ECOREGION North Sea
SUBJECT EU request on changing the TAC year for Norway pout in the North Sea

Advice summary

ICES advises that an escapement strategy based on an escapement biomass of 150 kt, modified to include a minimum TAC higher than zero and a ceiling on the TAC, and with a TAC year from 1 November to 31 October, is in accordance with the precautionary approach and leads to sustainable yields, under the following conditions:

The minimum TAC should not exceed 20 kt. The harvest control rule requires a ceiling on F (to be applied when the TAC is set higher than the minimum TAC) in order to be precautionary. If the ceiling for the TAC is set at 200 kt, then the ceiling on F should be no higher than 0.6. If the ceiling for the TAC is set at 100 kt, then the ceiling on F should be no higher than 0.8.

Moving the TAC year to 1 November–31 October, based on annual advice in October, is considered to have limited influence on long-term yield, stock sizes, and probability of low stock biomass.

Request

In 2012, the EU and Norway submitted a request to ICES to evaluate various measures for the management of Norway pout. ICES responded to this request in October 2012.

The first option that ICES evaluated was a management strategy based on the existing ICES escapement strategy for Norway pout (catch should not exceed an amount that allows stock biomass to be above 150 000 tonnes at the beginning of the following year), modified to include absolute constraints on the annual TAC (a minimum TAC higher than zero and a ceiling on the TAC).

For this management strategy, ICES evaluated only the option whereby the September assessment is used for the TAC for the next calendar year (with an in-year update in May, but not in September). It was noted that this option, where the TAC for quarter 4 is set from the May assessment without knowing the recruitment indices from the third quarter, is less robust than the alternative, which has an additional in-year update in September.

In the light of this, ICES is asked to again evaluate a management strategy based on the existing ICES escapement strategy, but where the TAC year is changed to 1 November – 31 October rather than 1 January – 31 December. In this case, the TAC for quarter 4 and for quarters 1 to 3 of the following year would be fixed on the basis of the September assessment, with no update in May.

Elaboration on the advice

After discussion with the EC, ICES has interpreted that the request is to evaluate the management strategy based on the existing ICES escapement strategy for the Norway pout stock, including a minimum TAC higher than zero and a ceiling on the TAC. This corresponds to Management Strategy 1 of the ICES advice (ICES, 2012). The present request moves the TAC year from 1 January–31 December to 1 November–31 October. There will be a single annual advice in October.

ICES has evaluated the performance of the harvest control rule (HCR) in relation to its conformity with the precautionary approach. The probability of SSB being below B_{lim} was considered in the short term (for each of the years 2013–2017) and in the long term (for the years 2018–2027). Probability values in the short term are highly influenced by the population state, which is estimated to be high at present due to the very strong incoming recruitment observed in 2012. This leads to low short-term probabilities of SSB being below B_{lim}. Probability values in the long term are strongly dependent on assumptions about future recruitment, which have been based on historically observed recruitments (assuming a stock–recruitment relationship with deviations around it).

For the HCR to be in accordance with the precautionary approach, the minimum TAC should not exceed 20 kt. A ceiling on the TAC can be set at levels up to around 200 kt. Simulations show that such a high TAC ceiling requires an additional ceiling on F in order to be precautionary. The ceiling on F would apply when the TAC is set above the minimum TAC of 20 kt and should be around 0.6 for an HCR if a TAC ceiling is set at 200 kt, or up to 0.8 if a TAC ceiling at 100 kt is chosen. Median long-term yield is almost the same for the two options.

Avoiding low stock biomass could also be achieved through effort management (instead of a ceiling on F in the HCR). This would require ensuring that standardized fishing effort stays within the range of values observed in the last decade, when fishing mortality has not exceeded 0.6. This is considered a less robust alternative than having a ceiling on F as part of the HCR (for example, concerning issues linked to technological creep).

