Possible Approaches for Developing OMPs which Output Ranges Rather than Unique Values for TACs

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Introduction

Reservations have been expressed by decision makers in Namibia that the OMP approach used in the past has provided only a single recommendation for a TAC, without any flexibility (range of options). Desires have also been expressed that the relative risks of options within such a range be reported.

Risks associated with fishery management decisions (e.g. alternative TAC levels) can only be meaningfully evaluated (except perhaps for very short-lived species) for a specified series of actions carried out over a period of time, and not for a decision for a single year only. Thus in conventional assessments, risks are usually indicated in terms of the consequences of the continued application of a TAC level proposed, which is taken to be fixed over a fair number of years (typically 10-20). However, this approach considerably overestimates risk, as it takes no account of the fact that such a catch level would be decreased over time if signals from indices monitoring resource abundance suggested this to be declining appreciably, thus avoiding the undesirable depletion that would otherwise occur.

The management procedure approach, by taking account of such feedback, does more properly evaluate the risks associated with alternative bases for setting TACs. However the decision makers' choice of an acceptable risk level (or trade-off with anticipated catches) is made on the basis of simulation results before the procedure is implemented in practice, so that the chosen procedure conventionally provides a unique TAC recommendation for each ensuing year.

How then can flexibility in a TAC decision each year be accommodated within this approach?

A Way Forward

Fig. 1 indicates the standard simulation testing procedure used in management procedure development, with the procedure producing a unique TAC recommendation each cycle (typically annual).

However, what matters to the operating model ("reality") is not the TAC *per se*, but the catch actually made. These two can differ for various reasons (e.g. reporting errors), and management procedure evaluations frequently take these into account through modeling "implementation error" (essentially the difference between the TAC set and the eventual catch), as illustrated in Fig. 2.

Fundamentally, the situation of decision makers choosing within a range of TAC options is structurally identical to implementation error, i.e. again there may be some difference between the procedure's "central" (and unique) output and the subsequent catch (see Fig. 3).

What then becomes necessary to add to the simulation evaluation process though, is consideration of a range of options that relate the "central" output from the TAC algorithm to the catch to be made.

Modelling TAC Flexibility

For such evaluations, the management procedure itself must output some range about the single TAC it in any case provides. This range could depend in some complex manner on values forthcoming from monitoring data, but for the moment (for ease of grasping the concept) can be thought of simply, e.g. as $\pm 10\%$.

The next and key step is to specify where the final TAC decided might lie within this allowable range, e.g. [0.9 $TAC_{central}$; 1.1 $TAC_{central}$]. A number of example options are specified below, and it is to be hoped that discussion in the Workshop will add to these. Clearly any procedure to be implemented must be tested for robustness across the set of such options considered to span the range of possibilities considered reasonably plausible.

a) "*Greedy*"

TAC_{final} = Top end of range [e.g. 1.1 $TAC_{central}$] <u>always</u>.

i.e. the decision makers always choose the highest option. If this is considered reasonably plausible, the end result is a procedure that gives a $TAC_{central}$ of (in this example) 1/1.1 of the unique TAC that would result in the standard "no flexibility" case. Even if this "maximum" choice is not made every time in practice, having to allow for that possibility results in eventual lesser utilization than would be consistent with the level of risk considered acceptable, i.e. flexibility introduces inefficiency (the average catch achieved is less than it could be).

b) "*Random*"

TAC_{final} chosen at random from U[Bottom of range; Top of range]

i.e. the decision makers are equally likely to choose anywhere within the range in a manner that is uncorrelated from one year to the next. Flexibility of this type will introduce only very slight inefficiency into the procedure (because of non-linear effects on abundance arising from catches set above $TAC_{central}$).

c) “*Block quota*”

For longer-lived species, “block quotas” can be set for a period of years, .e.g. a TAC applicable to a three year period, with flexibility allowed within that period. Typically some limitations are placed on such flexibility, e.g. no more than 40% of the three year amount may be caught within any one year. A negative aspect of this approach is that any limitations that might be placed on TAC changes made at one year intervals (in the interests of industrial stability) will need to be weakened if changes to a block quota can occur only every three years (say).

