SOME POSITIVES AND NEGATIVES OF THE OMP APPROACH

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INTRODUCTION

To set a context, it is useful to contrast the Operational Management Procedure (OMP) approach to the more "Traditional" approach to the provision of scientific recommendations for management measures (such as TACs) for marine resources.

Typically the Traditional approach involves (often annually) a "best assessment" of the resource, i.e. a mathematical evaluation which integrates all the available data to provide estimates of, in particular, past and present resource abundance and productivity. This is then followed by some basis to translate these results into a TAC recommendation: e.g. application of a reference-point based harvest control rule, or consideration of resource trends predicted under future constant catch scenarios for different levels of such catches.

The OMP approach was first developed in the Scientific Committee of the International Whaling Commission in the late 1980's, to provide an improved method to manage fisheries which, in particular, took proper account of uncertainties in line with the Precautionary Principle/Approach. The approach was subsequently endorsed by the FAO Technical Consultation on the Precautionary Approach to Capture Fisheries, held in Lysekil in June 1995, where it was expressed in terms of the need for "management plans" involving "decision rules", in conjunction with the directive that "a management plan should not be accepted until it has been shown to perform effectively in terms of its ability to avoid undesirable outcomes" (*FAO Tech. Pap.* 350/1). Note that evaluation of such "performance" necessarily implies some simulation testing process.

Formally an OMP is a formula to provide, say, a TAC recommendation, where the forms of the inputs to the formula (essentially resource monitoring data) have been pre-specified. Importantly, in line with the Precautionary Approach, the formula is tested by simulation to check that it gets reasonably close to achieving the objective of an appropriate trade-off between (*inter alia*) maximizing catches while at the same time minimizing the risk of substantial depletion which could put future use of the resource in jeopardy, *even if* the current "best assessment" of the resource is in error. Crucially it relies on the mechanism of automatic feedback control to adjust for inevitable errors in current perceptions about the resource (the "uncertainties").

DIFFICULTIES WITH THE TRADITIONAL APPROACH

- *Variability in "best assessments" from year to year, and hence in TACs*
  This can arise from new data becoming available, changes in methods to refine such data for inputs into stock assessments, and changes to the stock assessment methodology. In consequence the TAC can vary unnecessarily (even in the "wrong" direction) as a consequence of methodological changes, rather than (as would be the intention) in line with changes in resource abundance.

- *Inability to properly consider longer term trade-offs*
  Fundamental to sound fisheries management is an appraisal of the trade-off between long term catches and risk to the resource, but risk can be evaluated only on the basis of simulating repeated application of a decision rule. For example, constant catch projections can badly over-estimate risk, because they take no account of the management responses that would follow if resource monitoring data indicated deteriorating stock status.

- *Lengthy haggling*
  Final discussions in the process of arriving at a TAC recommendation can become wastefully protracted through exercises of a "horse trading" or ”nickel and dime-ing" nature, to squeeze small changes (up or down) based on argued improvements from minor modifications to data choices or analyses, which in reality relate to noise rather than to any improved resource signal detection.

- *What if the "best assessment" is wrong*
  There is no formal basis for proper allowance for uncertainties. Simple approaches to this such as basing decisions on the most conservative assessment alone, or a lower 95% confidence bound on an estimated TAC, can be very wasteful of the resource.

- *Default decisions of "no change"*
  In the frequent instances of assessment uncertainty that occur, management agencies frequently default to decisions of "no change" in, say, the TAC as the only consensus achievable. This can then result in whatever action eventually is taken being too little, too late.

ADVANTAGES OF THE OMP APPROACH

- *Less time spent haggling to little long-term benefit*
  Pre-specification of formula and inputs avoid this. The classic example is the 40 meetings of the Rock Lobster Working Group that were needed to finalise a TAC recommendation for the west coast resource based on the Traditional approach in 1996, which reduced to only 4 the following year when an OMP was first put in place.

- *Proper evaluation of risk*
  This is provided by the simulation testing framework which takes due account of feedback effects.