Basis of the advice

Background

In 2012 ICES evaluated three management strategies with a minimum TAC (ICES, 2012):

1) Escapement strategy with a minimum TAC >0 and a maximum TAC (with advice in June and October). It was found that a minimum TAC up to 27 kt and a maximum TAC in the range of 100–250 kt would be long-term sustainable.
2) A fixed initial TAC for the first six months of the year followed by a later update for the second half of the year, such that the TAC for the whole year is set based on a fixed F (with only one yearly advice in June). It was found that an initial TAC between 25 kt and 50 kt and a fixed F = 0.35 (corresponding to a median catch of 60 kt) would be long-term sustainable.
3) Similar to management strategy 2, but with the within-year assessment and advice (in June) based on the escapement strategy. It was found that this strategy, with an initial TAC of up to 50 kt for the first six months of the year, would be long-term sustainable.

A main constraint required for any of these options to be precautionary was that future fishing mortality should not significantly exceed the range of values observed in the last decade. Values for the ceiling on F larger than 0.6 lead to an increased probability of a low stock biomass for several of the management strategies configurations tested here.

The new request is based on Management Strategy 1 in the 2012 request, shifting the TAC year to 1 November–31 October and having a single annual advice in October.

This request specifies that the TAC should be set in accordance with the ICES escapement strategy, which targets an SSB at spawning time (1 January) above the MSY $B_{escapement}$ after the fishery has taken place. By having a TAC year that does not align to the annual life-cycle of the species, the default ICES escapement strategy cannot be used. ICES considers that the escapement strategy under these conditions should aim at having SSB above MSY $B_{escapement}$ at spawning time (1 January) after the TAC year. To align this with the TAC year, a preliminary assumption in the evaluation is that there are no catches for the period 1 November–31 December immediately after the TAC year. The actual advice for the two months following the TAC year is part of the annual advice given for the following year.

For practical reasons, the actual evaluation done by ICES uses a quarterly-based assessment (1 October–30 September; quarter 4 and quarters 1–3), which does not comply fully with the requested TAC year (1 November–31 October). This is considered sufficient to show that the suggested shift in TAC year has very limited influence on long-term yield, stock biomass, and the probability of the stock biomass being below B_{lim}.

Results

Figures 6.3.5.1.1–6.3.5.1.3 and Figure 6.3.5.1.5 show results for different options for the minimum TAC and the ceilings on the TAC and F. In each figure, two of these quantities are fixed and the figure shows results under different values of the third quantity (horizontal axis of the figure). All figures display the probability that SSB will be below B_{lim} in each of the years 2014–2017 and in the long term (years 2018–2027). Options for which these probabilities are less than 0.05 in all years are considered precautionary, as recommended by ICES (2013).

Given a TAC ceiling at 200 kt and a ceiling on F at 0.6, the performance of the different options is robust to the choice of minimum TAC (Figure 6.3.5.1.1). Considering minimum TACs in the range 0–50 kt, the probability of SSB being below B_{lim} is in the range 0–0.12. For a minimum TAC of around 20 kt, the probability of SSB being below B_{lim} in the long term (2018–2027) is estimated to be approximately 0.05.

Given a minimum TAC at 20 kt and a ceiling on F at 0.6, the actual choice of the TAC ceiling affects the long-term probability of SSB being below B_{lim} very little and is less than 0.05 for the range 50–250 kt TAC ceiling (Figure 6.3.5.1.2). The highest median long-term yield is obtained with a TAC ceiling at around 150 kt. Changing the TAC ceiling to this 150 kt has little influence on the minimum TAC of 20 kt (comparing Figures 6.3.5.1.1 and 6.3.5.1.3).

