ACSSWG Research and Monitoring Priorities (Draft for Peer Review)

Purpose: A prioritized tabulation of data collection and research recommendations for the cod stock structure peer review panel to consider in their own recommendations.

High priority or short term recommendations

- Simulation testing the performance of alternative management procedures for meeting fishery management objectives, in which the operating model(s) reflect the most likely scenario(s) of population structure and alternative management procedures include the current stock boundaries, alternative stock boundaries, and intermediate approaches (e.g., spawning closures, stock composition monitoring). This will ideally occur before the 2023 research track assessment of cod.

- Additional research to clarify the genetic stock structure in eastern Gulf of Maine where there are no spawning cod. Avenues for such research include analysis of historical otolith samples (some research ongoing), and mixed-stock analyses of juveniles and adults. The eastern Gulf has been understudied and it is difficult to obtain relevant samples from this area because of the depletion of its historical spawning grounds. Its assignment as a separate stock is the least certain.

Medium priority or medium term recommendations

- The source of cod larvae and juveniles in the Great South Channel and Southern New England, as well as the fate of spawning in these areas. These spawning locations and settlement areas have not yet been the subject of dispersal modeling studies, and would provide valuable early life history information of these areas of uncertainty with respect to stock structure.

- More samples and studies to clarify the connectivity between Cape Cod and the western Georges Bank (the area east of the Great South Channel) in order to determine the boundary between these regions. It is currently unclear if this boundary occurs in the 68^{o}W or 69^{o}W area.

- Develop tools for rapid assessment of spring and winter spawners in the western Gulf of Maine. The ACSSWG has identified tools related to otolith morphology, a natural marker, and genomics, a genetic marker. The priority of this task could be higher depending on whether mixed-stock discrimination for managing the fishery catch in the southwest Gulf of Maine is required.

Lower priority or longer term recommendations

- Continue biological monitoring of growth and maturity dynamics, because there are interesting long-term trends evident in both management units. Life history samples are

monitored as part of the assessment process, so at this time, no special effort is needed to continue this, assuming stable budgets. Analysis of surveys other than the NOAA's bottom trawl survey is also warranted, especially in areas identified here as having small sample sizes (e.g., southern New England, downeast Maine).

- Interview those with local ecological knowledge regarding cod spawning and movement in southern New England. Although categorized as a low priority, this is a low-cost research approach in an area with small samples from fishery-independent sources, and therefore a good value.

- Additional use of natural markers is promising because of previously successful applications in documenting spatial variation, and these may be low-cost if done cooperatively with the fishing fleets.

- More electronic tagging of spawning groups (e.g., as done in Massachusetts Bay) to understand spawning dynamics.

- Integrated analysis of genetics and electronic tagging data to investigate different behavior and seasonal movement patterns among genotypes.