- *Provision of a sound basis to put limits on inter-annual TAC variability*
  Orderly industrial development requires fairly steady TACs. Under the Traditional approach, these can vary unnecessarily in reaction to estimation imprecision, but there is no basis to judge what externally imposed level of TAC variability constraint (or similarly TAE variability constraint) might be set without jeopardizing resource status.

- *Consistency with the Precautionary Approach*
  By construction (the simulation testing framework, which includes robustness tests for uncertainties in "best assessments").

- *Provides a framework for interactions with stakeholders, particularly regarding objectives*
  The approach forces consideration of the long- as well as the short-term, by forcing clear thinking as to overall objectives.

- *Haggling time saved can be put to better use*
  The opportunity is created to focus more on longer term research efforts designed to resolve key uncertainties in the assessment.

- *Provision of a default*
  Some haggling may be unavoidable, particularly in international settings, but if that is to occur, the OMP output provides the default TAC around which to haggle, rather than "no change", which thus takes better account of avoiding undue risk to the resource.

DISADVANTAGES OF THE OMP APPROACH (WITH RESPONSES)

- *Lengthy evaluation time*
  The approach does require more time to develop or review an OMP than the Traditional one to arrive at a TAC recommendation, but once the OMP is in place non-productive haggling time is greatly diminished. Experience has, however, emphasized the importance of keeping to a pre-specified schedule during this development/review process, without allowing "back-tracking" (see RLWS/DEC05/MAN/8/1/3/2).

- *An overly rigid framework*
  See the Appendix regarding possibilities for flexibility. It must be remembered that introduction of flexibility does have a cost, likely either by way of lower future TACs on average or higher inter-annual TAC variability, if levels of perceived risk are to be kept unchanged. Note also the regular review process, and possibilities for bringing this forward (see RLWS/DEC05/MAN/8/1/3/2).

- *Trusting to an auto-pilot*
  An OMP is indeed analogous an auto-pilot, with the advantages that that brings. **But** it is linked to a review process to check for "undue course deviations" (see RLWS/DEC05/MAN/8/1/3/2), i.e. the pilot doesn't desert the plane.

- *Reference case/set selection*
  Evaluation of achievement of objectives is dependent (and can be quite sensitive) to the choice of the reference case operating model (or plausibility-weighted set of such models), i.e. the approach doesn't escape the difficulty of choosing the "best" assessment. But the Traditional approach has exactly the same problem, and the OMP approach has the advantages of having tested for the adequacy of feedback to correct for any errors, and of soundly based constraints to limit future TAC variability.

SPECIFIC PROBLEMS ENCOUNTERED WITH PAST OMPs FOR WEST COAST ROCK LOBSTER

- *Non-availability of, or "poor" data inputs*
  Non-availability has arisen once with the FIMS survey, and also with the somatic growth information. The most recent OMP (as implemented in 2003) includes tested provisions for action to be taken should this occur. In some years also, the level of tag returns to estimate somatic growth has been poor, or the tagging poorly timed (many tags placed at times when the information from their return was ignored in analyses because such times were when moulting might already have had occurred), and this has led to arguments on interpretation.

- *Argued lack of flexibility*
  See Appendix.

- *Difficulties in specifying objectives*
  Invited to contribute to this exercise, industry has often found difficulty in responding consistently. For example, during the development of OMP-2003, industry views on the maximum extent of TAC variability to be imposed (which trades-off against the average TAC to be expected over time) twice changed appreciably. In part at least, such difficulties would seem to have had their origin in uncertainties about access rights, and the different implications of different levels of TAC change for the extent of introduction of new entrants into the fishery. However, the culmination of the current long-term rights allocation process should eliminate that factor.

- *The procedure for advancing OMP reviews given substantial changes in scientific insight*
  The proposals in RLWS/DEC05/MAN/8/1/3/2 have been introduced in specific response to repeated queries on this point, to improve clarification. But this matter has also to be considered in context of how many such substantial insights have actually occurred in the post-1997 period since OMPs were introduced for this fishery. Arguably there have been only two:

  i) The use of GLMM models to standardize somatic growth, which showed that the precision with which such growth was estimated was appreciably poorer than had been thought, and necessitated adjustments to the OMP to be less responsive to changes in such estimates.

  ii) Indications as time has progressed, with the continued lack of recovery of somatic growth to pre-1990 levels, that a lower weighting should be given to scenarios that envisage a fairly rapid return to such levels in the future.

