EcoQO on imposex in dogwhelks[1]

Background

The Ecological Quality Issue is Benthic Communities. The EcoQ Element is Imposex in dogwhelks (*Nucella lapillus*) or other selected gastropods. The EcoQO is that: "The average level of imposex in a sample of not less than 10 female dogwhelks (*Nucella lapillus*) should be consistent with exposure to TBT concentrations below the environmental assessment criterion (EAC) for TBT – that is, <2.0, as measured by the Vas deferens Sequence Index, Where Nucella does not occur naturally, or where it has become extinct, the red whelk (*Neptunea antiqua*), the whelk (*Buccinum undatum*) or the netted dogwhelk (*Nassarius reticulatus*) should be used, with exposure criteria on the same index of <2.0, <0.3 and <0.3, respectively."

Has the EcoQO been met?

An assessment of the environmental status in relation to the EcoQO was prepared on the basis of data submitted by OSPAR Contracting Parties to ICES. Only time series with at least four years of data were used for the trend assessment and the fitted value for the last year of monitoring was used to assign an assessment class according to the JAMP TBT Assessment Classes (OSPAR agreement 2004-15). Data older than 5 years were excluded from the assessment. It was not possible to take the number of female gastropods in each sample into account, as this information is not consistently available from the ICES data base. OSPAR's Working Group on Trends, Concentrations and Effects of Substances in the Marine Environment (SIME) 2008 recommended that imposex data be submitted to ICES as individual observations (*e.g.* VSD) rather than summary statistics (*e.g.* VDSI).

The JAMP TBT Assessment Classes (OSPAR agreement 2004-15) relate the levels of imposex in the 5 key gastropod species monitored in the North Sea in a 6-class assessment scheme A-F. The EcoQO is met if assessment classes A and B are achieved.

Figure 8.1 provides an overview of the status in relation to the EcoQO in the North Sea. For colour presentation in the maps a colour code has been used for the different classes shown below. In this scheme, green indicates that the EcoQO is met. It should be taken into account that the EcoQO only applies to the species in the white columns. Significant trends are represented in Figure 8.1 by a triangle which indicates the direction of the trend. Spatial data assessed were for all sites monitored in the period 2000-2006.. Monitoring stations for which the times series were not included in the trend analysis (*i.e.* with less than 4 years) are represented in the map by a smaller symbol as illustrated in Figure 8.1 below. Similar presentations are made of data from Brittany (Figure 8.2) and Shetland (Sullom Voe, Figure 8.3).

[1] This evaluation is based upon the results of the 2007 CEMP Assessment (OSPAR 2007), including data up to 2007. An updated assessment has been published in OSPAR Publication 2009/390.

Assessment class	*Nucella* VDSI	*Nassarius* VDSI	*Buccinum* PCI	*Neptunea* VDSI	*Littorina* ISI
A	< 0.3			< 0.3	
B	0.3 - <2.0	< 0.3	< 0.3	0.3 - <2.0	
C	2.0 - < 4.0	0.3 - <2.0	0.3 - <2.0	2.0 - <4.0	< 0.3
D	4.0 - 5.0	2.0 – 3.5	2.0 - <3.5	4	0.3 - < 0.5
E	>5.0	> 3.5	3.5		0.5 - 1.2
F					> 1.2

This assessment shows that, with the exception of a limited number of locations, the EcoQO has not been met in the North Sea area, particularly in the vicinity of major ports, shipping lanes and shipyards (this is to be reviewed after a more elaborate assessment with more data). A significant trend is found at 28 stations, with 24 stations having a general downward trend indicating that the situation in general is improving. However, the area still suffers from the consequences of historic inputs related to shipping activities as is confirmed by the levels of TBT that are still found in sediments. The relative absence of positive trends indicates that only a limited input still remains, linked to very local situations.

The 2008-2009 assessment will seek to develop this approach to provide a clearer explanation of the situation in key regions.

