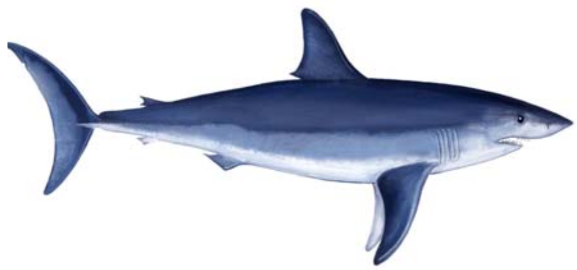
RECOVERY POTENTIAL ASSESSMENT REPORT OF SHORTFIN MAKO SHARKS IN ATLANTIC CANADA



Context

In April 2006, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated the Atlantic population of shortfin mako sharks (Isurus oxyrinchus) as threatened, and the government is now considering its addition to Schedule 1 under the Species at Risk Act (SARA). Decisions made on permitting of incidental harm and in support of recovery planning need to be informed by the impact of human activities on the species, alternatives and mitigation measures to these and the potential for recovery. An evaluation framework, consisting of three phases (species status, scope for human - induced harm and mitigation) has been established by DFO to allow determination of whether or not SARA incidental harm permits can be issued. This framework is used as a basis for decisions relating to the recovery planning of shortfin sharks.

SUMMARY

- Population abundance in the North Atlantic has declined since the 1970s, but has been relatively stable since the late 1980s. Length frequencies indicate that there has been a decline in abundance of larger shortfin makos in the Canadian fishery.
- Shortfin mako bycatch by foreign fleets in the North Atlantic is the most significant source of mortality for the population. While it is unlikely that a reduction in bycatch of shortfin makos by the Canadian pelagic longline fishery would have any detectable or biologically significant influence on the population, it would be prudent not to exceed 100t annually. International efforts to reduce cumulative impacts are required to promote recovery.
- As a precautionary measure, commercially-caught makos could be released alive as a measure to reduce mortality.
- Monitoring of mako population status in Canadian waters would require a fishery-independent shark survey, plus length and sex measurements of the catch.

BACKGROUND

Rationale for Assessment

The Species at Risk Act (SARA) provides legal protection to species listed in Schedule 1 and it is anticipated that prohibitions under SARA will soon apply to shortfin mako sharks in Canadian waters. Activities that would harm the species are prohibited and a recovery plan is required. Until such a plan is available, section 73(2) of SARA authorizes competent Ministers to permit otherwise prohibited activities affecting a listed wildlife species, any part of its critical habitat, or the residences of its individuals. Under section 73(2) of SARA, authorizations may only be issued if:

(a) the activity is scientific research relating to the conservation of the species and conducted by qualified persons;
(b) the activity benefits the species or is required to enhance its chance of survival in the wild; or
(c) affecting the species is incidental to the carrying out of the activity.

Section 73(3) establishes that authorizations may be issued only if the competent minister is of the opinion that:

(a) all reasonable alternatives to the activity that would reduce the impact on the species have been considered and the best solution has been adopted;
(b) all feasible measures will be taken to minimize the impact of the activity on the species or its critical habitat or the residences of its individuals; and
(c) the activity will not jeopardize the survival or recovery of the species.

Decisions made on permitting of incidental harm and in support of recovery planning need to be informed by the impact of human activities on the species, alternatives and mitigation measures to these activities, and the potential for recovery. An evaluation framework, consisting of three phases (species status, scope for human–induced harm and mitigation) has been established by DFO to allow determination of whether or not SARA incidental harm permits can be issued. The analysis provided here will support decisions relating to the listing of shortfin mako sharks and their recovery planning. In the context of this report, “harm” refers to all prohibitions as defined in SARA.

Species Biology

Shortfin mako (*Isurus oxyrinchus*) is one of two shark species in the genus *Isurus* and one of five species in the family Lamnidae or mackerel sharks. Since longfin makos are rare in Canadian waters, misidentifications within the genus have probably been minimal, but in Atlantic Canada, shortfin makos have at times been misidentified as porbeagle shark.

Shortfin makos are known to migrate over long distances throughout the north Atlantic. In Canadian Atlantic waters, the shortfin mako is typically associated with warm waters such as those associated with the Gulf Stream. They have been recorded from Georges and Browns Bank, along the continental shelf of Nova Scotia, the Grand Banks off Newfoundland and into the Gulf of St. Lawrence. Shortfin makos in Atlantic Canada are considered to make up no more than 2-3% of the Atlantic population (which is the Designatable Unit (DU)).

