

Squid assessment discussion points: Task Group meeting, 19 March 2021

Anonymous

The current squid model comprises the following key assumptions regarding the dynamics of the resource:

1. The resource is characterised by a single aggregated value B for biomass (i.e. not by numbers).
2. The year is split into two parts: Jan-Mar and Apr-Dec, during each of which growth, natural and fishing mortality are assumed to occur smoothly.
3. In these two parts of the year, there are both trawl and jig fishing mortalities, whose values can differ for the two parts.
4. The effects of somatic growth and natural mortality are combined in a single constant estimable value g (generalisation of M for natural mortality with respect to numbers) – note therefore that squid “live forever” – in the absence of fishing the biomass of a cohort declines exponentially (the current estimate of g is about 1.25, so that two years after birth, about 10% of the original cohort biomass still survives). Note that though the value of g is estimated in the model fit, it is subject to quite a tight prior $\sim N(1.2, 0.1^2)$.
5. Recruitment occurs in January, and immediately joins the exploitable (available to catch) and survey biomass.
6. Recruitment this year depends via a Beverton-Holt relationship on the biomass at that ends the previous year (i.e. as at end December, before new recruits are added). The steepness h of the relationship is estimated in the model fit, and is fairly low (about 0.35).
7. Recruitment this year is impacted negatively by the extent of jig-caused fishing mortality over Apr-Dec of the previous year (i.e. through egg bed disturbance) – we found that introduction of this effect was essential to be able to have the model fit the data – its size is estimated in the model fitting process.
8. We are dealing with a single stock.

Main points to discuss for possible change:

- a. The assumptions that recruits enter the fishery +/- Jan, and are the output from spawning over primarily Nov-Dec
- b. Splitting the year into Jan-Mar and Apr-Dec – the best way to take account of different fishing intensity over the 12 months?
- c. Lumping somatic growth and natural mortality into a single parameter g :

- i) Do we split this into the two separately – what data/equations do we have on squid growth curves and mass/length relationships (which we'd need for this)?
 - ii) Probably most important – the natural mortality component of g – should we rather have this increase substantially after spawning/reaching first birthday?
- d. Need we consider the possibility of multiple stocks (do we have sufficient data to be able to carry through on that)?