Scottish Government
Riaghaltas na h-Alba
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External fish disease

Key message

The health status of common dab in Scottish seas is predominantly satisfactory. The only area of concern was the Northern North Sea in 3 of 10 years assessed. However, this is not unexpected as this area is known to have higher levels of fish disease.

Hyperpigmentation in flatfish

Background

External visible disease is an indicator for the general health status of a population of fish. This indicator looks at nine specific diseases that are seen on the outside of the fish.

The data collected are run through a statistical programme to calculate the Fish Disease Index (FDI) for each individual fish. From this, an average index is calculated for the population in each biogeographic region and this is compared to the FDI assessment criteria established by experts in this field.

The diseases monitored include bacterial, viral and parasitic infections. However, fish health can be impacted by other environmental stressors including exposure to contaminants. These impacts can have a direct or indirect effect on fish health. Indirect effects include reducing the function of the immune system, which can lead to an increase in disease. Main sources of contaminant exposure include industrial waste, sewage discharge, agriculture, road run off and household and atmospheric depositions.

For further information on this topic go to: https://marine.gov.scot/sma/assessment/external-fish-disease

Results

Between 2010 and 2019 external fish disease was assessed in common dab from 16 sampling locations around Scotland which covered four biogeographic regions – Northern North Sea, Scottish Continental Shelf, Minches and Western Scotland, and Irish Sea (Clyde and Solway) (Figure 1). The number of sampling events per station varied from annual visits to every six years.

An annual average Fish Disease Index (FDI) was calculated for each biogeographic region based on the presence and severity of external fish disease observed. This was compared to OSPAR species specific Background Assessment Criteria (BAC) and Environmental Assessment Criteria (EAC). The BAC determines if observed fish disease is at background or elevated. Furthermore, EAC identifies if the degree of fish disease is causing significant harm. A FDI below the EAC indicates an acceptable health status.

In the Irish Sea (Clyde and Solway), the FDI was usually found to be above background but not of significant concern (Table 1). The FDI analysis only has considerable data for two sites and increasing the number of sites would increase confidence in the data. However, these preliminary results indicate that the health status of