Figure 6.3.5.1.4 shows the long-term distributions of SSB, yield, and F, under a ceiling on F at 0.6. The left- and right-hand sides of the figure correspond to a ceiling on the TAC of 100 kt and 200 kt, respectively. A higher long-term yield is obtained with a high (200 kt) TAC ceiling compared to yield with a TAC ceiling at 100 kt. The annual F (and effort)

is, however, much more variable when a high TAC ceiling is applied. With a TAC ceiling at 100 kt, less than 5% of the simulations are restricted by the F ceiling, while the F ceiling is reached in around 35% of the cases when the 200 kt TAC ceiling is applied. This high percentage emphasizes that the 200 kt option is very sensitive to the assumption of an F ceiling, while the 100 kt TAC ceiling option is robust. Having a TAC ceiling at 200 kt will therefore rely heavily on the assumption on a ceiling in realized F.

Figures 6.3.5.1.1–6.3.5.1.4 all assume that there is insufficient effort to generate an F higher than 0.6, even in the years when the TAC would be set at the minimum of 20 kt. In these figures, the ceiling on F (0.6) is applied to the actual realized F and not as part of the harvest control rule. This means that effort is implicitly assumed not to exceed the level of the last decade, based on the strong relationship observed between effort and F. As a more robust option, the HCR could include a ceiling in both F and the TAC, where the ceiling in F is not applied in the years when the TAC is set at the minimum of 20 kt. With an F ceiling in the HCR, a TAC ceiling at 200 kt results in a probability of SSB being below B_{lim} less than 0.05 if the F ceiling is less than 0.6 (Figure 6.3.5.1.5). With a TAC ceiling at 100 kt, the F ceiling in the HCR should not exceed 0.8 (not shown in the figure).

Methods

A management strategy evaluation (MSE) analysis was conducted to investigate the properties of the proposed management strategy (Vinther and Nielsen, 2013). The analysis was based on settings very similar to the ICES assessment from September 2012, with a quarterly time-step, but was implemented with a different assessment model (SMS) which allows uncertainty in the outputs to be quantified. This leads to only minor differences with the ICES assessment. The internal SMS population structure is used to project the population forward, under application of different management strategies. Forward simulations use historical averages of weights-at-age and exploitation patterns by age and quarter. Future recruitments are generated stochastically around a hockey-stick, with inflection point at B_{lim}, fit to the historically observed stock–recruitment values. The stochastic distribution is Normal (in logarithmic scale), constrained to deliver values within 2 standard deviations, to better match the observed recruitments. Assessment errors were included in the MSE loop by generating a perceived population stochastically around the true population. The simulations start in 2013 and no implementation error was assumed. However, when catching the TAC would lead to an annual F in excess of 0.6 (split into F = 0.28 for the quarter 4 of the year and F = 0.32 for quarters 1–3), this value is imposed as an F ceiling and the full TAC is not taken. The situation where a ceiling on F is imposed directly as part of the harvest control rule, instead of on the realized F, was also tested.

The MSE uses quarterly time steps which do not align with the suggested TAC year, 1 November–31 October. It was not possible to change the quarterly time steps used by the software so the implemented TAC year in the simulations was actually 1 October–30 September.

Sources

ICES. 2012. Joint EU–Norway request on management measures for Norway pout. *In* Report of the ICES Advisory Committee, 2012, Section 6.3.3.3. ICES Advice, 2012, Book 6: 19–25.

ICES. 2013. Report of the Workshop on Guidelines for Management Strategy Evaluations (WKGMSE), 21–23 January 2013, ICES HQ, Copenhagen, Denmark. ICES CM 2013/ACOM:39. 127 pp.

Vinther, M., and Nielsen, J. R. 2013. Evaluations of management strategies for Norway pout in the North Sea and Skagerrak. ICES CM 2013/ACOM: 66.

