

6.4.1* Danish request regarding real-time monitoring for sandeel in Divisions 4b and 4c, SA 1 (Central and South North Sea, Dogger Bank)

Advice summary

ICES reviewed the approach for real-time monitoring (RTM) proposed in the request from Denmark and considers that the method is suitable for monitoring sandeel abundance and for setting an in-year TAC for sandeel area (SA) 1.

Request

Request from Denmark to ICES regarding Real Time Monitoring of Area 1 sandeel for 2016.

Information on the 2015 sandeel year-class in Sandeel Area 1 from the Danish dredge survey conducted in November - December 2015 indicates that it is the lowest observed in the time series (2004-2015). ICES stock annex for Area 1 Sandeel suggests real time monitoring where the dredge survey result is outside the bounds of the current observations. In accordance with this, the Danish Ministry of Environment and Food is proposing that the TAC be based on the results of a real-time monitoring in 2016. The proposed real-time monitoring is slightly modified compared to the method used in 2012. The basic methodology has previously been evaluated by CES ("Sandeel real-time monitoring assessment", Special request, Advice May 2012) where ICES considered that the method is suitable for monitoring Sandeel in Area 1. The new proposed method includes an additional option for a more timely response for implementing the TAC. This is described in the attached document[†].

ICES is requested to;

- i. review the real-time monitoring approach described in the attached document, and*
- ii. advise on the suitability of the approach.*

Elaboration on the advice

The methodology suggested by Denmark is similar to the method previously evaluated by ICES (ICES, 2012) where it was noted that the correlation between catch rates in the early part of the season and assessed stock abundance was good for the sandeel area (SA) 1. The updated method shows the same good correlation but is based on 15 years of observations of catch rates, during which time there has been a very large variation in age 1 numbers. Therefore, previous concerns about year selection in developing a suitable regression are likely resolved.

The relationship (i.e. TAC-setting rule) between observed catch per unit of effort (CPUE) of age 1 in the early 2016 fishery and final TAC is derived in accordance with the default ICES escapement strategy for short-lived species. Provided sufficient data (catch and biological samples) from the early 2016 fishery are available, the suggested TAC-setting procedure is considered suitable for management purposes.

The equation for the 2016 TAC-setting rule is[‡]:

$$\begin{aligned} \text{TAC} &= -22.35 + 11.70 \times \text{CPUE} - 0.58 \times \text{CPUE} \times \text{CPUE}, \quad \text{for CPUE} \leq 10 \\ \text{TAC} &= 37, \quad \text{for CPUE} > 10 \end{aligned}$$

Where "TAC" is TAC in thousand tonnes calculated on the basis of the RTM 2016, and "CPUE" is the observed CPUE (million per day) of age group 1 from the fishery in the period 15 April to 6 May. The TAC cannot exceed 37 thousand tonnes[§].

* Version 3; section number corrected

[†] See Vinther and Rindorf, 2016.

[‡] Version 2; formula corrected.

[§] Version 2; value corrected.

If this TAC-setting rule is to be used in the future, the relationship between CPUE and TAC would need to be recalculated each year with updated data.

Basis of the advice

Background

In 2012, at the request of Denmark, ICES provided advice on an approach for real-time monitoring of the sandeel abundance in Sandeel Area 1 (ICES, 2012). ICES considered that the proposed method was suitable for monitoring sandeel abundance. The present request from Denmark is similar to the 2012 request; however, the method for ICES to review is extended with an option to provide TAC advice through a TAC-setting procedure that sets a TAC from the observed catch rates of age 1 sandeel in the early 2016 fishery. This allows for a more responsive management procedure. The updated method, documented in “Real time Monitoring of SA 1 Sandeel” (Vinther and Rindorf, 2016), was reviewed by ICES.

Results and conclusions

ICES reviewed the proposed methodology to estimate sandeel abundance through real-time monitoring (RTM) in the commercial fishery in Sandeel Area 1. The aim of RTM of sandeel is to use observations of catch per unit effort (CPUE) from the commercial fishery in the period 15 April to 6 May 2016 in the estimation of stock abundance. The method extends the default ICES assessment with an additional tuning series of the observed CPUE from the Danish fishery, observed 15 April to 6 May in the period 2001–2015. The updated RTM assessment shows that this CPUE time-series was in good agreement with the standard ICES assessment. The RTM assessment produces very similar, although slightly more conservative, outputs for age 0 and age 1 sandeel when compared with the default ICES assessment.

Results from a series of assessments were used to build a relation between CPUE and TAC, using scenario values for age 1 CPUE in 2016 within the historical range, followed by forecasts using the default escapement strategy. The scenario CPUEs and TACs are fitted to a quadratic equation, which can be used to set the TAC from the CPUE of age 1 sandeel observed in the early fishery of 2016. Figure 6.4.1.1 summarizes the results used for determining the equation for setting the TAC.

