

APPENDIX 1 THE PEER REVIEW OF THE 2002 LCS STOCK ASSESSMENT

NOAA Fisheries announced the availability of the LCS stock assessment on October 17, 2002 (67 FR 64098). At that time, NOAA Fisheries submitted the stock assessment and the related documents to Natural Resources Consultants, Inc. (NRC) to be independently reviewed per the peer review process outlined in the settlement agreement with Southern Offshore Fishing Association *et al* (SOFA). NRC selected three independent parties to conduct the peer review: Dr. Terry Quinn II, Dr. Kim Holland, and Dr. Dayton L. Alverson. The names of the reviewers were not disclosed to NOAA Fisheries, SOFA, or the public until the review was complete. The entire peer review process was completed on December 20, 2002, after the emergency rule and its accompanying documents was finalized. Copies of the peer reviews are available on the web at <http://www.nmfs.noaa.gov/sfa/hmspg.html> or by contacting Karyl Brewster-Geisz at (301) 713-2347.

Overall, the peer reviews concluded that the models and methodology used in the 2002 LCS stock assessment were appropriate. Thus, the peer reviews reaffirmed NOAA Fisheries determination that the 2002 LCS stock assessment constitutes the best available science. Because the peer reviews do not find any fundamental errors or flaws in the 2002 LCS stock assessment, the results of the peer reviews did not change NOAA Fisheries' decision to implement the management measures in emergency rule. The peer reviews will also be considered in Amendment 1 to the HMS FMP.

The executive summaries of the three reviewers, as submitted to NOAA Fisheries, are below.

Executive Summary of Dr. Quinn II:

My review of the 2002 assessment of large coastal sharks suggests that a state-of-the-art was performed using the best scientific information available. Alternative datasets were constructed for catch to represent the uncertainties in the data. Several indices of abundance were compiled and used in the assessment with two weighting systems. Six alternative stock assessment models were evaluated, and five of these were used in the stock assessment document. Alternative harvest policies from no catch to 150% of the year 2000 catch were contrasted, and management implications were discussed.

The stock assessment results show that there is great uncertainty in estimates of abundance, fishing mortality, and management parameters such as MSY. This difficulty can be traced to and high variability, uncertainty, and conflicting information in the data. The stock assessment wisely uses Bayesian analyses to provide an objective, albeit uncertain, assessment of stock status.

The stock assessment concludes that the condition of sandbar and blacktip sharks is good. Using "inference by subtraction", it concludes that there is no evidence that some species in the LCS complex may be in a poor condition. The declines in some of the

indices of abundance since the 1970s and 1980s mean that these results from the assessment of the LCS complex may actually be valid. The problem is that the stock assessment did not examine individual species to see where the problems may lie. Whether there is sufficient information on which to take management action depends on the level of risk one is willing to accept. There is neither positive proof of an effect on the complex nor positive proof of no effect. It should be noted that many shark species have low productivity and are long-lived, so that failure to take action could result in long-term depletion of some species.

Improvements to the assessment can be made in the future. Further investigation of indices should be undertaken. Assessments should be done for more species or species groups in the LCS complex. Further investigation of age and age-sex-area models should occur. Investigation of alternative and robust harvest policies in contrast to the current constant-catch policy should occur in the future.

Executive Summary of Dr. Holland:

This review covers material (methods, results and recommendations) contained in both the 2002 Shark Evaluation Workshop Report (SEW) and the subsequent 2002 Stock Assessment (SA). The evaluation was based on a careful review of these documents and the accompanying background literature. In addressing specific items contained within the Scope of Work, particular emphasis was placed on evaluating the way in which the 2002 SEW and 2002 SA responded to the recommendations of previous independent reviews of the 1998 SEW.