Shortfin makos prefer temperate to tropical waters with temperatures between 17-22°C. They occur from the surface to 500 m depths and typically well offshore, but shortfin makos have occasionally been observed in littoral zones. They feed on fish and marine mammals.

Shortfin makos have a moderate growth rate and a lifespan of about 30 years. Males reach sexual maturity in 7-9 years at lengths between 2.0-2.2 m, but females do not mature until they are 19-21 years old and between 2.7 – 3.0 m in length. Shortfin makos are ovoviviparous and have a 15-18 month gestation period. Females give birth to an average of 11 young every 3 years. These life history characteristics imply that makos are somewhat more productive as a species than are porbeagle, but less productive than blue sharks. Mature females and young of the year are rarely caught in Canadian waters.

ASSESSMENT

Trends and Current Status

There are no shark surveys or fishery-independent surveys for shortfin mako in Canadian waters. Therefore, abundance indices are based on data from commercial or recreational fisheries.

Japanese and Canadian pelagic longline catch rates showed no evidence of a significant change in abundance between 1988 and 2005 (Figure 1). However, due to small sample size and high variance, this analysis would have been unable to detect anything other than a severe change. Length frequencies indicate that there has been a decline in abundance of larger shortfin makos in the Canadian fishery.

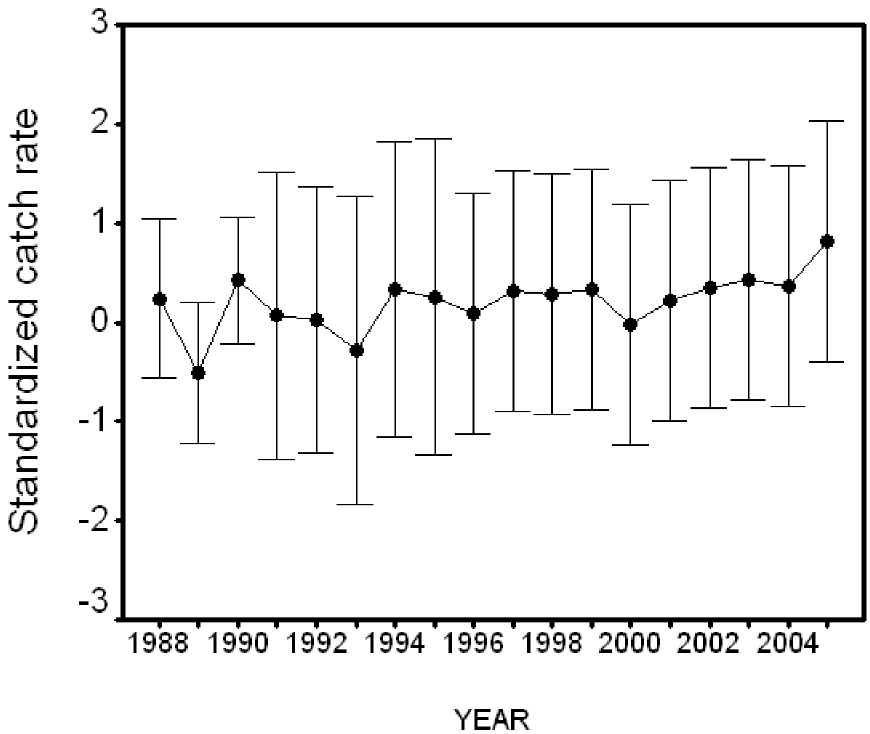


Figure 1. Standardized trip-level catch rate (kg/hook) of shortfin mako sharks caught by pelagic longliners on the Scotian Shelf between 1988 and 2005. Data were restricted to Japanese longliners targeting bigeye tuna between Oct-Dec of 1987-99 and Canadian longliners targeting swordfish between July-Sept of 1996-2005. The GLM model was fit to non-zero trips using a gamma error distribution and with Year and Vessel as factors. Error bars represent 1 SE around the mean.

Because shortfin mako in Atlantic Canadian waters represent the margins of their distribution, catch rate trends in Canadian waters may be influenced by factors other than abundance. For this reason, analyses representing a larger spatial scale present a more accurate picture of the population. U.S. catch rates in the Northwest Atlantic suggested a 40% decline in abundance since 1986 (Baum et al. 2003) (Figure 2). This needs to be interpreted with caution because the analysis was not based on the full range of available international data (Burgess et al. 2005).

