A Report Back on Discussions on "Some initial ideas for data required before the next assessments of sardine and anchovy" FISHERIES/2014/JUL/SWG-PEL/43

SP-SWG Meeting
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Anchovy

- Change model from

i) using catch-at-age 0 & 1

assumed known without error and calculated with a monthly and annually varying cut-off length

ii) fitting to proportion-at-age 1 in November survey

obtained from modelling the length distributions of age 1 and 2+ and fitting to survey proportions-at-length to estimate proportion-at-age 1 with SE (de Moor et al. 2013 AJMS)

to a model that fits to

i) monthly commercial proportion-at-length

ii) proportion-at-length in November survey

Anchovy

- Changes include:

- Monthly time steps

  particularly to fit to commercial length distributions of fast growing juveniles

- Incorporate an age-to-length matrix: von Bertalanffy growth curve from 90,92-95 ageing data with model estimated error about the curve

- Recruit catch prior to the survey extrapolated between modelled predicted catch at the end of the month before and month of the start of the survey

  i.e. assume that catch is equally spread throughout the month in which the survey begins

- Estimate November survey selectivity-at-length

  most likely uniform above a particular length

Anchovy

- Changes include:

- Estimate commercial selectivity-at-length for 1+ year olds

  constant throughout the year

- Estimate commercial selectivity-at-length for 0 year olds

  possibly variable through the year to incorporate availability to the fishery as the recruits begin to move down the coast

- Estimate the monthly catch split between 0 and 1+ anchovy

- Include a deterministic weight-at-length relationship for calculating model predicted November biomass

  available annually for $\pm$ 10 most recent years, average used for other years

Anchovy

- Further possibilities:
- In the “initial” model, variability about the growth curve each month encompasses both variability in the growth rate (inter-annual) as well as variability in the birth date (between fish within a year)

Model as a normal distribution about an annually varying mean birthdate?

Anchovy

- Further possibilities
- In the “initial” model, the growth rate (growth curve + error distribution) remains constant over time.

Allow the growth curve to change over time?

e.g. a single change (reduction in growth due to higher biomass) in 2000

e.g. change as a random effect

e.g. dependent on biomass

Sardine – Part 1

- Exploration of other hypotheses using the current 2-stock modelling framework

Sardine – Part 1

- Option A

Observation:

Eggs from sardine spawning on the south coast are transported to the west coast (Coetzee 2014)

Hypothesis:

Some of the spawning products from south coast spawning biomass contribute to west stock recruitment (and future west stock population dynamics), i.e. west stock recruitment is a function of west stock spawning biomass and a portion of the south stock spawning biomass

Sardine – Part 1

- Option A

Assumption:

The proportion of eggs estimated to be successfully transported to the west coast are taken to represent the proportion of south coast spawning biomass that contributes to west stock recruitment

As a ‘first-cut’ this proportion is assumed to be 10%. Further work may allow the proportion to vary as informed by Coetzee 2014. In addition further work my allow for a proportion of west coast spawning biomass to contribute to south stock recruitment as informed by Coetzee 2014.

Sardine – Part 1

- Option A

Assumption:

The effective spawning biomass from which west stock recruitment is generated consists of the west stock biomass and 10% of the south stock biomass.

Assumption:

The effective spawning biomass from which south stock recruitment is generated consists of 90% of the south stock biomass.

Sardine – Part 1

- Option B

Observation:

Some years of large May/June survey estimates of recruitment west of Cape Infanta correspond with high model estimated proportions of recruits moving from west to south stocks

Hypothesis:

Recruits surveyed west of Cape Infanta may consist of west stock recruits AND some south stock recruits that originated from south stock spawning and will return to contribute to south stock population dynamics

Sardine – Part 1

- Option B

Assumption:

The model predicted recruits fit to the survey estimate of recruits west of Cape Infanta will be the sum of the model predicted west stock recruits and x% of the model predicted south stock recruits.

(100-x)% of model predicted south stock recruits will be fit to the survey estimated recruitment east of Cape Infanta.

Sardine – Part 1

- Option B

Assumption:

These recruits are assumed to form part of the south stock population dynamics and thus contribute to the recruits from which catch east of Cape Agulhas is subtracted as well as future south stock spawning. i.e. these recruits are modelled to remain east of Cape Agulhas and are either found between Cape Agulhas and Cape Infanta during the survey or spend a very short period west of Cape Agulhas during May/June.

Alternatives:

B-1) x=0% current two stock model

B-2) x=10%

B-3) x=20%

Sardine – Part 1

- Option C

Observation:

Parasite infection prevalence and intensity continues to increase with length for sardine east of Cape Agulhas while the parasite is assumed endemic only to the area west of Cape Agulhas

Hypothesis:

Some part of the (primarily adult) south stock sardine are distributed west of Cape Agulhas at some point during the year, exposing them to possible (further) infection by the parasite

Sardine – Part 1

- Option C

Assumption:

Although it is likely under such a hypothesis that only some of the south stock sardine would spend a percentage of their time west of Cape Agulhas, as a 'first cut' this option assumes that y% of the south stock spend all of their time west of Cape Agulhas. The alternatives do, however, have different implications for the modelling of catch and stock-recruitment relationships.

Assumption:

The directed sardine catch and sardine bycatch with round herring taken west of Cape Agulhas is modelled to be taken from a combination of the west stock sardine and y% of the south stock sardine, instead of this catch being assumed to be only from the west stock.

Sardine – Part 1

- Option C

Assumption:

y% of the south stock spawning biomass is added to the west stock spawning biomass to formulate a west coast stock recruit relationship to estimate the recruitment to the west stock. The south coast stock recruit relationship used to estimate recruitment to the south stock would be based on (100-y)% of the south stock spawning biomass.

Alternatives:

C-1) y=0% current two stock model assumes 0% of south stock sardine are found distributed west of Cape Agulhas

C-2) y=20%

C-3) y=40%

C-4) y=60%

Sardine – Part 1

- Option D

(Not considered with current two stock model framework)

Observation:

Parasite infection prevalence and intensity continues to increase with length for sardine east of Cape Agulhas while the parasite is assumed endemic only to the area west of Cape Agulhas

Hypothesis:

Fish older than recruits/1-year olds migrate from the west stock to the south stock

Given data limitations, proportions moving will likely have to be assumed to be independent of age

Sardine – Part 2

- The implications of the options above will be explored based on the current two stock model using data from 84-11. These will guide where further work will be focused.
- Model design for the next assessment (using data from 84-14) and data to be used will be influenced by the impact of the above alternative options on results and was thus not discussed further at this point.

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Disclaimer:

The form of data finally used and model design may differ from that discussed above following initial results!

Thank you for your attention