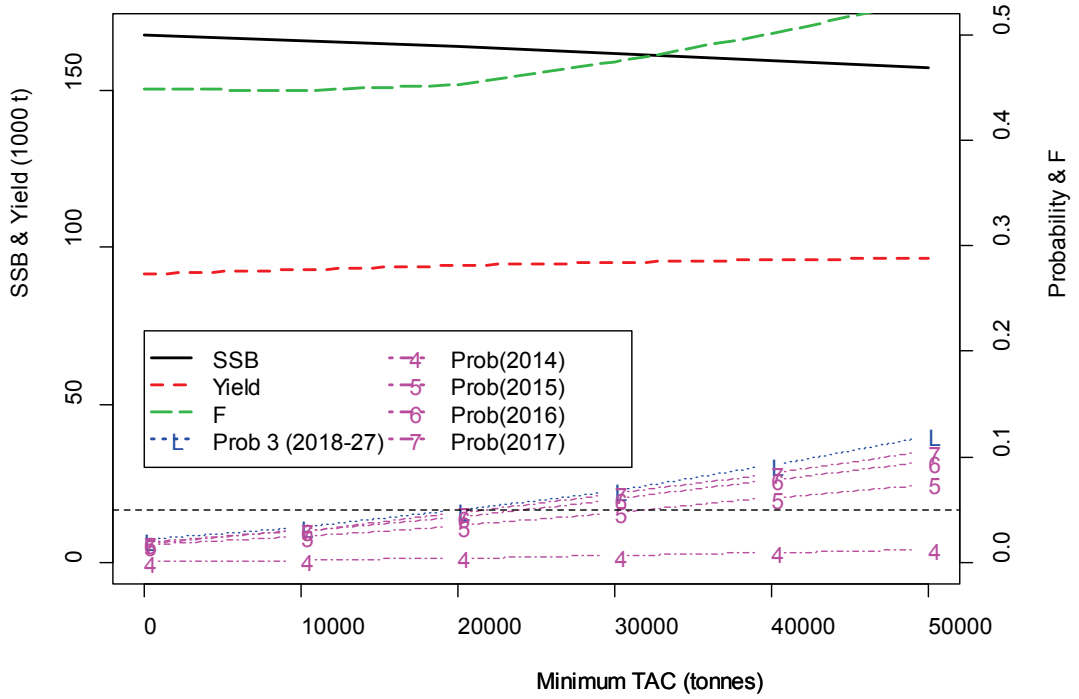

Figure 6.3.5.1.1 Sensitivity to minimum TAC (horizontal axis), assuming the TAC ceiling is fixed to 200 kt, and realised F assumed not to exceed 0.6. The graph shows the median values of SSB, yield, and F in the years 2018–2027 from 10 000 iterations for each value of minimum TAC shown on the horizontal axis. The probabilities (Prob) of SSB being below B_{lim} are shown for individual years and a long-term period.