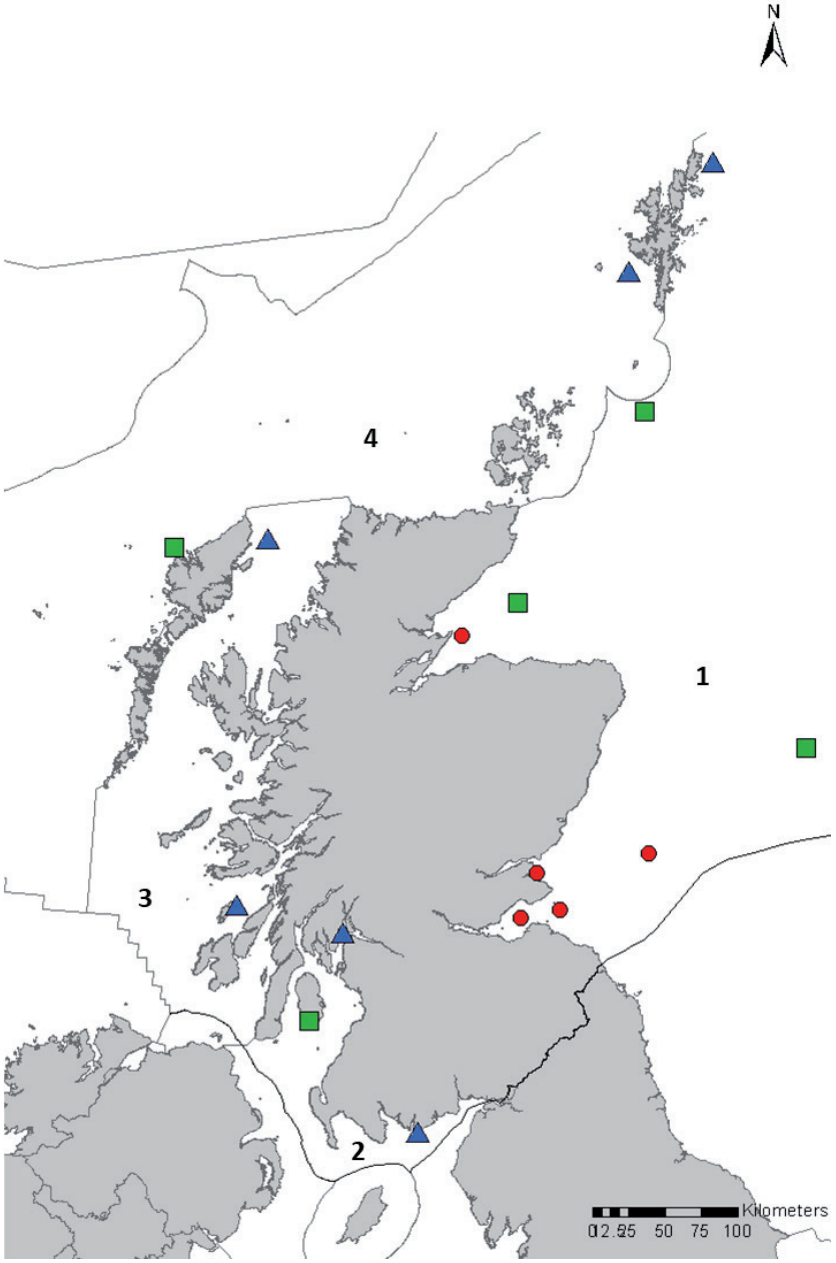


Figure 1: Sampling locations and most recent annual assessment status. Blue triangle = FDI below BAC. Green square = FDI greater than BAC but below EAC. Red circle = FDI exceeds EAC. BAC and EAC are general assessment criteria used across all regions for fair comparison. 1, Northern North Sea; 2, Irish Sea (Clyde and Solway); 3, Minches and Western Scotland; 4, Scottish Continental Shelf.

the populations of fish sampled in the Irish Sea (Clyde and Solway) was acceptable.

There were limited data available for an assessment of the Minches and Western Scotland. However, tentative results indicate that external fish disease was below background (Table 1).

In the Northern North Sea, the FDI status was above the EAC in three of the reporting years (2013, 2017 and 2019). In all other years, the FDI status was above background but below levels of significant concern (Table 1). An elevated level of disease has previously been reported in the Northern North Sea (Lang *et al.*, 2017) and the FDI results presented here are fairly typical for this area.

There were limited data available for an assessment of the Scottish Continental Shelf. However, tentative results signify that external fish disease was not at a level of concern, with one year below background and the other year below the EAC (Table 1).

There were no clear trends in the mean FDI of common dab observed at the biogeographic scale.

Biogeographic region	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Irish Sea (Clyde and Solway)	<EAC	<BAC	<EAC	-	-	<EAC	<EAC	<EAC	<EAC	<BAC
	(1)	(2)	(1)	(0)	(0)	(2)	(2)	(1)	(2)	(1)
Minches and Western Scotland	<BAC	<BAC	-	<BAC	-	-	-	-	<BAC	-
	(1)	(1)	(0)	(1)	(0)	(0)	(0)	(0)	(2)	(0)
Northern North Sea	<EAC	<EAC	<EAC	<EAC	<EAC	<EAC	<EAC	<EAC	<EAC	<EAC
	(4)	(3)	(2)	(3)	(3)	(3)	(3)	(2)	(3)	(5)
Scottish Continental Shelf	-	-	-	-	<BAC	-	-	-	-	<EAC
	(0)	(0)	(0)	(0)	(2)	(0)	(0)	(0)	(0)	(1)

Table 1: Fish Disease Index Status Assessment

Results of annual average Fish Disease Index analysis per biogeographic region with number of stations included in the assessment in brackets. Blue = FDI below BAC (<BAC). Green = FDI greater than BAC but below EAC (<EAC). Red, bold text = FDI exceeds EAC (>EAC). BAC and EAC are general assessment criteria used across all regions for fair comparison.

Conclusion

The Fish Disease Index analysis of common dab showed that the fish health status in the Irish Sea (Clyde and Solway), Scottish Continental Shelf and Minches and Western Scotland was satisfactory, although there were limited data for some areas. The level of disease observed in common dab in the Northern North Sea was acceptable in seven of the ten years assessed. However, in three years of the years assessed, the fish disease was elevated above a level that indicates significant harm. This is not unexpected for this area, and has previously been reported.

Fish health is complex with multiple contributing factors. The health status in common dab found in this assessment contrasts with the concentrations of hazardous substances. The contaminant assessments show that concentrations of contaminants in the Northern North Sea are acceptable indicating that the increase in fish disease in some years is not due to exposure to contaminants. Furthermore the Clyde, a highly industrialised and more contaminated area with higher concentrations of hazardous substances, had a low FDI indicating acceptable health status. There were no clear trends in the mean FDI of common dab observed at the biogeographic scale.

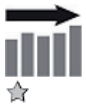
Knowledge gaps

There are a lack of data available in some Scottish biogeographic regions. To improve this, further monitoring stations are required in the Irish Sea (Clyde and Solway), Minches and Western Scotland, and Scottish Continental Shelf. Since there are only assessment criteria available for common dab, this further limits the available data, especially in areas like the Irish Sea (Clyde and Solway) where there are sufficient fishing sites for most other contaminant assessments. However, a different species of fish is currently sampled from these locations making them unsuitable for inclusion in the fish disease assessment.

Further work into the links between FDI and contaminant exposure would be useful as this assessment of fish health has contrasting conclusions to the other contaminant assessments. Inclusion of emerging contaminants would also be helpful as only a limited number of contaminants are monitored.