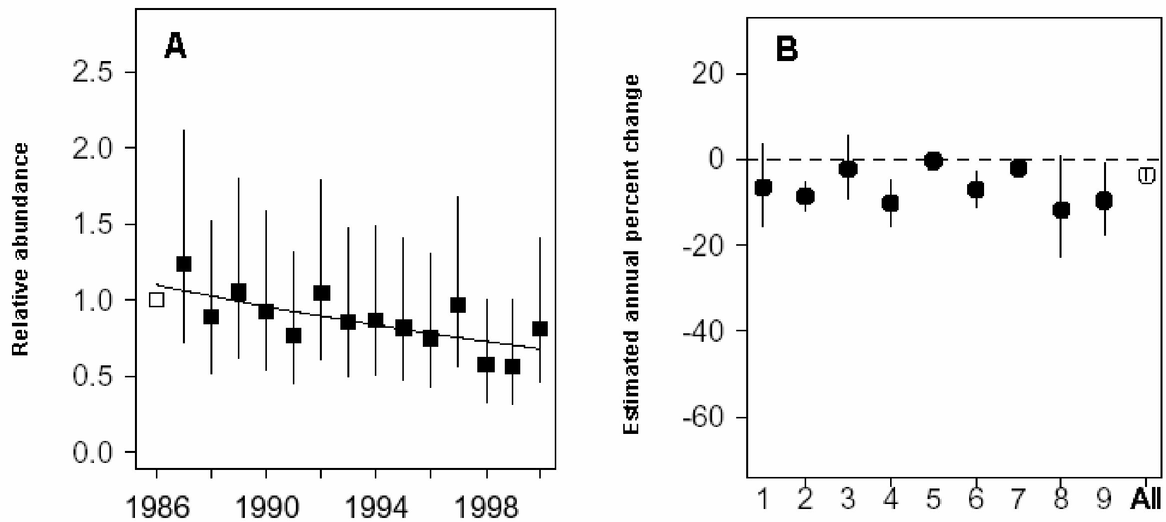


Figure 2. (A) Relative abundance of shortfin mako in the entire west Atlantic indicated by an analysis of U.S. commercial longline fishery logbook from 1986-2000 (decline of 40%); (B) estimated annual rate of change for nine assessment areas and total. Areas 6 and 7 refer to the areas south of Nova Scotia and around the Grand Banks, respectively. From Baum et al. 2003.

An International Commission for the Conservation of Atlantic Tunas (ICCAT) analysis of catch rate trends from several countries in the North Atlantic concluded that shortfin mako abundance may have declined by about 35% between 1971-2003 (ICCAT 2005) (Figure 3). Current spawning stock biomass relative to pre-exploitation conditions (SSB/SSB_0) was estimated to be about 0.32 (ICCAT 2005), below the 0.50 level that would be expected at maximum sustainable yield (MSY). Due to concerns over the quantity and quality of the information that was available, the assessment was described as very preliminary and current status uncertain (ICCAT 2005).

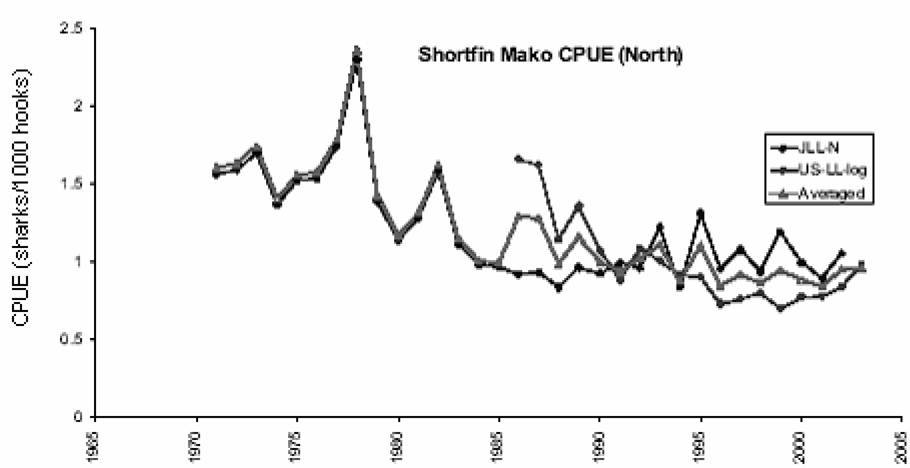


Figure 3. Indexed CPUE of shortfin mako in the North Atlantic from the Japanese longline fleet (JLL) and United States longline fleet (USLL). Source: ICCAT 2005a.

