in the data. The other sites cannot be classified due to lack of repeat data necessary for the intertidal seagrass tool. In addition, there are no data to classify any of the other Scottish Marine Regions.











Since the 2011 Marine Atlas assessment (Baxter *et al.*, 2011), understanding of the distribution of seagrass has not changed and records are available on [Marine Scotland Maps NMPi](#). However, since 2011 quantitative data has started to be gathered that will enable future assessment of the health of Scottish intertidal seagrass.

Knowledge gaps



















There are a lack of data and knowledge available for Scottish intertidal seagrass in order to carry out an assessment for Scottish Marine Regions. Not only is there a lack of comprehensive baseline data but there is no long-term understanding of ecological trends of Scottish seagrass. SEPA has begun the process of assessing intertidal seagrass at a select number of sites but these are not representative of Scottish seagrass beds as a whole.

Status and trend assessment

There are only four marine regions that have been assessed and these are currently listed as 'grey' - 'lack of evidence/robust assessment criteria' because 2 years' worth of the required time-series data has not been completed for the majority of the study sites. As a result the WFD classification cannot be completed for them all.

Region Assessed	Status with confidence	Trend with confidence	Comments
All Scotland			
Clyde			
Forth and Tay			<p>Three sites in this region are the Eden Estuary, Montrose Basin and the Forth Estuary. Increase in area extent found in results section is most likely due to increase in survey effort in the Eden and Forth estuaries, therefore one more year's survey data is needed for increased confidence in this assessment.</p> <p>As such, the status is grey as there is a lack of evidence, but the evidence we have so far is good, hence the medium confidence (two stars).</p>
Moray Firth			
Solway			

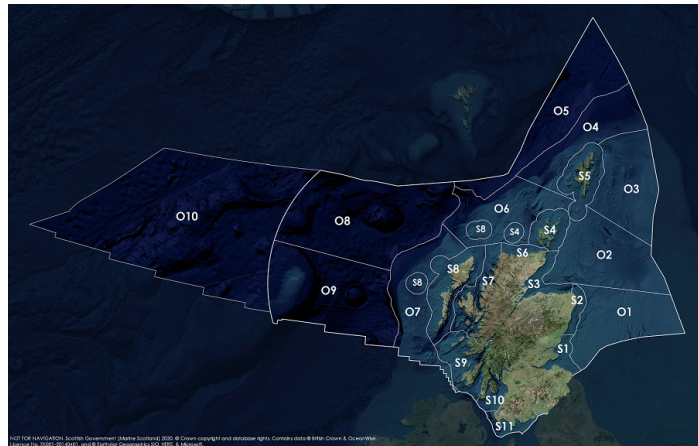
Status and trend assessment legend

Status assessment (for Clean and safe, Healthy and biologically diverse assessments)		Trend assessment (for Clean and safe, Healthy and biologically diverse and Productive assessments)	
	Many concerns		No / little change
	Some concerns		Increasing
	Few or no concerns		Decreasing
	Few or no concerns, but some local concerns		No trend discernible
	Few or no concerns, but many local concerns		All trends
	Some concerns, but many local concerns	Confidence assessment	
	Lack of evidence / robust assessment criteria		
	Lack of regional evidence / robust assessment criteria, but no or few concerns for some local areas		Low
	Lack of regional evidence / robust assessment criteria, but some concerns for some local areas		Medium
	Lack of regional evidence / robust assessment criteria, but many concerns for some local areas		High

Overall confidence

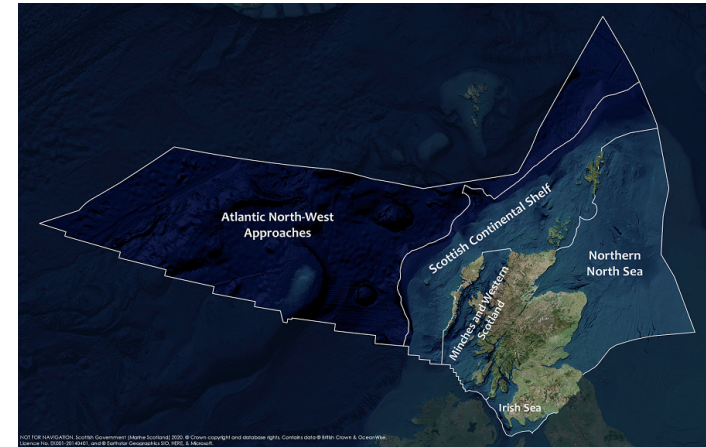


Assessment regions

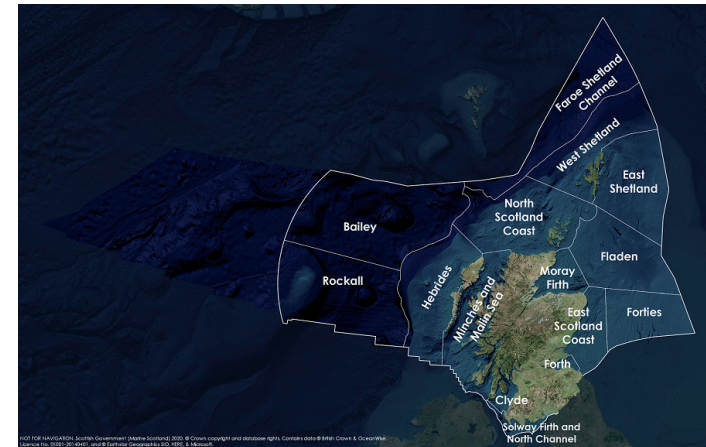


The Scottish Marine Regions (SMRs; S1 - S11) and the Scottish Offshore Marine Regions (OMRs, O1 - O10)

Key: S1, Forth and Tay; S2, North East; S3, Moray Firth; S4 Orkney Islands; S5, Shetland Isles; S6, North Coast; S7, West Highlands; S8, Outer Hebrides; S9, Argyll; S10, Clyde; S11, Solway; O1, Long Forties, O2, Fladen and Moray Firth Offshore; O3, East Shetland Shelf; O4, North and West Shetland Shelf; O5, Faroe-Shetland Channel; O6, North Scotland Shelf; O7, Hebrides Shelf; O8, Bailey; O9, Rockall; O10, Hatton.



Biogeographic, Charting Progress 2 (CP2) Regions. These have been used as the assessment areas for hazardous substances.



Scottish Sea Areas as used in Scotland's Marine Atlas 2011. These are sub divisions of the biogeographic, or Charting Progress 2 (CP2), Regions.