I find the 2002 SEW to be a good faith effort by NMFS to address the various criticisms and concerns that were raised regarding the methods, results and recommendations of 1998 SEW. The scope of work of the various 2002 SEW working groups represented a logical approach to providing the best available scientific data for the various analyses and their subsequent interpretation. The current analyses incorporated several substantive changes or additions to those of the 1998 SEW. Many of these changes were in accord with the suggestions of previous reviewers and included age-structured models, models that consider delayed recruitment of animals into the fishery and models that attempt to capture the potential differences in responses to exploitation of open versus closed populations, among others. Recently acquired biological data (e.g., juvenile survival rates) were incorporated into the analyses. Also, considerable effort was expended in trying to reconstruct historical catch rates to provide longer time series. As suggested by reviewers of the 1998 SEW, sensitivity analyses were applied to the results of the various models. In the 2002 iteration, the weighting and importance functions are explicitly described as are the other criteria used for evaluating which results make 'more sense' than others do. As suggested by commercial shark fishing interests, estimates of the Mexican catch were incorporated into the models.

The 2002 SEW and the Stock Assessment are scientifically rigorous bodies of work. These exhaustive attempts to include the multiplicity of recommendations from previous reviews are almost self-defeating; so many permutations were considered that the assessment document is cumbersome and difficult to digest. Fortunately (or unfortunately), there is an overwhelming consistency to the results; the LCS resources of the Western Atlantic and Gulf of Mexico have been exploited beyond sustainable rates and populations are at or below levels required to sustain MSY. Recent management restrictions may have halted the decline in these stocks but current exploitation rates will not stabilize them at (or allow them to rebuild to) MSY levels. These results are consistent with the results of the 1998 SEW. The reliability of the models and their pertinence to stock management continue to be impacted by the paucity of historical catch data and uncertainty about the reliability of certain data sources. However, I find that the catch levels recommended in the 2002 Stock Assessment follow logically from the results that were presented in the document especially when viewed in light of the Precautionary Approach to resource management. To improve future stock assessments, NMFS should support on-board observer programs and programs (e.g., VIMS, Mote, NMFS-Mississippi) that acquire fishery independent estimates of abundance. Movement and habitat utilization research should be high priorities.

Executive Summary of Dr. Alverson:

The author found some difficulty in relating the work of the SEW to the subsequent major stock assessment document undertaken by the NMFS and it was not always clear whether NMFS had followed the suggestions of the SEW in regard to procedures and recommended mixing rates between the U.S. and Mexico stocks and other potential out migrations. Nevertheless, in my opinion, the works of the 2002 SEW and the NMFS are highly professional in character, management recommendations contained in the 2002 SEW and NMFS (Sept.) documents are based on appropriate fisheries stock assessment techniques and that the scientist based their conclusions on relevant available science. The major effort of the 2002 SEW and NMFS efforts were dedicated to responding to comments made by independent scientists regarding the information base, the need to standardize data sets, underlying assumptions used and the legitimacy and nature of the models employed. In this regard the SEW/NMFS scientists have undertaken an exhaustive effort to organize and reassemble the catch data to include information on catches in Mexico and bycatch mortality, standardize data sets and extended the modeling to include age dependent data and open populations. In addition, a range of statistical methods has been employed to evaluate the model's sensitivity to different inputs and to examine model performance. These efforts demonstrate a very real commitment to respond to earlier identified problems noted by industry and outside reviewers. In my view, the SEW/NMFS scientists provide a range of projections upon which managers can precede with appropriate measures to maintain the sustainability of the LCS resources. Since the comments on the status of stocks and the need for potential management actions is only found in the NMFS document it is not clear how

the SEW members have or would have responded to the NMFS generic management comments. This reviewer is in general agreement with the findings and recommendations of the SEW/NMFS 2002 reports.

In the future, work of the SEW should be completed at the time of the meeting of the selected SEW scientists and not dependent on work subsequently done outside the SEW by any party. It is suggested that over the next several years the scientists concentrate on improving life history, taxonomic and behavioral aspects of important LCSs. Some attempt to examine open and closed populations should consider the probability of recovery. In the LCS group, reductions in the TAC of species other than sandbar and blacktip sharks should be considered, as proposed by the NMFS. For sandbar and other sharks further reductions in fishing related mortalities should be achieved through the decrease of bycatch mortality and/or increasing the survival of sharks caught as bycatch in non-target fisheries. The possibility of increasing the catch of blacktip sharks should be carefully examined. Considering the uncertainty in some of the CPUE indices, perhaps the TAC should remain unchanged and the trend in the population reviewed over the next several years.