

HEALTHY AND BIOLOGICALLY DIVERSE : HABITATS

Predicted extent of physical disturbance to seafloor

Key message

Disturbance of seafloor habitats from towed, bottom-contacting fishing activity is predicted to be widespread. The indicator predicts seafloor habitats are in poor condition across more than half of their area in nine out of 21 regions, and some level of damage is likely in all regions.

Background

Physical disturbance can damage seafloor habitats, especially those supporting larger and more fragile species and/or those with longer recovery time. The status of seafloor habitats can be assessed using monitoring data from surveys, ideally across a long time period. However, it is not feasible to monitor the whole seafloor: currently, monitoring data are mostly available from Marine Protected Areas. A modelled approach is necessary for large scale habitat assessments across all Scottish waters. Exposure to pressures associated with human activity can be used to devise a proxy for habitat condition.

This assessment, developed for use in OSPAR and UK Marine Strategy assessments (known as 'Extent of Physical Damage' indicator (OSPAR, 2017),

predicts the spatial extent and level of physical disturbance by mapping areas where pressures overlap with sensitive habitats. Currently, it only considers disturbance from surface and sub-surface abrasion caused by vessels over 12 m in length using Vessel Monitoring System (VMS) (reporting vessels) fishing with bottom contacting gears. This is considered to be the most significant pressure (Foden, 2011). The corresponding pressure maps produced using these data aggregate pressure across a large grid cell. It is assumed that fishing occurs evenly across the whole grid cell which may not be the case.

The indicator categorises disturbance at the seabed from 0 (none) to 9 (very high). Categories



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Broken shells, decaying material on recently dredged sea bed in Loch Carron © NatureScot/Ben James

5 to 9 represent higher levels of disturbance. Areas with a score of 5 and above are considered highly disturbed and, therefore, potentially in poor condition. Habitats may have a high disturbance score if they are heavily fished or, if they are fished less frequently but are highly particularly sensitive to the associated pressures. This indicator primarily relates to subtidal sediment habitats as rocky areas tend to be avoided by those involved in towed, bottom-contact fishing; however, there will be some disturbance of subtidal rock and reef habitat. Case studies on benthic habitats are available for [Loch Creran](#) and [Loch Carron](#) and [Deep sea vulnerable marine ecosystems](#).

Results

Figure 1 shows the combined disturbance from both surface and subsurface abrasion caused by towed, bottom-contacting fisheries for Scottish waters. Categories 5 to 9 are considered to represent high levels of disturbance. Disturbance was widespread across most Scottish Marine Regions and Offshore Marine Regions. Table 1 shows the proportion of each region where high disturbance is predicted.

When interpreting these results, it should be noted that the pressure data layers used to derive disturbance aggregate pressure across a large grid cell and it is assumed that fishing occurs across the whole grid cell which may not be the case. The percentages provided should be taken as indicative values for disturbed area as they are calculated from the gridded data. High disturbance categories accounted for 1% (Hatton) to 95% (East Shetland Shelf) of the total area of the region. The whole of the East Shetland Shelf (95% high and 5% low disturbance) and Fladen and Moray Firth (86% high and 14% low disturbance) offshore regions experienced some disturbance.

The threshold used for the Marine Strategy was that less than 15% of the habitat area should be in poor condition (Vina-Herbon et al., 2018). The high disturbance categories of 5 - 9 are taken as a proxy for 'poor condition'. Based on the results of this Scottish assessment, Hatton, Faroe-Shetland Channel and Bailey regions are

below the threshold with less than 15% of the area assessed as highly disturbed, while all other regions are above the threshold.

There are no comparable results from the last Marine Atlas assessment (Baxter *et al.*, 2011) to make a comparison and assess change over time. It is not possible to compare the results of the indicator with an assessment for the last reporting period as any changes in disturbance would reflect mostly changes in the amount of reported fisheries activity VMS data.

The method for assessing whether Good Environmental Status is met for this indicator for the Marine Strategy (Vina-Herbon *et al.*, 2018) was adapted to produce the traffic light assessment for this report. The threshold of 15 % area in high disturbance categories was reused to distinguish between categories. The scoring system is outlined in Table 2.