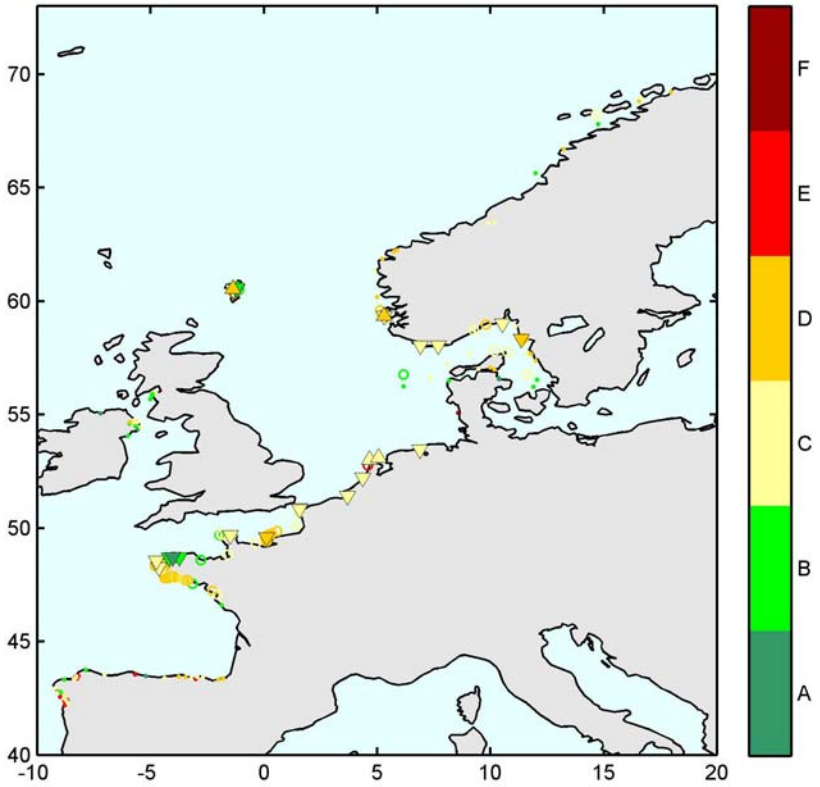

Figure 8.1: *Overview map showing stations where the EcoQO is met (green – classes A and B, trends (upward trends – upward triangles; downward trends – downward triangles; circles – no significant trend)*

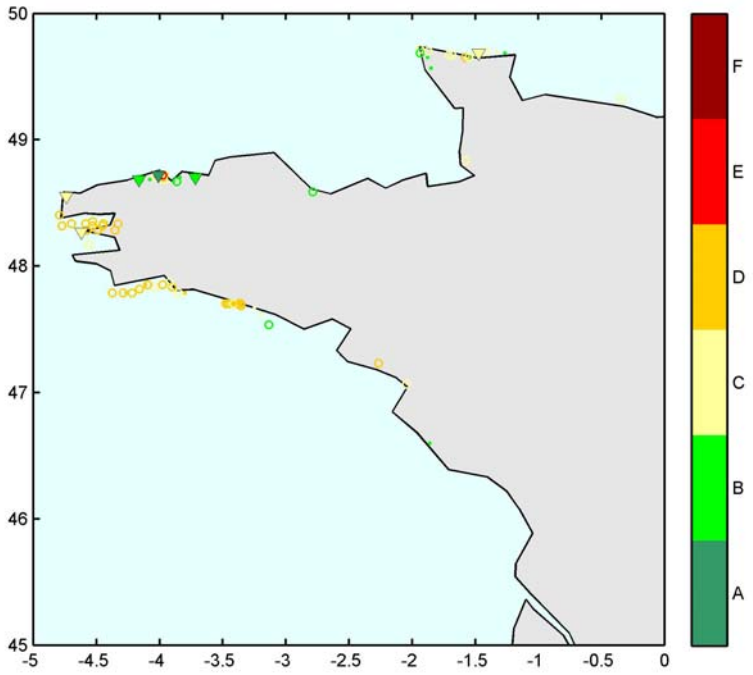

Figure 8.2: *Overview map of EcoOQ status in Brittany (Stations to the south of Brittany are not in the greater North Sea)*

