Shortspine Thornyhead

STAR Panel Meeting Report
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NOAA Fisheries
Northwest Fisheries Science Center
Hatfield Marine Science Center
Newport, Oregon

STAR Panel:
Tom Barnes (Chair) – SSC representative
Selina Heppell – Oregon State University
Bob Mohn – Center of Independent Experts (outside reviewer)
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Overview

Shortspine thornyhead occurs from Baja to the Bering Sea and is most abundant in the depth range of 180-450 meters. They are associated with Dover sole, sablefish and longspine thornyhead. Shortspine thornyhead was assessed several times over the last 15 years: Jacobsen (1990, 1991), Ianelli et al (1994), Rogers et al (1997, 1998) and Piner and Methot (2001).

The assessment was presented to the STAR Panel by the author, Dr. Hamel. He reviewed the fishery and the data used in the analysis. Also, the survey abundance estimates were re-estimated using a new GLM post-stratification (Helser et al. 2005) and these were further revised during the meeting. A sensitivity run showed that the mid-week update to the NWFS survey did not affect the performance of the model and the values in Helser et al. (2005) were used.

After several re-runs and discussion, a Base Model was accepted for this resource and a decision table produced. The model describes a single stock with two fisheries, north and south. Because of the sparseness and quality of the data, natural mortality, steepness and survey efficiency (q) were all fixed. The Panel noted that these data and the subsequent assessment were just marginally sufficient to estimate the resource status. Similarly the biological reference points and the forecasts in the decision table should be considered with caution.

The depletion for 2005 is estimated to be 0.63 with a weakly falling recent trend. At an OY strategy, the resource is expected to fall towards the MSY biomass.

The Panel commends the high quality of the draft assessment, and appreciated the STAT's patience and efficiency in responding to the many requests for further analysis.

Requests for analyses by the STAR Panel

After the initial presentation of this assessment, the following suggestions came from the STAR Panel for additional analysis and model runs.

1) There was a question of selectivity for the AFSC slope survey. It was observed that the presentation differed from draft. Also there was a question of which of the selectivity parameters were estimated and which were assumed set. *Response: A correction was made between versions. A proper description was provided which now includes a lower bound on largest fish which improves convergence.*

2) Re-run. Assume asymptotic selectivity and free up q on the two slope surveys. The role of surveys in the model fit is quite important and this exploration is to better understand its role.

Response: These runs gave a poorer fit and were contrary to the strong evidence in Lauth et al. (2004). Asymptotic selectivity for the surveys was later dropped from further consideration.

3) Re-run. Remove the triennial survey and free q on the two slope surveys, and set M = 0.05 and 0.03, h = 0.3 and 0.6, and domed and asymptotic survey selectivities, resulting in a 2 x 2 x 2 design. These were suggested to focus on the sensitivity to higher and lower productive models and to separate h and M effects. *Response: The change to a lower h alone gave more fish B0 and B2005. The low h also had very high recruitment deviations. Low M gave much more depletion and seemed to dominate changes in h.*

4) Convergence analysis. Use initial randomization with small perturbations (i.e.: jitter) to assure the quality of the convergence for the base model. The author had commented on convergence problems in many formulations and it was deemed useful to have a quantitative analysis. *Response: Fixed issue on convergence and first jitters are close (changed bound on how low the selectivity can go at highest age/length).*

5) Re-run. Assess the sensitivity to the 1966-67 foreign catch as used in the 2001 assessment versus the estimates from the Rogers (2003) paper. The impact of these catches, which were previously estimated to be very large, on our perception of stock dynamics was requested. *Response: The inclusion of the old foreign catch had only a slight 1-2% impact (depletion0 .626 ->0.616).*

After reviewing the responses to the first set of requests, most of the rest of the week was spent trying to define a base model.