Recovery Targets

Reference points to characterize recovery have not been developed for shortfin mako. One possible recovery target is that proposed by ICCAT (2005): one half the virgin spawning stock biomass (SSB_0). Although this is a very cautious recovery target, and there is large uncertainty associated with virgin biomass estimates, it is consistent with the Cautious-Healthy boundary of the Precautionary Approach Framework being established by DFO (DFO 2005).

Recovery Potential

Based on life history characteristics, the recovery potential of mako appears to be better than that of porbeagle, but not as good as that of blue shark.

Given the small percentage (at most 2-3%) of the population in Canadian waters, recovery targets will not be reached without a reduction in shortfin mako bycatch by international fisheries (e.g., Spain, Portugal, U.S.). Although Canadian effort peaked in the mid-1990s, it has been declining steadily to the present and is currently near the lowest levels observed since 1994 (Figure 4). The low fishing effort in the 1970s and 1980s was due to concerns about mercury levels in swordfish. In contrast, effort in the North Atlantic pelagic longline fishery increased steadily between 1955 and 1997 (Figure 5).

It appears unlikely that a reduction in bycatch of shortfin makos by the Canadian pelagic longline fishery would have any detectable or biologically significant influence on the population. International efforts to reduce cumulative impacts are required to promote recovery.

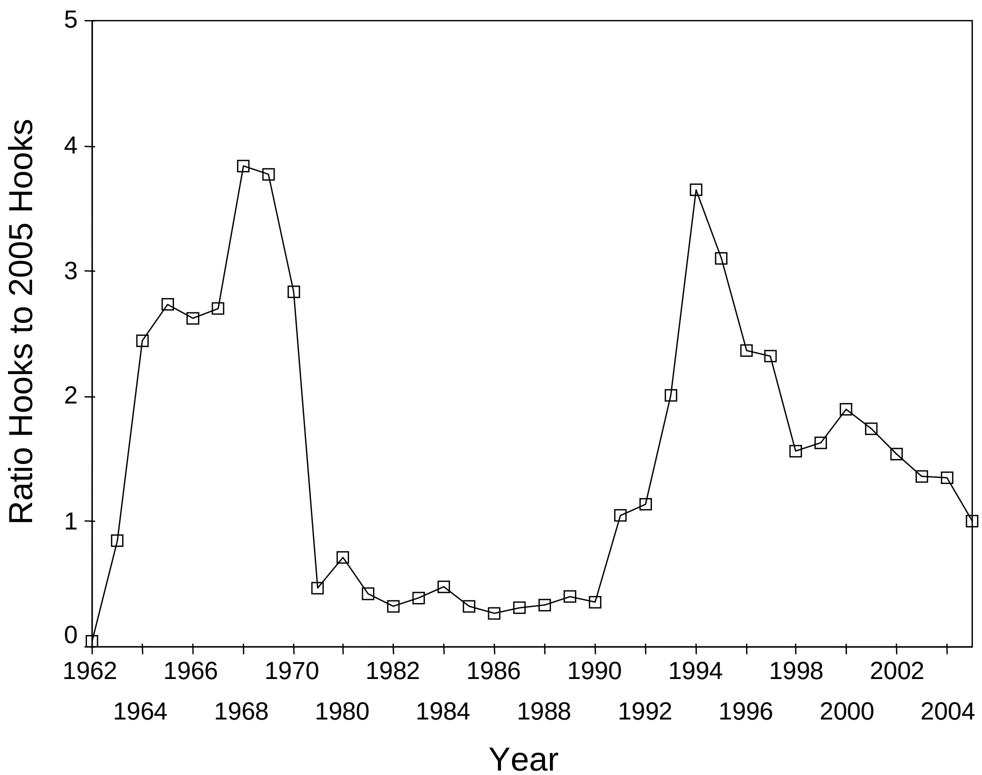


Figure 4. Trend in effort for the Canadian North Atlantic longline fleet (1962-2005).