APPENDIX

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

A simple approach

Certainly a very simple way to accommodate flexibility in the system is to allow for limited (say +-10%) quota under- or over-runs by rights holders each year. This is readily simulation tested, and unlikely to be problematic for a longish-lived animal such as a rock lobster. The advent of long-term rights makes this the more feasible an option, but aspects of practical implementation would need to be considered.

OMPs that output ranges for TACs

Reservations have been expressed by certain industry sources (and also by decision makers in Namibia) that the OMP approach as applied in the past has provided only a single recommendation for a TAC, without any flexibility (range of options). In Namibia, 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. The OMP approach, by taking account of feedback effects, 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 Possible 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 $TAC_{central}$] always.

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.

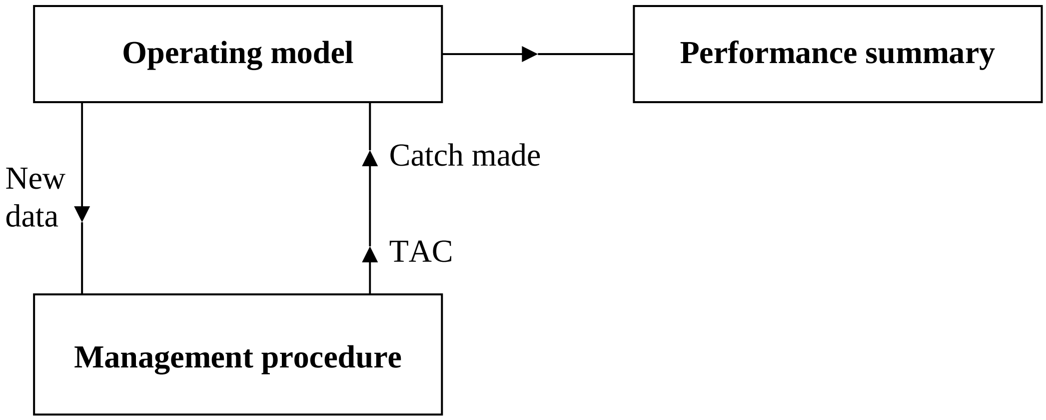

Figure 1. The standard management procedure evaluation process where annual catch made exactly equals the TAC output by the management procedure.

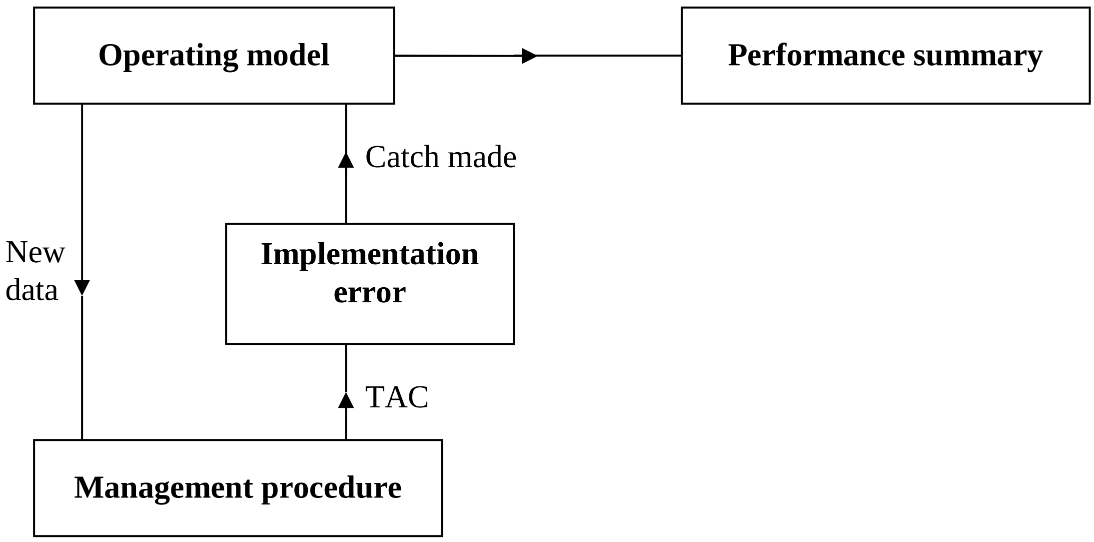

Figure 2. The standard management procedure evaluation process modified to include implementation error: the catch made may differ from the TAC output by the management procedure, but in a specified manner (which may include stochastic components).