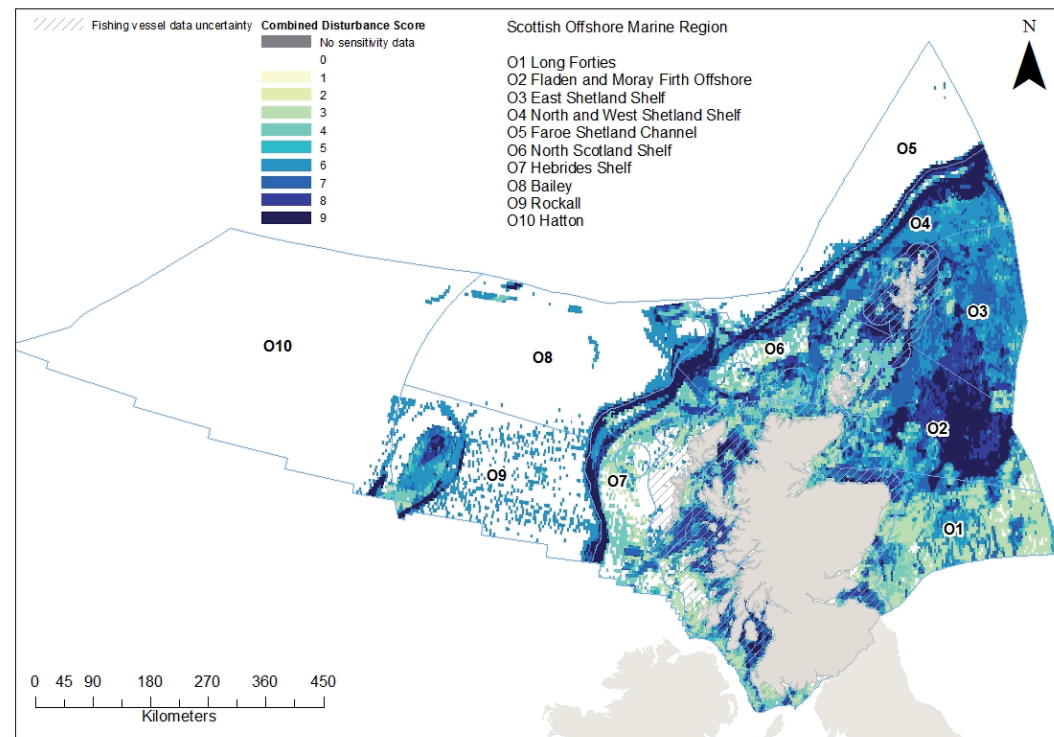


Figure 1: Disturbance from combined surface and subsurface abrasion from bottom fisheries in Scottish waters (0 = no disturbance, 9 = very high disturbance).

Table 1: Percentage of seafloor predicted to be subjected to low and high levels of disturbance by bottom fishing.

Scottish Marine Region (SMR)	No predicted disturbance	Low disturbance (categories 1-4)	High disturbance (categories 5-9)
Solway	12%	66%	22%
Clyde	8%	26%	65%
Argyll	20%	36%	44%
West Highlands	8%	27%	65%
Outer Hebrides	36%	31%	33%
North Coast	5%	46%	49%
Orkney Islands	10%	48%	41%
Shetland Isles	4%	16%	80%
Moray Firth	9%	34%	57%
North East	5%	44%	51%
Forth and Tay	13%	39%	48%
Offshore Marine Region (OMR)			
Hatton	98%	0%	1%
Rockall	61%	3%	36%
Bailey	87%	1%	11%
Hebrides Shelf	23%	37%	40%
North Scotland Shelf	8%	28%	64%
Faroe Shetland Channel	89%	1%	10%
North & West Shetland Shelf	2%	8%	89%
East Shetland Shelf	0%	5%	95%
Fladen and Moray Firth Offshore	0%	14%	86%
Long Forties	4%	59%	36%

Conclusion

Towed, bottom-contacting fishing activities are widespread in most Marine Regions and are capable of causing disturbance to sensitive seabed habitats. Disturbance of seafloor habitats from towed, bottom-contacting fishing activity is predicted to occur to some degree in all regions. The only regions which lack significant disturbance, and which the indicator does not predict to have benthic habitats in poor condition, are in deeper waters off the edge of the continental shelf. Nine out of 21 regions have seafloor habitats which are predicted to be in poor condition across more than half of their area.

Some limitations should be noted when interpreting the results. It is likely that pressure in inshore waters is underestimated due to a lack of fisheries activity data for smaller vessels (data from vessels 12-15 m in length became progressively more available through the assessment period but data for smaller <12 m vessels was not available). Disturbance overall may be overestimated in some places because a precautionary approach was used for assessing sensitivity where data on the distribution of habitats and species were lacking, and the scale of available data on fishing activity means that pressures are assumed to be acting over an area that is likely to be larger than that which is actually fished.

