

## **APPENDIX A3: Chairman and Rapporteur's Report from Working Group Meeting.**

Silver Hake WG Meeting, Oct. 24-28, 2005.

### **Truncation of Older Fish**

A concern was raised that the relatively high spawning stock biomass and low fishing mortality estimates for silver hake are inconsistent with the recent truncation of older, larger fish in the commercial and NMFS survey data. The Working Group also noted that the change in total mortality needed to account for the observed decline in age structure seems unrealistic. The intense fishing effort by foreign fleets during the 1960s and 1970s may have caused such a decline in age structure, but it was noted that recently the age structure does not show expansion despite decades of lower fishing effort. It was observed that the truncation of the older silver hake started in the mid 1980s when survey doors changed, and it was recommended that gear comparisons be reexamined by length.

Ageing error was discussed as one possibility for the recent lack of older silver hake, since sectioning methods and age readers have changed. Attempts to re-age old fish from archived otoliths show that new ages average one to two years younger than original ageing. However, these slight biases do not seem to explain the age truncation seen in the survey, and the older fish in the earlier part of the survey time series also correspond to larger fish than are currently being observed.

The Working Group also discussed the possibility that the older fish in the historical NMFS data could have been miss-identified as offshore hake. In the NMFS spring survey, the distributions of older silver hake roughly corresponded to offshore hake distributions. However, it is not likely that the aged fish are mis-identified since the otoliths are distinct between the two species, and no mis-identified otoliths have been found in recent years. The older fish also seem to fall on the same age-length growth curve as the young silver hake, indicating that they are most likely not offshore hake, although growth curves for offshore hake were not examined. The commercial sample data are not aged. The commercial catch is not sorted by species and may include offshore hake, especially from the area along the shelf edge where offshore hake are often found.

The decrease of large silver hake in commercial landings was discussed by the Working Group, and it was noted that the closure of areas for lobster pot fisheries could be affecting catch composition since large fish were historically caught in these areas. The recent decrease in silver hake landings can be attributed to catch limits implemented in 2001.

### **Stock Structure**

A question was raised about whether the northern and southern silver hake stocks are in fact distinct. The two stocks are within close proximity to each other, and it is thought that some exchange exists between the two areas. However, there is currently no new evidence to refute the current stock structure assumed in management.

The Working Group noted that silver hake recruitment seemed strong in both stocks. Concern was expressed that estimates of fishable biomass of silver hake in the NMFS surveys is

far less in the southern stock than in the northern stock. Several potential explanations were discussed including greater fishing efforts in the south, less thorough coverage of silver hake habitat by NMFS surveys in the south, especially in deep waters, and possible exchange between the Scotian Shelf and the northern stock.

### **Survey and Commercial Data Uncertainty**

Concern was expressed that the catchability of silver hake in the NMFS survey could be variable since silver hake are known to come off the bottom during the day. The point was also made that the decreased catchability during the day could be a net avoidance issue, since the species is a visual feeder. However, the NMFS survey design assumes that strata are sampled randomly during day and night, and catchability is not biased over the time series.

Commercial discard estimates were calculated on a trip basis, but the Working Group discussed examining changing target species between tows. Due to variability between years, small sample sizes, and the belief that target species during a trip would not frequently change, discards were estimated on a trip basis. A recommendation was made to also include catches that are entirely discarded, as well as some fisheries with low discard rates but large landings such as large mesh groundfish. Despite the low discard ratio of silver hake in the groundfish fishery, these discard estimates should be included due to the substantial catch volume.

Depth was found to be a more significant predictor of large silver hake distribution than temperature, and concern was expressed that the NMFS survey does not thoroughly cover deeper habitat. The Working Group noted that interactions should be tested between temperature and depth in GAM models.

### **Population Density Estimation**

The Working Group discussed possible issues for using supplemental survey data to calibrate NMFS survey data. These issues include uncertainty of area swept, diel migration of fish, tow duration, and availability of tow-specific sensor data. These concerns merit further research. The analysis would benefit from controlled side-by-side tows involving both vessels. Estimates were only applied in the southern region where the surveys overlapped.

Three methods were presented to calculate an expansion factor of silver hake density between NMFS and supplemental surveys, and the viability of each method was discussed. Small sample sizes were a concern for all of these models. The first method estimated a median density by year and strata in order to obtain a ratio of relative fishing power, but was inefficient in utilizing the available data. The second method was to use a conventional ratio estimator. The bootstrap estimates of precision for this method show substantial bias due to small sample size. A third regression method using density by tow was performed in order to use the survey data most efficiently and account for depth and other effects. The regression method had the narrowest confidence intervals, and was agreed to be the best model using the supplemental survey data.

Finally, a catch-survey ratio method was applied to both stock areas. This method gives a reasonable minimum biomass estimate since the catch in the years of greatest fishing effort cannot exceed the total biomass. Concerns were expressed that the bootstrap results from this method do not reflect all of the uncertainty since a constant catchability is assumed, and a minimum estimate of biomass is not comparable between years. Do to the difficulty in

comparing this assessment to previous years and the potential to ignore missing older fish, it was recommended that future assessments be based on model-based assessments.

**Research Recommendations:**

- A study be conducted to verify silver hake species identification with port agents, and to take additional age samples of larger commercial silver hake.

-The presence of silver hake in stratum 99 of NMFS surveys as well as in special deepwater surveys needs to be examined in order to determine if the NMFS survey is missing silver hake in deeper waters, and if additional tows in existing NMFS deep water stations would be beneficial. All available surveys that cover depths in excess of NMFS surveys should be examined for the distribution of silver hake.

-Acoustics data could be examined to augment silver hake distributions.

-Review effects of gear changes in NMFS survey on catchability of silver hake by size.

-Devise a method to cast the current survey based reference points into a form that is compatible with abundance indices derived from the new vessel.

-A study needs to be conducted to determine the extent of movement along the coast, especially around Georges Bank.

-The next assessment be based on an age-structure model, and reference points be derived from model results.

**Sources of Uncertainty:**

-There is uncertainty in the aging precision of silver hake from NMFS surveys due to changes in sectioning methods and age readers.

-Offshore hake could be incorrectly identified as silver hake, especially in commercial data.

-Gear changes in NMFS survey could affect catchability of silver hake over time.

-There is uncertainty as to whether silver hake is appropriately divided into two stocks.

-The NMFS surveys may have reduced catchability and coverage in deep water, and may not capture a good representation of the larger silver hake.