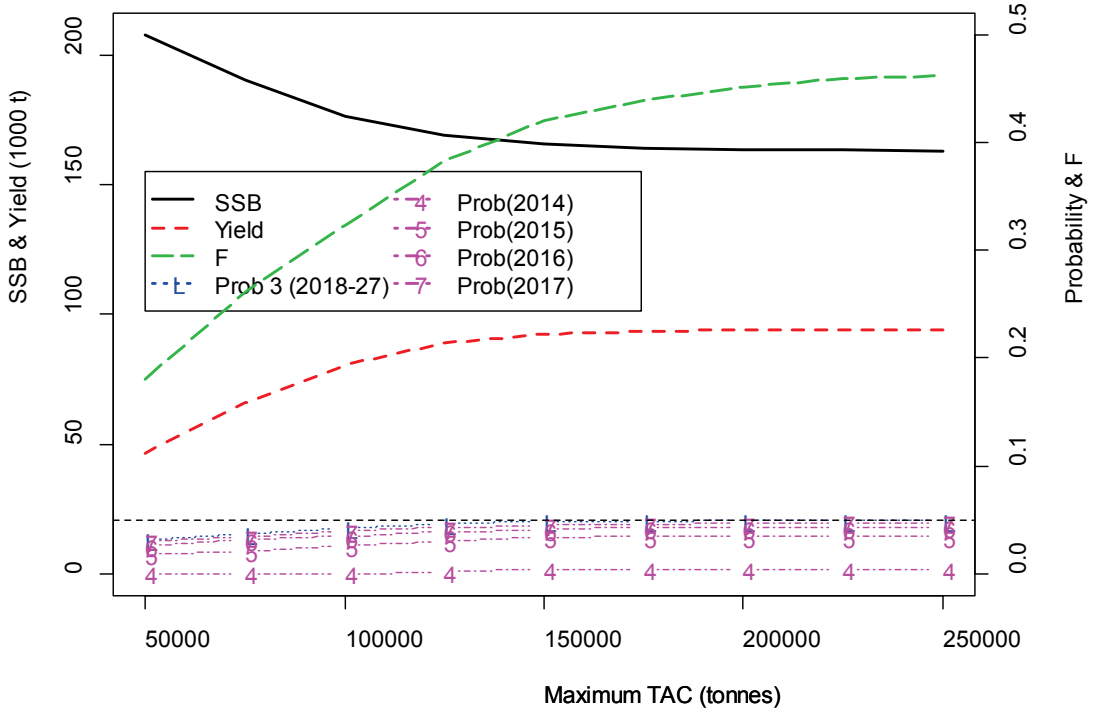

Figure 6.3.5.1.2 Sensitivity to TAC ceiling (horizontal axis), assuming the minimum TAC is fixed at 20 kt, and realised F assumed not to exceed 0.6. The graph shows the median values of SSB, yield, and F in the years 2018–2027 from 10 000 iterations for each value of minimum TAC shown on the horizontal axis. The probabilities (Prob) of SSB being below B_{lim} are shown for individual years and a long-term period.