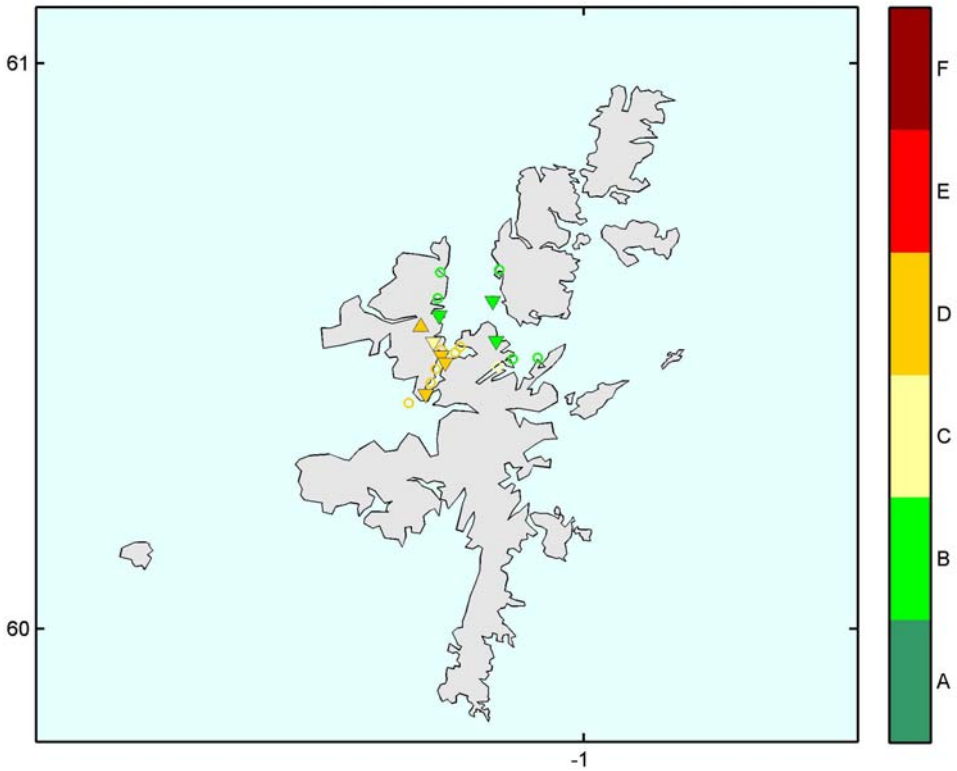

Figure 8.3: *Overview map of EcoOQ status in Shetland*

Consequences of failing to meet the EcoQO

The EcoQ is intended to provide a basis for monitoring the level of TBT in the environment after implementation of the following measures:

a. restrictions on the marketing and use of organic tin compounds as antifouling under Directive 1999/51/EC of the Commission of 26 May 1999 adapting to technical progress for the fifth time Annex I to Council Directive 76/769/EEC;

b. *International Convention on the Control of Harmful Anti-fouling Systems on Ships* (*AFS Convention*) adopted on 5 October 2001 which bans the application of TBT based anti-fouling paints by 1 January 2003 and a ban on the presence of TBT on ships' hulls by 1 January 2008;

c. EC Community Regulation, (Regulation (EC) No 782/2003) implementing the AFS Convention within the EU;

d. PARCOM Recommendations 87/1 on the Use of Tributyl-Tin Compounds and PARCOM Recommendation 88/1 on Measures to Reduce Organotin Compounds Reaching the Aquatic Environment through Docking Activities.