Status and trend assessment

This status and trend assessment is an overall assessment for Contaminants in sediment and biota (PAHs, PCBs, PBDEs and metals in sediment and biota) and Biological effects of contaminants.

Region assessed	Status with confidence	Trend with confidence	Commets
Irish sea (Clyde and Solway)			Green square with red triangle for status indicates few or no concerns as a whole, but many local concerns, particularly in the Clyde, with some sites exceeding the EAC/EAC-proxy. Two stars for confidence in the status is due to lack of suitable assessment criteria for some determinands (metals in biota and some biological effects measurements)
Minches and Western Scotland			Two stars for confidence in the status is due to lack of suitable assessment criteria for some determinands (metals in biota and some biological effects measurements). In addition there is limited fish sites which impacts on the ability to make biological effects assessments.
Northern North Sea			Two stars for confidence in the status is due to lack of suitable assessment criteria for some determinands (metals in biota and some biological effects measurements)
Scottish Continental Shelf			One star for confidence in the status is due to lack of suitable assessment criteria for some determinands (metals in biota and some biological effects measurements). In addition this region could not be assessed for all determinand/matrix combinations due to the lack of sites

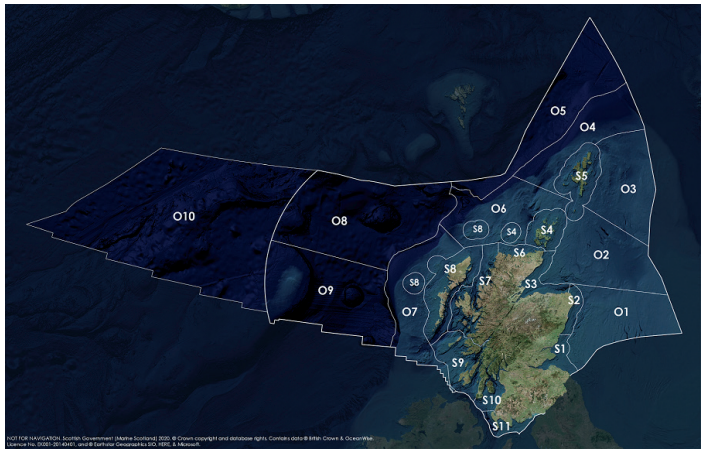
This status and trend assessment is an overall assessment for Contaminants in sediment and biota (PAHs, PCBs, PBDEs and metals in sediment and biota) and Biological effects of contaminants.

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	**Symbol**	**Confidence rating**
	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

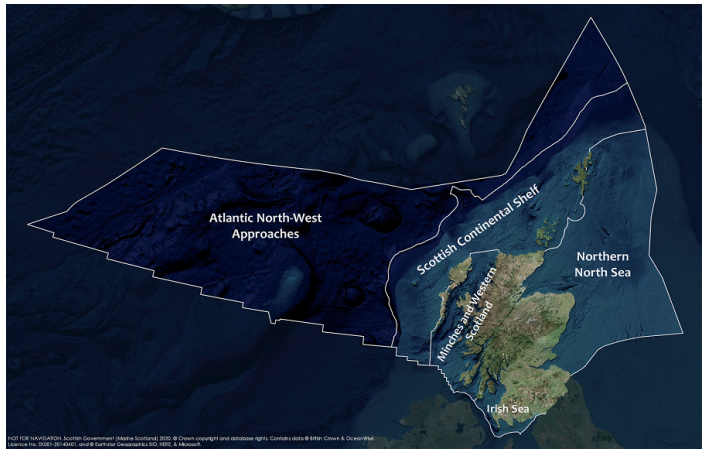
Overal confidence

Assessment regions

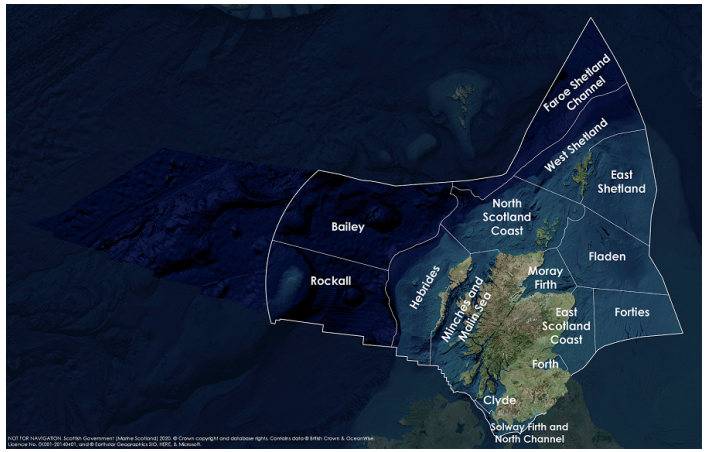


The Scottish Marine Regions (SMRs; S1 – S11) and the Scottish Offshore Marine Regions (OMRs, O1 – O10)

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.

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NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

JNCC
Joint Nature Conservation Committee

SEPA
Scottish Environment Protection Agency

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