

Comments on a recent hypothesis about the spatial structure of the sardine stock

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Reflection of uncertainty in the models forming the basis of management procedures and their development

1. Reassurance is being sought that the extent of uncertainty about stock structure and dynamics is adequately represented in the models upon which management systems will be developed? In the ensuing points there is some allusion that certain processes are no longer being considered in the OMs, and we suggest that where there is uncertainty linked to such hypotheses, they be included in the OMs used for management.
2. At a recent PWG meeting it was clarified that the range of uncertainty in the prior for the estimate of the proportional contribution of SC spawning biomass to the effective WC spawning biomass based on the hydrodynamic model is only based on the variance due to the initial spatio-temporal distribution of eggs, and not on the lack of model fit to system oceanography or variation in system oceanography from that used for original model validation. Some provision for this is required in the prior.

Contribution of SC spawning biomass to spawning outputs on the WC

- 3a. It is suggested that evolutionary biology places constraints on the dynamics of the system. In particular it is not reasonable to expect that the biomass on the SC is only linked to the WC by WC to SC migration without any return of SC reproductive product to the WC, since this would imply a population that is exporting itself out of a habitat area for no reproductive or population benefit. A similar argument would apply if there is only a small return of SC reproductive products to the WC?
- 3b. At this stage there is apparently no example of other sardine stocks around the world with similar dynamics which would make the South African situation plausible.
- 3c. It is therefore proposed, just on evolutionary grounds, that SC spawning biomass is most likely making a substantial contribution to WC recruitment.

Relative reproductivity of spawning biomass on the SC and the WC

- 4a. The very low reproductivity of SC spawners is puzzling and implausible. This is however more understandable in circumstances where the SC spawning biomass contributes meaningfully to WC recruits.
- 4b. No example of a sardine stock which shows such a large regional variation in its reproductivity w.r.t recruitment has been tabled to the scientific process which would make this more plausible. (w.r.t. 4a).

Mixing or population shifts across the geographic boundary dividing the WC from the SC

5. It is possible for sardine which are uninfected and on the SC to acquire parasite infection by having some residence time within the parasite endemic area on the WC. Such a possibility should be considered in the OMs underpinning the management strategy evaluation process.
6. It is possible for sardine to move both W-E and E-W across the 20 degree geographic boundary between the WC and the SC as defined, as a result of E-W and W-E shifts in population distribution. This possibility should be included in the operating models used for the development of OMPs.
7. It is unlikely that the commercial catch taken in the vicinity of Mossel Bay is derived solely from a portion of the South African sardine population which resides on the SC. The models used for management strategy evaluation should allow for a proportion of the catch on the SC being derived from a portion of the stock which also resides on the WC, and vice versa?

Model existence criteria

8. Existence behaviour for the pristine situation should be checked, for the population dynamics for all operating models?

Model convergence

9. Model convergence tests should be reported for the results for OMs reported at the joint posterior mode.

Long term investment decision into the SC

10. The scientific process should express the degree of assurance it can give that the large investments to make infrastructure available to exploit sardine on the SC, consistent with the present model of dynamics and migration, will not face a reversal of the population shift in the next 5 to 10 years.