Given the comprehensive nature of these measures in addressing sources of TBT in the marine environment, any failure to meet the EcoQO indicates the need for the further implementation of the agreed measures. Therefore the progress made in implementing the key measures (AFS and Regulation 782/2003) should also be taken into account. In the immediate future status in relation to the EcoQO should be assessed on a regular basis to check the progress being made and the effectiveness of the measures. However, there should be an analysis of the need to urge improved implementation of the existing measures or the adoption of additional measures.

Suitability of present monitoring and reporting

Monitoring in relation to the EcoQO on imposex in dogwhelks and other gastropods is a mandatory commitment of Contracting Parties under the CEMP and should be carried out in accordance with technical Annex 3 of the JAMP Guidelines for contaminant specific biological effects monitoring (Agreement 2008-9) in the gastropod species *Nucella lapillus, Nassarius reticulata, Buccinum undatum* and *Neptunea antiqua*. The monitoring provides the basis for the assessment reported under section 2. Data resulting from this monitoring is reported to the ICES data centre.

The table below presents an overview of the monitoring being carried out by Contracting Parties in relation to this EcoQO in the North Sea based on information reported by Contracting Parties to OSPAR.

Contracting Party	Number of locations monitored								Remarks
	2004		2005		2006		2007		
	Temporal	Spatial	Temporal	Spatial	Temporal	Spatial	Temporal	Spatial	
Belgium					3	3	tbc	tbc	Littorina
Denmark	13	13	14	0	0	0	4	4	
France	117	117	0	113	91	91	tbc	tbc	Snails
Germany			6	6	4	4	tbc	tbc	
Netherlands	0	6	0	7	0	7	7	0	
Norway	9	13	8	0	8	22	22	9	Snails
Sweden	0	15	0	0					Dogwhelks
UK					[46]	[46]	53	75	

Note: Not all stations monitored by France, Norway and the UK are in OSPAR Region II

As with other aspects of monitoring under the Coordinated Environmental Monitoring Programme (CEMP) there is currently no specific guidance on the spatial intensity of monitoring although the JAMP monitoring guidelines include recommendations for monitoring:

a. in the vicinity of point sources (marinas/shipyards/offshore installations/harbours);

b. in shipping lanes. The following shipping lanes are suggested in the North Sea (Strait of Dover, German Bight - Texel T.S.S; Off Ushant Island (North-west France); Pentland Firth and the Skagerrak;

c. as part of a regional TBT survey.

To be consistent with the level of specification of monitoring for the other EcoQOs, it is recommended that a set of stations for time trend monitoring of imposex and other TBT-related effects in gastropods should be defined (taking into account the station dictionary for the CEMP).

Developments in harmonisation of monitoring and reporting schemes

The arrangements for monitoring under the CEMP seek to ensure that monitoring and reporting is fully harmonised. OSPAR has adopted provisional assessment criteria for TBT-specific biological effects which have already been mentioned above and can be found in OSPAR agreement number 2004-15.

Costs of present monitoring and reporting

Given that the monitoring of TBT-specific effects has become mandatory under the CEMP since 2003, there should be no additional cost for implementing the monitoring required for this EcoQO. Assessments under the current CEMP should allow determination whether the EcoQO is met or not. However, if the monitoring frequency is increased, if the current monitoring is extended to include other relevant species occurring at different locations (*e.g.* inshore – offshore) and/or if sample sizes and the number of sites sampled are increased, then costs will rise accordingly.

Extra costs of harmonising the monitoring

The tools needed for harmonising monitoring are already in place (monitoring guidelines, quality assurance procedures and assessment tools).