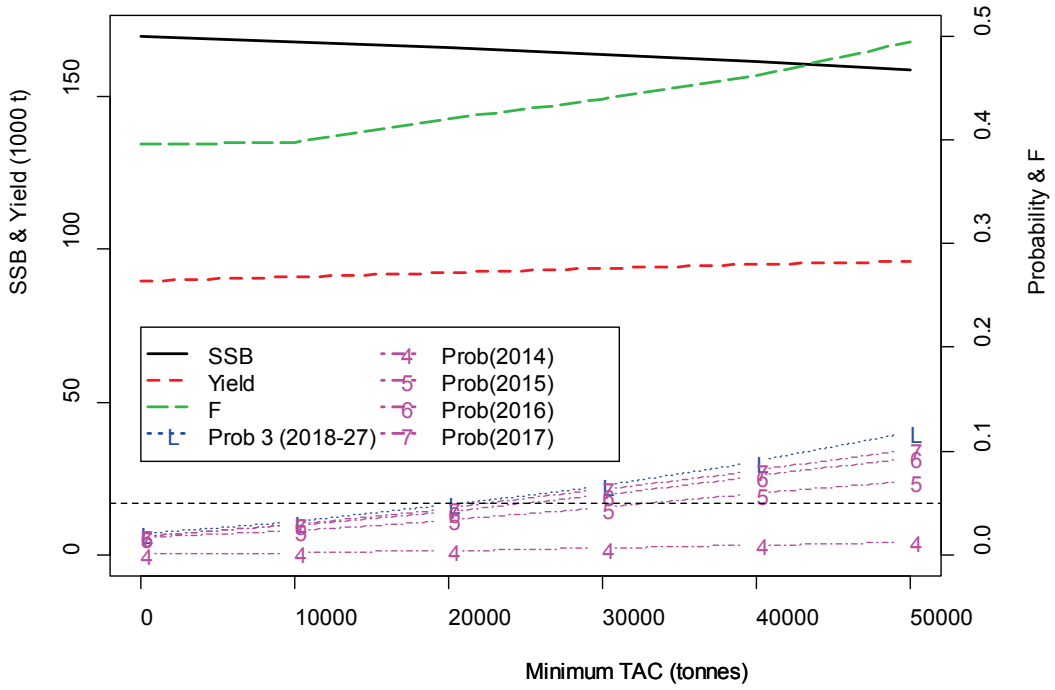

Figure 6.3.5.1.3 Sensitivity to Minimum TAC (horizontal axis), assuming the TAC ceiling is fixed at 150 kt, and realised F assumed not to exceed 0.6. The graph shows the median values of SSB, yield, and F in the years 2018–2027 from 10 000 iterations for each value of minimum TAC shown on the horizontal axis. The probabilities (Prob) of SSB being below B_{lim} are shown for individual years and a long-term period.

