ECOREGION General Advice
SUBJECT European Commission's TAC Setting Rules [COM (2010) 241]

Request

The EC Communication titled "Consultation on Fishing Opportunities for 2011" [COM (2010) 241, Annex 4] asks ICES to evaluate rules for setting TACs with respect to the precautionary approach and compatibility with maximum sustainable yield (MSY). The rules apply to stocks, excluding naturally short-lived species, where it is not possible to provide advice based on a catch forecast (sometimes referred to as category 6–9 stocks). The TACs rules are:

1. Where there is evidence that a stock is overfished with respect to the fishing mortality that will deliver maximum sustainable yield (or is depleted to a low level compared with historic levels), a reduction in TAC as needed to reach Fmsy, but no greater than 15% would apply.

2. Where there is evidence that a stock is underfished with respect to the fishing mortality that will deliver maximum sustainable yield, an increase as needed to reach Fmsy, but no greater than 15%, would apply.

3. The considerations in paragraphs 1 and 2 override subsequent paragraphs.

4. Where abundance information either indicates no change in stock abundance, is not available or does not adequately reflect changes in stock abundance, an unchanged TAC would apply.

5. Where ICES considers that representative stock abundance information exists, the following rule applies:

a. If the average estimated abundance in the last two years exceeds the average estimated abundance in the three preceding years by 20% or more, a 15% increase in TAC applies.
b. If the average estimated abundance in the last two years is 20% or more lower than the average estimated abundance in the three preceding years, a 15% decrease in TAC applies.

Where TACs have not been restrictive, and a reduction is required according to paragraph 1 or paragraph 5.b, ICES shall advise on an appropriate level of TAC reduction necessary to achieve the intended reduction in catches. ICES shall decide on an appropriate Fmsy proxy in each case.

If necessary, ICES is also asked to advise on an alternative rule and the corresponding TACs that would improve compatibility with the precautionary approach, with maximum sustainable yield, or with improved stability of TACs. This could be provided on a case-by-case basis.

Statement on the Nature of ICES 2011 TAC Advice Concerning the TAC Rules

ICES provided the information necessary to apply the TAC rules as part of its presentation of 2011 catch options. However, options corresponding to the TAC rules are not necessarily recommended by ICES.

Response

A limited amount of simulation testing of the TAC rules for hypothetical fish stocks was performed. The main conclusions are as follows:

- Rules based on stock abundance (5a and 5b) stabilize the stock in some situations.
- If the stock abundance is initially stable, the stock abundance based TAC rules maintain the stock near the initial level, but if it is declining, stabilization occurs at a lower level.
- The performance of the stock abundance based TAC rules better (in terms of stock stability) if changes in TAC proportional are proportional to changes in stock abundance (i.e., without the 20% change threshold).
- The performance of TAC rules based on stock abundance deteriorates when the abundance index used to track the stock suffers from a change in catchability coefficient (i.e., the proportional relationship between the index and stock size changes).
- While stock abundance based rules may stabilize a stock, they do not necessarily stabilize it within safe biological limits (above Bpa), or around the level that corresponds to MSY. If the rules are applied to a stock that has been depleted by overfishing, the stock is likely to remain at a low level.

- Fishing mortality (F) based rules (numbers 1 and 2) perform poorly in terms of achieving F_{MSY} for data poor situations where only 3 years of hypothetical catch at age data is available to estimate F. The poor performance of the rules is due to very imprecise estimates of F. Under circumstances where the data is sufficient for better estimates of F, it is reasonable to expect the rules to perform better, although this conclusion was not simulation tested.

In summary, the TAC rules are not in general precautionary and they do not in general achieve MSY. They are likely to perform poorly relative to the precautionary approach and MSY for some realistic scenarios (as indicated above).

In spite of the shortcomings of the TAC rules, it is worth noting that they help to achieve some consistency in TAC setting and they make the management system more predictable. For some scenarios, the rules seem sensible.

Background

The investigation of the TAC rules is based on computer simulations for a matrix of stock types, fishing histories and intensities, and population dynamics parameters. The simulations use a program developed for the June 2008 STECF meeting (STECF, 2008), with modifications to allow simulation of Harvest Control Rules (HCRs) corresponding to the TAC rules. A total of 64 scenarios were investigated. The scenarios correspond to all combinations of the factor levels in the following table:

Factor	***Level***
Stock	Cod like
	Herring like
Stock Recruitment	High production - Steepness = 0.9
	Lower production - Steepness = 0.75
Initial status	Well managed, i.e. $\overline{F}$ around $\overline{F}_{\mathrm{MSY}}$ and $SSB \geq B_{MSY}$
	Overfishing, i.e. $\overline{F}$ >> $\overline{F}_{\mathrm{MSY}}$ and $SSB < B_{MSY}$
HCR	Pseudo-cohort with TAC constraint (TAC rules 1 and 2)
	Biomass step rule (TAC rules 4 and 5)
	Un-tuned VPA with TAC constraint (TAC rules 1 and 2)
	Biomass linear transition rule (alternative to TAC rules 4 and 5)
Error models	30% CV on CPUE assuming log-normal error
	As above, plus recent increase in q, as an x% bias in F

There are two HCR scenarios for TAC rules 4 and 5 to examine two approaches for estimating F in a data poor situation (e.g., three years of catch at age data only).

The hypothetical cod and herring like stocks used in the simulations roughly correspond to actual stocks in terms of demographics, spawner-recruit dynamics, and recent stock trajectories. The cod like stock is relatively stable at the beginning of the simulations whereas the herring like stock is declining.

For the cod like stock, the overfishing scenario assumes that F is 1.65 times F_{MSY}. For the herring like stock, the overfishing scenario assumes that F is 2.45 times F_{MSY}. The spawning stock biomass for the two hypothetical stocks is 0.40–0.44 times B_{MSY} for the overfishing scenarios

A limitation of the study s that it is based on a relatively small number of scenarios in terms of combinations of population dynamics, stock conditions and fishing histories, and uncertainty in assessment information. However, the framework could be applied to more scenarios and it could be used to evaluate the performance of alternative TAC rules if there are specific options the EC would like to have evaluated.

References

De Oliveira, J., Darby, C., Earl, T., and O'Brien, C. 2010. Technical Background Evaluation of Annex IV rules. ICES CM 2010/ACOM:58

STECF. 2008. Annex I. STECF/ SGRST-08-02 Working Group Report on Harvest Control Rules, Lowestoft, 9–13 June 2008. p9-82. *In* Subgroup on stock reviews of the STECF. STECF opinion expressed during the plenary meeting of 7-11 July 2008, Helsinki.