Performance of the EcoQO

The cause-effect relationship between the presence of TBT and imposex in dog whelks is clear and direct. The toxicological effects of TBT on gastropods occur at very low concentrations in seawater, below the levels that can be routinely measured by most laboratories. The technical evaluation in relation to the ICES criteria for a good EcoQO is as follows *(adapted from ICES, 2004a):*

ICES criteria	Comments	
Relatively easy to understand by non-scientists and those who will decide on their use	Usually	Dogwhelks are very sensitive to TBT. A number of scientific reports documenting this are available
Sensitive to a manageable human activity	Usually	Several documented cases of a recovery in dogwhelk populations after the decrease in the use of TBT
Relatively tightly linked in time to that activity	Usually	Detection of change after a decrease in the use of TBT should be less than 10 years
Easily and accurately measured, with a low error rate	Usually	There is a standard method (VDSI). Refere to interlaboratory variation in QUASIMEME
Responsive primarily to a human activity, with low responsiveness to other causes of change	Usually	There is a clear cause-effect relationship between the presence of TBT and imposex in dogwhelks
Measurable over a large proportion of the area to which the EcoQ metric is to apply	Usually or occasionally	Dogwhelks are widely distributed in the North Sea area, but only on rocky substrates and predominantly intertidally
Based on an existing body or time series of data to allow a realistic setting of objectives	Usually	Data exist from "pristine areas" where TBT concentrations are zero or almost zero

Specific linkages with the MSFD

In the context of the initial assessment under the MSFD, this EcoQO is able to provide an indication of the environmental quality status with regard to inputs of a synthetic chemical giving rise to concern (*i.e.* TBT).

The EcoQO provides an indicator and an environmental target in relation to the GES conceptual descriptor: "concentrations of contaminants are at levels not giving rise to pollution effects".

In terms of programmes and measures the EcoQO is a means of measuring the effectiveness of measures addressing the marketing and use of TBT, including EC Community Regulation, (Regulation (EC) No 782/2003) implementing the AFS in the EU.

Gaps in knowledge

Presently there is still a lack of data to come to an elaborate assessment of the situation in the North Sea. Also, most time series are not long enough to assess the evolution for the entire area; the monitoring of TBT-specific biological effects has only become mandatory in 2003. It will take a while for monitoring to be properly established and to solve the above shortcomings. No immediate action is therefore necessary.

Effectiveness of communication

Imposex/intersex effects in gastropods are one of the most vivid effects of hazardous substances measured in the marine environment and provide an effective and eyebrow raising topic on which to engage interest among stakeholders and the wider public interested in the marine environment. There is a need to ensure that the reporting of status in relation to the range of measurements that can be made in relation to TBT-specific biological effects is as harmonised as possible to ensure effective communication and to ensure that any assessment is backed up by solid science.

Whether the status of the EcoQO should be target, limit or indicator

The EcoQO provides a limit above which undesirable or even irreversible effects to living organisms may occur, however given the current general status in relation to the EcoQO it is also possible to interpret the objective as a target *i.e.* a goal to be met in the future, although one currently without a timeframe. Additionally, it can be used as an indicator for the status of the area.

There are no proposals for revision of the EcoQO.

Proposals for possible milestones up to the achievement of the objective

Given the limited timeframe in which the measures have been taken and the fact that monitoring has only recently started, a sensible evaluation of the situation and hence the prediction of milestones, will only become possible at a later date.

Potential applicability of the EcoQO in other OSPAR regions

Under the CEMP, monitoring in relation to TBT-specific biological effects in gastropods is carried out throughout the OSPAR maritime area in coastal regions and the data that have been reported to ICES have been assessed as part of the 2006/2007 CEMP assessment. Some Contracting Parties that have carried out monitoring have not reported the data to ICES (*e.g.* Iceland, Portugal). The JAMP assessment classes for TBT-specific biological effects, on which the EcoQO is based, are intended to provide a means of harmonising the results from monitoring of TBT-specific effects found in different gastropods across the OSPAR maritime area. The EcoQO is suitable for application in the OSPAR regions beyond the North Sea.

Reference

OSPAR (2007). 2006/2007 CEMP assessment. Trends and concentrations of selected hazardous substances in the marine environment. Publication No. 2007/330.

➥*Go to full QSR assessment report on the evaluation of the OSPAR system of Ecological Quality Objectives for the North Sea (publication number 406/2009 (update 2010))*