

## THE SOLE ASSESSMENT ENIGMA

Butterworth, D.S., Glazer, J.P. and Durholtz, M.D.

Keywords: Sole, CPUE, Schaefer model, regime shift

Up to the turn of the Century, the sole resource had “behaved by the book”: A steady annual catch of about 700 mt with a similarly steady CPUE over the last two decades (at least).

Then, without any change in the TAC, the catches started to drop. Initially this was driven mainly by a decrease in effort as old vessels were retired from the fishery. But then a decade into the new Century, the CPUE dropped markedly too, by some 50%.

Initially it was unclear whether this was caused by a drop in catchability or in resource productivity. The former explanation was suggested by the fact that other fisheries for other resources on the South Coast (such as shallower water hake and especially the midwater fishery for adult horse mackerel) had shown similar marked drops in CPUE. Hence, when as the second decade drew to a close, all these resources showed marked improvements in CPUE, the decrease in catchability hypothesis came to be accepted, although the mechanism underlying this was not clear.

Dynamic production modelling (Schaefer model) of the sole resource to provide TAC advice consequently assumed a period of reduced catchability during the second decade of the Century. However, despite appreciably lower catches after the turn of the Century than before, the CPUE did not climb rapidly above its earlier level, so it was also necessary to assume some form of regime shift at that time, implemented as an appreciable drop in the value of the intrinsic population growth rate parameter  $r$  for the sole resource.

This proved adequate (in the sense of providing reasonably satisfactory fits to abundance indices for a few further years), until the 2021 CPUE value became available, and showed a marked drop despite low catches and this being inconsistent with model projections which were projecting a slow increase.

So where next? Despite data available over a long period, sole remains close to the classical one-way-trip scenario, with insufficient data contrast to remove confounding in the estimation of as few as three parameters (aside from catchability): an  $r$  value changing at the turn of the Century, and a time invariant  $K$ .

### KEY QUESTION FOR THE PANEL

**What parsimonious revisions to the assumptions underlying the current sole model do you suggest for further investigation?**

For example, a time-dependent  $K$  might be suggested, but given data limitations, could any useful inferences be drawn from the resultant model fit? Note that another period of decreased catchability is difficult to justify, as unlike before other resources on the South Coast are not showing marked CPUE reductions.