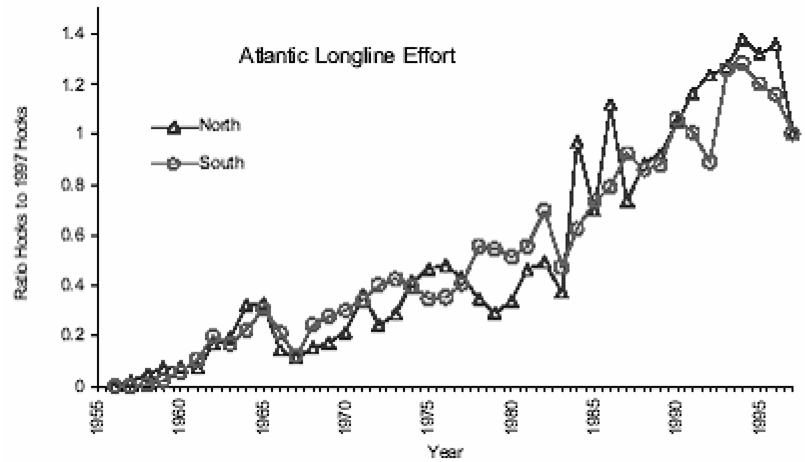


Figure 5. Trend in effort for the North Atlantic longline fleet (1956-1997). Source: ICCAT 2005a.

Sources of Uncertainty

Although it is known to be small, the percentage of the mako population found in Canadian waters is unknown. The relationship between abundance trends in Canadian waters and overall population abundance is also unknown.

In the absence of historical baseline population abundance information, it is difficult to estimate recovery targets.

There is considerable uncertainty around estimates of the current population size and trajectory. Population abundance relative to the recovery target is poorly estimated.

Although mako sharks are suspected to have high levels of contaminants in their tissues, the effects of these contaminants are unknown.

Allowable Harm / Provisions of Recovery Plan

High exploitation rate is the only cause for the apparent decline in population size that has been identified for shortfin mako.

There is no directed fishery for shortfin makos in Canadian waters, with most of the catch coming from bycatch from pelagic longline fisheries, especially the swordfish fishery. Mako typically make up less than 2-3% of the pelagic longline catch by weight, with relatively little discarding. Landings reported from Canadian vessels have averaged between 70 and 80 t per year from 1998 to 2004, with a slight increase to 92 t in 2005. Most Canadian bycatch is taken by Scotia-Fundy vessels in swordfish and fixed gear groundfish fisheries. Since 1999, there have been no international longline fisheries in Canadian waters. Recreational catches of shortfin makos are minor with only a few sharks landed per year.

Nominal landings of shortfin makos in the North Atlantic averaged about 2900 t annually since 1997. These landings are believed to be underestimates due to underreporting by some foreign fleets. Thus, the Canadian catch is at most 2-3% of the total.

Estimates of allowable harm could not be calculated. Both catches and fishing effort by the Canadian pelagic longline fishery peaked in the mid-1990s, with no apparent effect on population status. However, it would be prudent not to exceed the roughly 100 t average catch of these years. Catch levels at or below these values are unlikely to have a detectable or biologically significant effect on population recovery. To be precautionary, live release of all commercially-captured makos would further reduce mortality. There are neither mating areas nor nursery grounds in Canadian waters, so there are no sensitive habitats to protect.

As top predators, makos bioaccumulate chlorinated hydrocarbons and other contaminants in their tissues. Although it is possible that these contaminants are having an adverse effect on mako shark physiology, there is no obvious means through which this contaminant load could be minimized.

Currently, the ability to monitor population status is dependent upon commercial catch rates, which is a fishery-dependent activity. A fishery-independent shark survey could provide an index of abundance for makos and other sharks and thus monitor population recovery. Such a survey would also detect any changes in the proportion of the mako population resident in Canadian waters.

CONCLUSIONS AND ADVICE

Population abundance in the North Atlantic has declined since the 1970s, but has been relatively stable since the late 1980s. Length frequencies indicate that there has been a decline in abundance of larger shortfin makos in the Canadian fishery.

Shortfin mako bycatch by foreign fleets in the North Atlantic are the most significant source of mortality for the population. While it is unlikely that a reduction in bycatch of shortfin makos by the Canadian pelagic longline fishery would have any detectable or biologically significant influence on the population, it would be prudent not to exceed 100 t annually. International efforts to reduce cumulative impacts are required to promote recovery.

As a precautionary measure, commercially-caught makos could be released alive as a measure to reduce mortality.

Monitoring of mako population status in Canadian waters would require a fishery-independent shark survey, plus length and sex measurements of the catch.

SOURCES OF INFORMATION

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