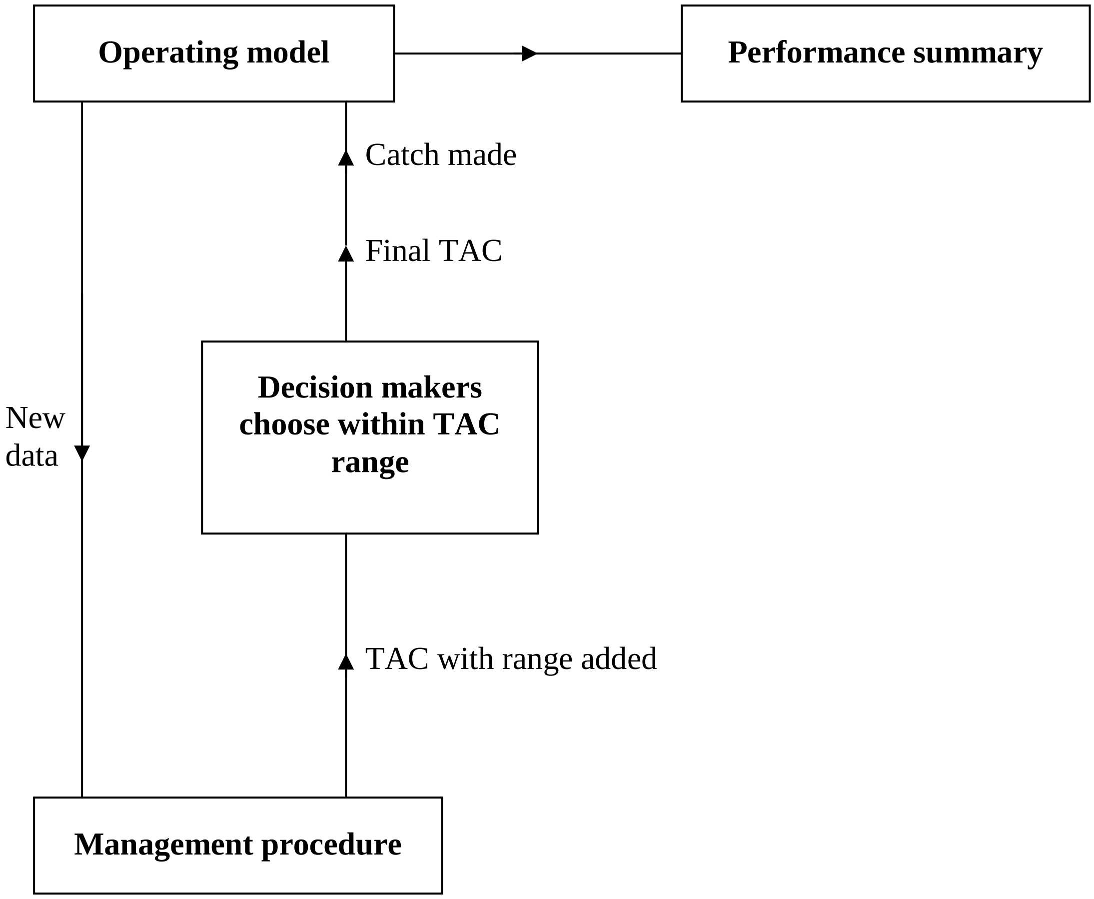

Figure 3. The management procedure evaluation process when the decision makers choose a TAC from within a range of output. The manner in which the final TAC relates to the range output by the procedure must be specified (but may include stochastic components). Note that this process is structurally identical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