Thus admitting flexibility in the TAC chosen compared to the management procedure’s “central” output will incur some cost in other respects, e.g. lower catches or less industrial stability in the longer term. Once again a trade-off issue arises, regarding which choice falls within the mandate of the decision makers, with scientists responsible to quantify the trade-off to assist the final decision.

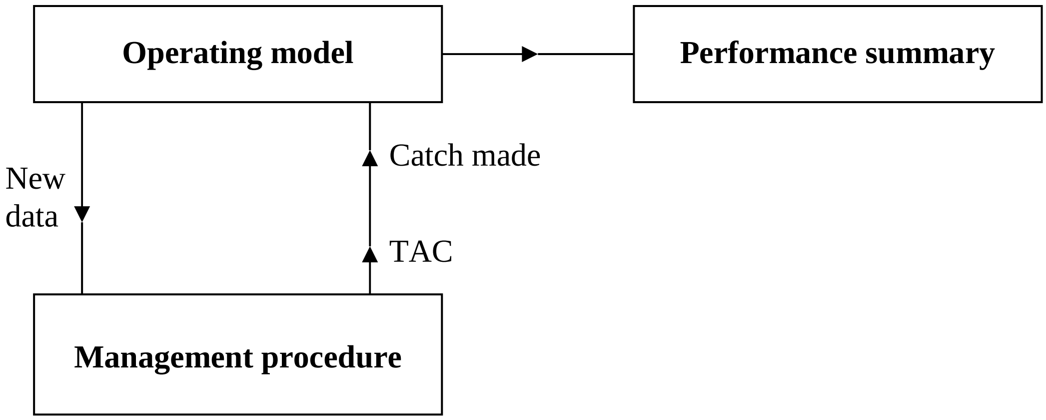

Figure 1. The standard management procedure evaluation process where annual catch made exactly equals the TAC output by the management procedure.

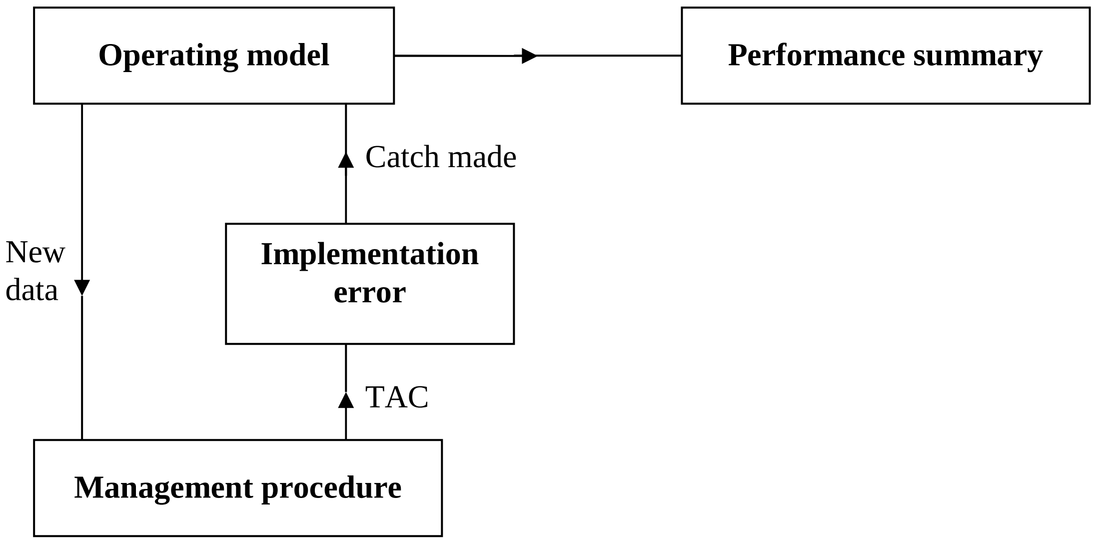

Figure 2. The standard management procedure evaluation process modified to include implementation error: the catch made may differ from the TAC output by the management procedure, but in a specified manner (which may include stochastic components).