Knowledge gaps











Increased availability and improved resolution of habitat survey data and fisheries data would improve the accuracy of indicator results.

Scottish Government have made a commitment (Scottish Government, 2019) for introducing tracking technology for vessels less than 12 m which will result in significant improvements in the inshore waters in future. In situ monitoring data could be used to assess habitat condition over time in a different way, and also assess the accuracy and inform future development of this type of proxy assessment.



















Status and trend assessment

Region assessed	Status with confidence	Trend with confidence
All Scotland		NT

Region assessed	Status with confidence	Trend with confidence
SMRs		
Argyll		NT
Clyde		NT
Forth and Tay		NT
Moray Firth		NT
North Coast		NT
North East		NT
Orkney Islands		NT
Outer Hebrides		NT
Shetland Isles		NT
Solway		NT
Western Isles		NT

Region assessed	Status with confidence	Trend with confidence
OMRs		
Bailey		NT
East Shetland Shelf		NT
Faroe-Shetland Channel		NT
Fladen and Moray		NT
Hatton		NT
Hebrides Shelf		NT
Long Forties		NT
North and West Shetland Shelf		NT
North Scotland Shelf		NT
Rockall		NT

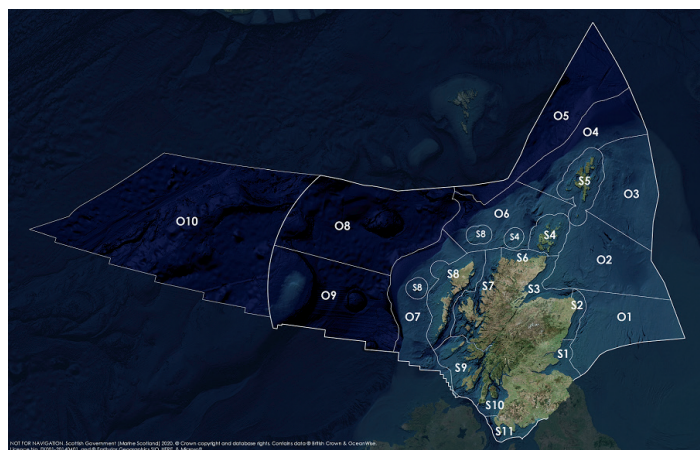
Status and trend assessment legend

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

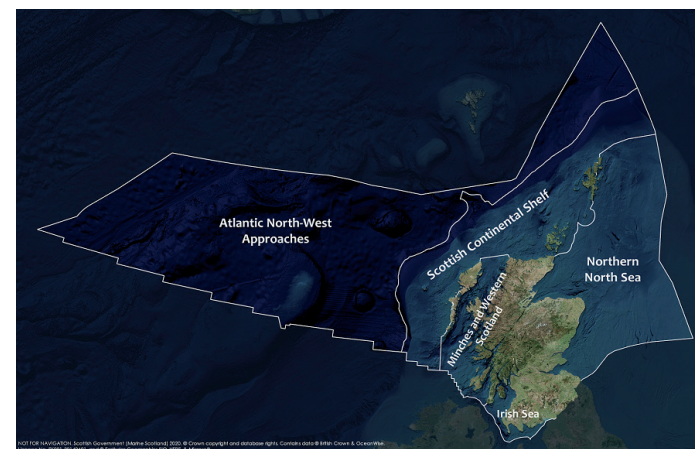


Assessment regions

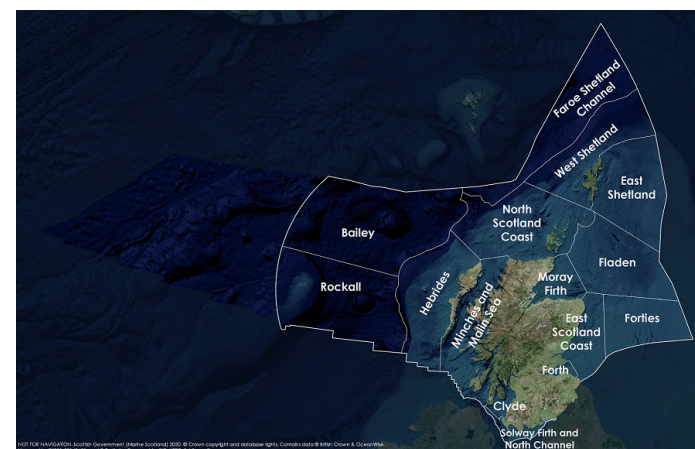


The Scottish Marine Regions (SMRs; S1 - S11) and the Scottish Offshore Marine Regions (OMRs, O1 - O10)

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.