# Appendix B.
## (of "C. Atlantic Surfclam" SARC-37 Report):

**A Review of Invertebrate Subcommittee meeting, 14-16 April 2003 –** *Spisula solidissima*
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The purpose of the meeting was to review the information and methods available for the SARC 37 surfclam stock assessment. This document describes my views, as an outside observer, of the effectiveness of the stock assessment process, in terms of both procedure (representation, meeting process) and scientific quality (biological and fisheries data, analytical approach).

The procedural aspects of the meeting could not be faulted. The agenda was clear and comprehensive, and sufficient relevant information was presented on each agenda item to allow in depth discussion of the scientific and technical issues. The presence of surfclam fishing industry representatives was a huge benefit for the meeting, particularly when it came to discussing technical issues of dredge and vessel performance. Wide industry participation at such meetings should certainly be encouraged in the future.

The science presented at the meeting was also of a very high standard. There were two principal themes for the discussions. Firstly, the meeting focused on the annual research surveys of surfclams, particularly the technical aspects of converting survey catch rates to biomass density estimates in the light of information on dredge performance and efficiency. Secondly, the meeting considered how this survey information can be used together with data on fishery removals to estimate historical trends and current status of both stock and fishery.

Discussions on the research surveys concentrated firstly on how best to use dredge sensor data (principally inclinometer and pump flow measurements) to judge when the survey dredge was fishing effectively. This is important for determining the effective area from which a survey catch is taken. Rigorous, in depth discussions resulted in a agreed criteria for determining the start and finish positions of a survey tow, with dredge performance between these positions considered to be a component of dredge efficiency. Information on survey and commercial dredge efficiency was drawn from a number of experiments and analyses. These included use of the new patch depletion model – an innovative and sophisticated approach for making best use of the available information. Some uncertainty about survey dredge efficiency remains, since estimates differ somewhat between the sources. However, discussions at the meeting led to the placing of effective bounds on the range of possible variation through comparison of the performance of research and commercial vessels. An important outcome of this meeting will be that the swept area biomass estimates for surfclams are as scientifically rigorous and defensible as is possible given the current survey data.

The research survey data are used to 'tune' the analytical assessment model. This is the 'KLAMZ' delay-difference model, a sophisticated forward simulation approach using fishery and survey data together with information on growth. The (provisional) outcome of the model shows a similar current surfclam stock status to the previous assessment (SARC 30), but a very different view of historical stock trends. This outcome is encouraging in the sense that recent biomass estimates appear to be robust to model assumptions. The updated view of historical trends is certainly plausible given the survey data, and probably the is best that is possible given the current state of understanding. However, some problems with the model were identified, such as the difficulty in modelling the fishing down of the older age groups and the sensitivity to assumptions about recruitment. Taken together, these difficulties indicate that there is still much uncertainty about historical stock trends. Critically, the

assessment also needs to reconcile the marked difference between modelled and observed trends in recent LPUE.

The suggested way forward for analytical assessment is to use explicitly age-based models. Besides moving away from some of the difficulties in defining growth within the 'KLAMZ' model, an age-based approach would be more transparent to all stakeholders in the assessments. Age in surfclams is readily determined and the introduction of routine age determination for fishery catch samples (as opposed to inferring age from size) would further facilitate the use of explicit age-based assessments in future. It will also be important to consider spatial patterns in both population processes and exploitation. Spatial patterns are important because fishery trends may be influenced by the targeting of high catch rate areas within a sedentary stock, and because locally acting and density-dependent factors may be very significant for bivalve population dynamics. Consideration of spatial factors (and gear width) in analyses of commercial CPUE will be helpful in this context. Interpretation of survey and fishery data also needs to take place in relation to what is considered 'normal' population behaviour. For example, are zero catches in recent research surveys in the inshore and southern stock areas a cause for concern? Or, are they merely a consequence of the temporal and spatial dynamics of recruitment in surfclams? The time series of age-composition and abundance data from the research surveys represents a substantial resource for investigating the temporal and spatial scales at which year class strength varies. It may be crucial to determine the influence of environmental factors on this variation – are recent temperature trends likely to change the long-term geographic range of successful reproduction in surfclams?

In summary, the assessment process witnessed at this meeting was of very high quality. The meeting was conducted in a spirit of rigorous science with free and frank discussion of its limitations. The assessment results represent the best current scientific understanding of the status of surfclam stocks. Some areas for future progress were nevertheless identified, indicating a continuing positive trend in the state of surfclam assessment science.


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