6) Re-run with triennial survey back in to see if it removes spikes in recruitment. Use both domed and asymptotic recruitment for a couple of choices of M and h. *Response: With either domed or asymptotic survey selectivities, the recruitment spikes were still seen.*

7) Show proportion of biomass in each size bin to see what the dome is sampling. *Response: Showed results for terminal year separated into males and females. When the survey selectivity was superimposed, it missed a large portion of the biomass of older fish. The results showed a large proportion of the biomass in the plus group.*

8) For the biomass proportions do a cumulative sum to show the proportion at size beneath the selectivity. The reader will not have to do the integration mentally and it removes the variable bin size perturbation in the plot. *Response: Will be done in the assessment document.*

9) Re-run – to show the sensitivity to the new slope abundance data. If the sensitivity is low can keep the analysis to date and use the old data. *Response: Done. There was a not a big sensitivity in the time trend of the biomass but there was a shift downward corresponding to the biomass south of 34.5 deg. N. Lat. in the Conception Area. As it did*

not affect the dynamics or the perception of the resource, all future runs used the old (Helser et al.) slope data.

10) Re-run – low priority, try to estimate M, perhaps with a prior with a mean of M = 0.05 and cv of 0.2. *Response: Done; M went to 0.036. Panel retained the fixed M = 0.05 for the base model.*

11) Re-run – profile on h, find MSY and MSY proxy *Response: Done. The best fit was at h = 0 .3 or 0 .4 as opposed to 0 .6 in the base model. Results showed that we should use proxy MSY as at high h's too much depletion would occur from MSY. Variation in h has more impact on the estimate productivity than on the perception of the current state of resource.*

12) Re-run to assess the influence of larger fish. *Response: This was attempted by reducing the age at maximum length in the model parameters. This had little impact; perhaps the selectivities changed to cancel out this perturbation.*

Final base model description

Data
Full catch history with discard estimates
AFSC survey (new GLM model) abundance index
NWFSC survey (new GLM model) abundance index
Triennial shelf survey abundance index
Fishery length frequencies
AFSC survey length compositions
NWFS survey length compositions
Shelf survey length compositions

Model
Beverton-Holt stock recruit relationship
Begin model in 1901
Recruitment deviations 1985-2000 year classes
q = 1 for slope surveys, estimated for triennial
M = 0.05
h = 0.6
K = 0.018 (von Bertalanffy growth parameter)

Selectivities are estimated for fisheries and all surveys.

To evaluate uncertainty in the decision tables, both h and q were given values thought to be less likely than the base model. Different values for q were chosen to capture uncertainty in the current abundance and h to the uncertainty in the productivity of the stock. As q is expected to be near 1, the ranging values were set at 0.75 and 1.33. The values of h, 0.3 and 0.9, are thought to be near the extrema for many fish stocks. The q and h dimensions were combined so the low abundance was matched with the low h as a poor stock-low productivity state of nature. Because of the poor input data, probabilities of the states of nature could not be given quantitative descriptions. The best the Panel could do was assign labels of less likely, likely and less likely to the low, base and high states of nature in the decision table. Quantitative estimation using the Hessian from the base model was not possible because M, h and q were all fixed and the Hessian would be a considerable underestimate of uncertainty.

Comments on technical merits and/or deficiencies in assessments

The model was a standard SS2 formulation. The main limitation seemed to be the data which were not sufficiently informative to allow the estimation of the key parameters and in turn the uncertainties associated with them.

Areas of disagreement

No areas of disagreement remained unresolved.

Unresolved problems and major uncertainties

The principal parameters for this assessment could not be estimated. This in turn meant that it was not possible to estimate uncertainty. The resolution of this problem is primarily dependent upon the availability of adequate data.

Aging data are weaker for this stock than is usual for assessed stocks. Resolving growth and natural mortality for shortspine requires reliable age data.

Prioritized recommendations for research and data collection

As the main problem with assessing this stock is the data limitation, the following recommendations focus on enhancing input data.

1) Better age information is needed for this stock. As well as more samples, research is needed on how to age this species accurately.

2) A survey using a towed camera to assess the abundance in deeper water. The proportion of the stock and its size range in deeper water is unknown.

3) More tows or visual surveys south of 34.5 deg. N. lat. including the area closed for cowcod. Because the southern Conception Area is a large potential habitat for thornyheads, more effort is required to define their distribution in this area.

4) Length frequencies for discards are needed. As well, SS2 should be enhanced to include a more sophisticated description of the discard fraction at length.

5) A critical evaluation of the significance at q's for surveys of absolute abundance when they are far from 1, especially those greater than 1.