The decrease in calculated TAC for RTM CPUE is larger than 10 million per fishing day (Figure 6.4.1.1). This is due to the uncertainty of high CPUE values in the historical data, used to establish the relationship between TAC and CPUE, is much higher (CV of 0.63) than for those with low CPUE (CV of 0.38). The dredge survey index, on the other hand, has more stable estimates of uncertainty. The high CPUE values are thus given a much lower weight in arriving at model estimates. As a result, at high RTM CPUE (>10 million per fishing day), the stock estimates are determined primarily by the dredge survey index, and the stock estimate and calculated TAC 2016 become similar to the assessment and advice derived from the default ICES methods for this stock.**

A sensitivity analysis showed that the ability to predict the stock size from RTM data depends very much on the proportion of the total annual catch that is included in the historical RTM time-series. A longer historical RTM period will therefore better predict the stock size than a short RTM period. In general, a longer RTM period gives higher TAC estimates for a given RTM CPUE value because the uncertainty of RTM CPUE values is reduced with the length of the RTM period. This gives more weight to the RTM CPUE in the estimation process and results in a different relationship between RTM CPUE and TAC.**

In the ICES advice released on 22 February 2016, the relationship between the TAC and observed CPUE in the RTM was based on historical data that included observations outside the intended RTM period of 15 April to 6 May. This longer time-series resulted in a better fit of the RTM data in the assessment model, such that the predicted increase in stock size and TAC by increasing CPUE was higher than in the present advice.**

** Version 2; paragraph added.

ICES considered that the proposed method is suitable for monitoring sandeel abundance and setting a TAC, provided that the amount of fishery data collected are sufficient (ICES, 2012) to deliver a reliable index of stock abundance.

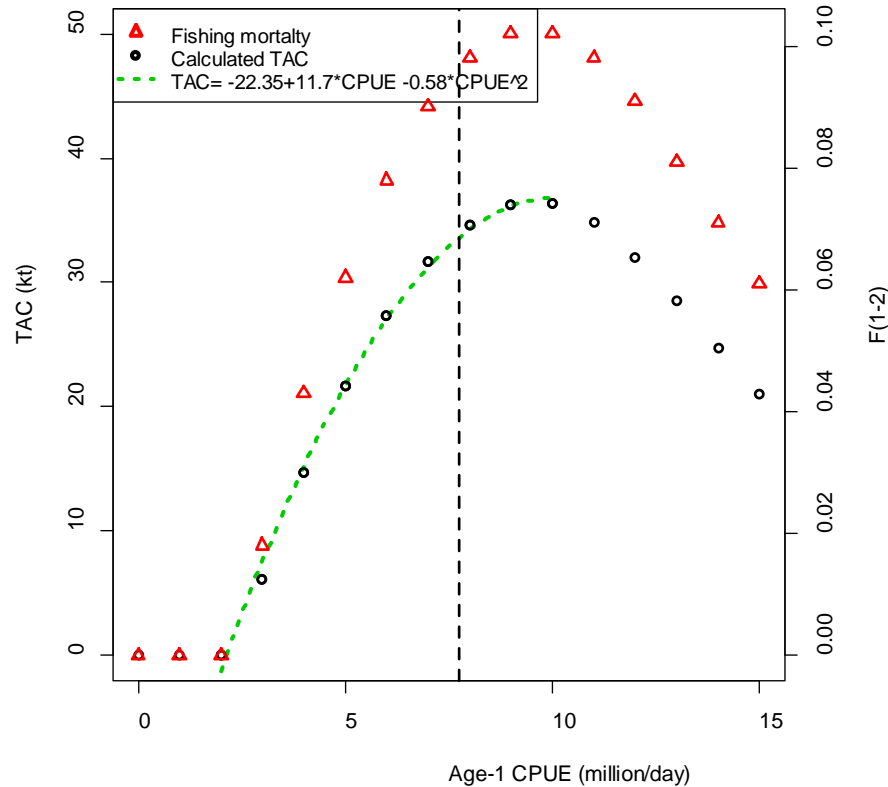


Figure 6.4.1.1**** TAC in 2016 as a function of CPUE of age 1 sandeel from the 2016 RTM fishery in the period 15 April to 6 May 2016. The black circles show the calculated TAC on the basis of an assessment with CPUE as given by the x-axis, and a forecast F (red triangles) is derived from the escapement strategy without constraints on F. The green dotted line shows the advised TAC from the forecast for CPUE less than 10 million per fishing day, calculated from the equation shown in the legend box. Advised TAC is 37 kt for CPUE larger than 10 million per fishing day. The black vertical line shows the average CPUE (7.7 million per fishing day) for the period 2001–2015.

Sources and references

ICES. 2012. Special request on sandeel real-time monitoring assessment. *In* Report of the ICES Advisory Committee, 2012. ICES Advice 2012, Book 6, Section 6.3.3.1. 7 pp.

Vinther, M., and Rindorf, A. 2016. Real Time Monitoring of SA 1 Sandeel. ICES CM 2016/ACOM:50. 14 pp.

** Version 2; figure updated.

†† Version3; figure number corrected