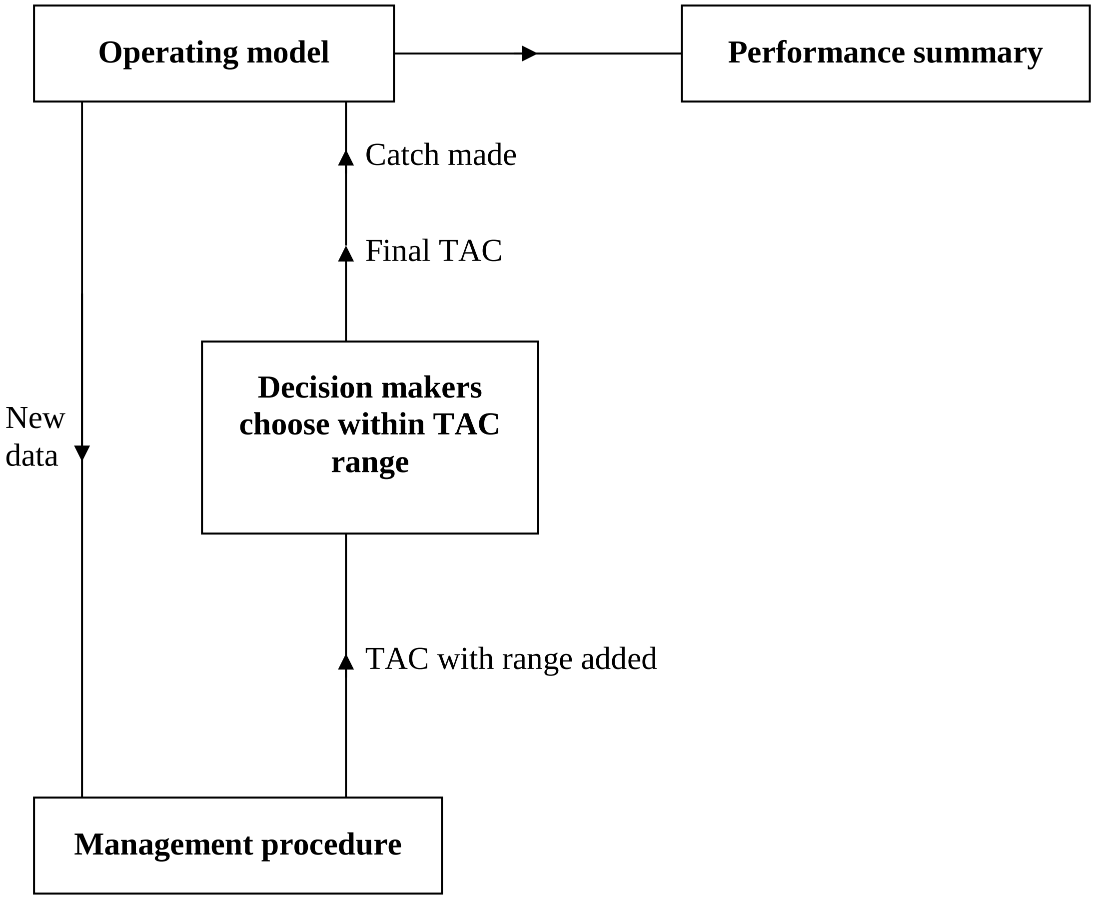

Figure 3. The management procedure evaluation process when the decision makers choose a TAC from within a range of output. The manner in which the final TAC relates to the range output by the procedure must be specified (but may include stochastic components). Note that this process is structurally identical to that of Fig. 2.