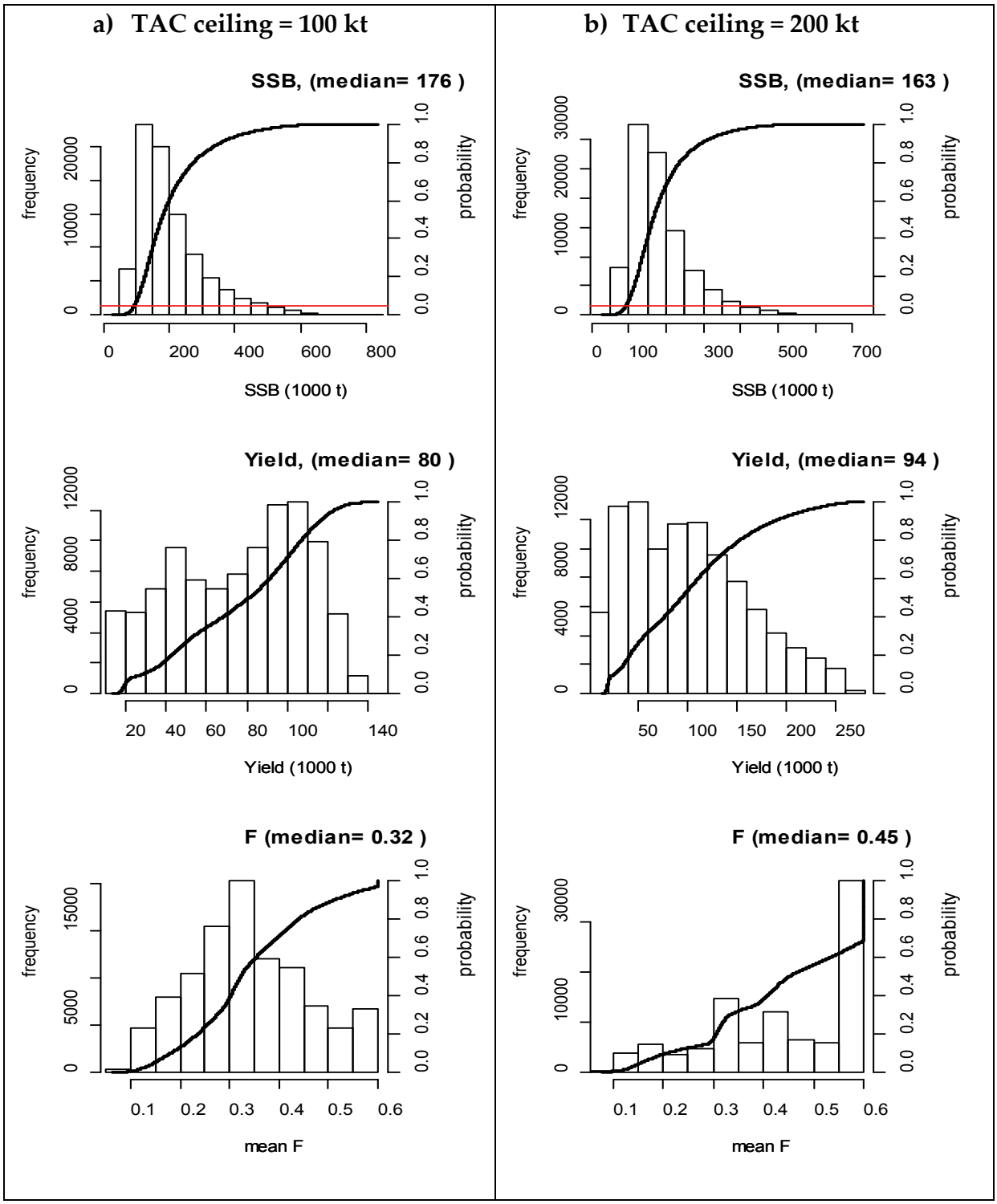

Figure 6.3.5.1.4 Long-term distribution of SSB, yield, and F, including cumulative probabilities of SSB< B_{lim}, for column a) TAC ceiling at 100 kt, and column b) TAC ceiling at 200 kt. Both apply a minimum TAC at 20 kt and realized F is assumed not to exceed 0.6. Yield and F are by calendar year.

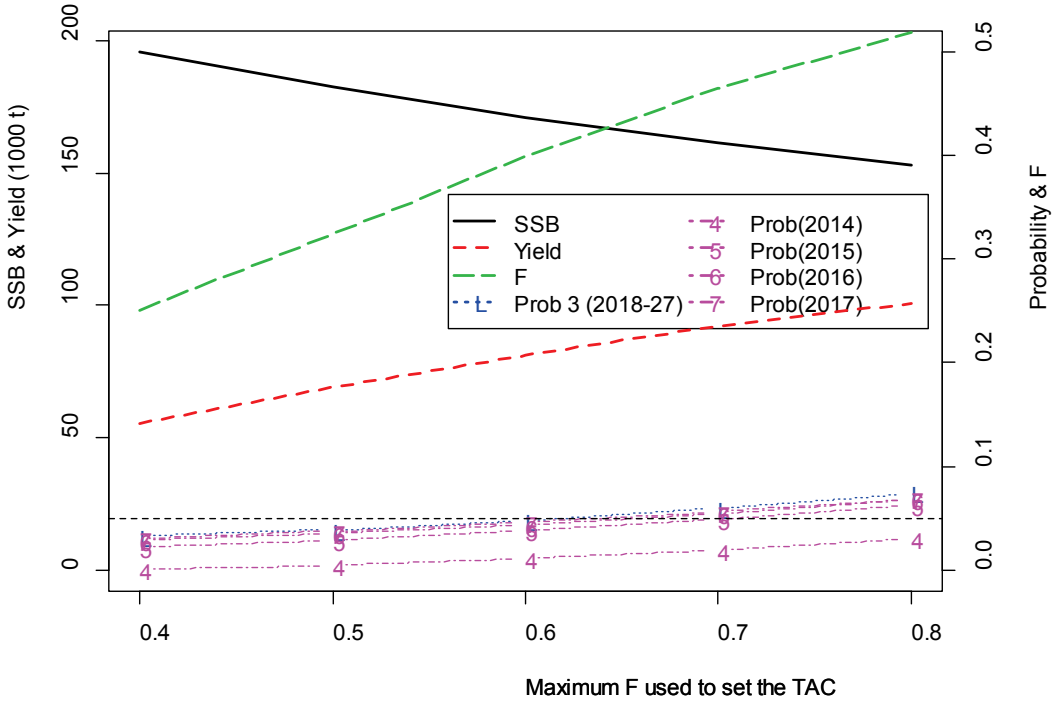

Figure 6.3.5.1.5 Sensitivity to the F ceiling used in the HCR (horizontal axis), assuming the minimum TAC is fixed at 20 kt and the TAC ceiling is fixed at 200 kt. The graph shows the median values of SSB, yield, and F in the years 2018–2027 from 10 000 iterations for each value of F ceiling shown on the horizontal axis. The probabilities (Prob) of SSB being below B_{lim} are shown for individual years and a long-term period.