

**PEER REVIEW REPORT OF THE  
2004 ICCAT PELAGIC SHARK ASSESSMENT MEETING**

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*SUMMARY*

*Pelagic sharks are an important by-catch of longline fisheries that target tunas, billfish and swordfish. The SCRS Sub-Committee on By-catches began an assessment of pelagic sharks in 2001. A preliminary data meeting was held in Halifax, Canada, in September 2001. The assessment meeting was held in Tokyo in June 2004. This report provides a peer review of the 2004 stock assessment session.*

*RÉSUMÉ*

*Les requins pélagiques constituent une prise accessoire importante pour les pêcheries palangrières qui ciblent les thonidés, les istiophoridés et l'espadon. Le Sous-comité des Prises accessoires du SCRS a lancé, en 2001, une évaluation sur les requins pélagiques. Une réunion préliminaire sur les données a été tenue à Halifax, Canada, en septembre 2001. La session d'évaluation a eu lieu à Tokyo, au mois de juin 2004. Le présent rapport fournit un examen par des pairs de la session d'évaluation de stock de 2004.*

*RESUMEN*

*Los tiburones pelágicos son una importante captura fortuita de las pesquerías palangreras dirigidas a los túnidos, marlines y peces espada. El Subcomité de capturas fortuitas del SCRS comenzó una evaluación de tiburones pelágicos en 2001. Se celebró una reunión de preparación de datos en Halifax, Canadá, en septiembre de 2001. La reunión de evaluación se celebró en Tokio en junio de 2004. Este informe proporciona una revisión por pares de la sesión de evaluación del stock de 2004.*

*KEYWORDS*

*Stock assessment, Peer review*

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## 1. Background

Pelagic sharks are an important by-catch of longline fisheries that target tunas, billfishes and swordfishes. The SCRS Sub-Committee on By-catches began an assessment of pelagic sharks in 2001. A preliminary data meeting was held in Halifax, Canada, in September 2001. The assessment meeting was held in Tokyo in June 2004.

## 2. Appropriateness of the discussions and analyses in terms of the meeting's objectives

The objective of the meeting was to conduct stock assessments of Atlantic blue shark and shortfin mako stocks. To this end the Working Group discussed a broad range of topics in relation to the assessment of blue shark and shortfin mako. Since this was the first assessment meeting for pelagic sharks undertaken by ICCAT, basic topics such as descriptions of fisheries, stock structure, and biological parameters were initially covered. These discussions were necessary for the Group to agree on the extent of the assessments and the data required for them.

A broad range of data was presented in documents at the meeting covering biological and fishery related topics. Although many documents and data were presented, there remains a high level of uncertainty about the input data required for assessments of blue and shortfin mako sharks in both the North and South Atlantic.

Biological data are incomplete for both species. In particular the Working Group identified the fact that there are conflicting data on the periodicity of mating in blue shark and shortfin mako. The resolution of this input is important for several of the modeling approaches as it changes population increase rate due to the close relationship between stock and recruitment in elasmobranchs. The Working Group also noted the lack of age and growth data for shortfin mako Atlantic-wide. As a result they had to rely on age and growth estimates for the shortfin mako from the Pacific.

The Working Group identified the need for a significant improvement in the accuracy of the historic catch data for pelagic sharks as those reported to ICCAT (especially those prior to the mid 1990s) were not believed to adequately represent actual catches. As a result, considerable time and effort were spent discussing and implementing methods for estimating the catches of pelagic sharks since 1971. Several methods were trialed based on fleet-specific ratios between tuna and swordfish catches (which are well reported) and shark catches. Different assumptions resulted in very different historic catch estimates. I believe that the two resulting catch series provided a reasonable first approximation of pelagic shark catches. Further work to refine the reconstruction of the historic data is recommended.

A number of CPUE time series were presented to the Working Group for use in population models. These series were divided into wide-ranging and small-scale. It was agreed that only wide-ranging series would be used in the assessments as these would most likely represent changes in abundance for pelagic sharks that are highly migratory. Small-scale series were not considered as they are subject to much great influence of year-to-year changes in environmental parameters. The selection of CPUE series for input to the assessments was appropriate.

The Working Group applied assessments to blue shark and shortfin mako separately for the North and South Atlantic. This decision was based mostly on the outcomes of tagging studies that show little movement from the North Atlantic to the South Atlantic. There remains a considerable degree of uncertainty about the stock structure of both species that further research will be required to resolve.

The meeting considered four types of assessment framework – demographic, surplus-production, age-structured and “catch-free.” Given the gaps in the available data the use of a wide selection of assessment types provided a diverse view of potential outcomes. This provided the Working Group with different interpretations of the data. This approach was appropriate given the uncertainties in the input data.

The Working Group discussed the prior distribution of carrying capacity (K) for the production models. Initial runs of the model with a maximum boundary of 1,000,000 t resulted in most runs not converging. The selection of this upper bound occurred before the revised catch estimates were made. Since the revised catches were substantially higher than the previously used data, the use of a higher maximum bound was more appropriate. Re-running the models with a maximum boundary of 10,000,000 t improved model performance, but did not fully resolve the issue of model convergence.

### **3. Soundness of the main conclusions**

The meeting's conclusions were consistent with the outcomes of the assessments completed. The results for blue sharks support the conclusion that in both the North and South Atlantic the stock biomasses are unlikely to have been depleted below that required to produce MSY. Similarly, the results for the shortfin mako in the South Atlantic support the conclusion that biomass depletion has been relatively small. In the North Atlantic, however, the results are less parsimonious. The "catch-free" analysis indicates a decline in biomass, possibly below that required to achieve MSY, while the surplus production model results suggest less of a decline.

The Working Group concluded that given the uncertainties associated with the input data for the models that the results for both species should be considered preliminary and extremely uncertain. The conclusions of the Working Group were sound.

### **4. Future research and data collection**

All of the assessment approaches used by the Working Group were limited to some degree by a lack of data. There is a need for further compilation of historic data, particularly as it relates to catches. Biological data are mostly available for both the North and South Atlantic, but there were questions about periodicity of breeding in both blue sharks (1 vs. 2 years) and shortfin mako (2 vs. 3 years). The estimation of age and growth parameters of shortfin mako in the Atlantic are required. Hypotheses about the movement patterns within both the North and South Atlantic were discussed. Work towards a detailed understanding the movement patterns should continue, but should not be a high priority as the current assessment techniques do not allow spatial disaggregation. However, the use of tagging data to estimate fishing mortality should be pursued as a priority as it may prove useful in the absence of detailed historic catch data. The estimation of fishing mortality rates should also assist in resolving problems associated with the maximum boundary for carrying capacity in the production model assessments.

The Working Group considered the results from four types of models. The demographic and "catch-free" models in the short-term may provide the best indication of the status of stocks due to their more limited data requirements, especially in relation to historic catches. However, in the longer-term, when improved catch data are available, the production and age-structured models will allow more complex investigation of management scenarios. The complex spatial dynamics of blue shark and shortfin mako make the development of spatially disaggregated models an attractive option. The data requirements of this style of model will, however, delay their development and implementation. I would not recommend such an approach until issues relating to the accuracy and adequacy of input data for the current models have been resolved.