Evaluating the robustness of candidate management procedures in the BC sablefish (\*Anoplopoma fibria\*) fishery for 2019-2020

# Context

Since 2008, Fisheries and Oceans Canada (DFO) and the British Columbia

(BC) groundfish fishing industry have collaborated on a management

strategy evaluation (MSE) process intended to maintain a transparent

and sustainable harvest strategy for Sablefish fisheries in BC.

Transparency and potential sustainability of candidate management

procedures (MPs) are demonstrated by simulating MP performance

against a set of pre-agreed biological and fishery objectives (hereafter referred to as Fishery Objectives). Operating models underlying the simulations are intended to represent

key uncertainties related to Sablefish stock status and productivity.

The Sablefish MSE process has been reviewed in several Canadian

Science Advisory Secretariat (CSAS) peer-review processes, and independent peer-reviewed

scientific literature [@cox2008practical;

@cox2011management; @cox2013roles; @cox2019evaluating;

@dfo2014performanc]. Canadian Sablefish harvest advice derived

from simulation-tested MPs has been adopted by DFO every year since 2011.

The Sablefish MSE aims to follow a 3-year cycle in which the

operating model (OM) is re-fitted to updated fishery and survey

biomass indices, catch-at-age, at-sea releases, and tag

release-recoveries. Each 3-year update also offers an opportunity

to revise the Fishery Objectives, as well as to

propose new candidate MPs.

Previous BC Sablefish assessments and MSE work have demonstrated that

low recruitment (on average) over the past three decades has

contributed to a long-term decline in spawning stock biomass

and harvest opportunities. Stakeholder and management

consultations identified at-sea release mortality of

sub-legal Sablefish (i.e., fish smaller than 55 cm size limit)

as a potential source of mortality that, if reduced or avoided,

may improve production of over-55 cm Sablefish, spawning stock

biomass, and, ultimately, future harvest opportunities

[@cox2019evaluating]. While some voluntary tactics

aimed at reducing sub-legal mortality have been identified

(e.g., improved fleet communication, and increased electronic monitoring), management

measured aimed at reducing sub-legal mortality have not been

formally evaluated through the Sablefish MSE process. However,

past closed-loop simulations suggest that both full avoidance and

full retention of sub-legal Sablefish may improve both average

annual Sablefish yield in directed fisheries as well as the

probability of stock rebuilding to $B\_{MSY}$ [@cox2011management;

@cox2019evaluating]. Unfortunately, full avoidance may not

be feasible, especially in trawl fisheries, which encounter

sub-legal Sablefish as part of fishing operations for other

species, while full retention may involve lost fishing

opportunities (particularly for the trawl sector) and

lower profitability for directed fisheries, because sub-legal

Sablefish are worth less per-kilogram than legal-sized fish.

In consultations, industry stakeholders suggested that

a potential solution would involve incentives that shift fishing

behaviour toward higher avoidance of sub-legal Sablefish.

The DFO Fisheries Management Branch has, therefore, requested that

the Science Branch (i) update the Sablefish OM to

include the most recent data available (up to 2018); (ii) update

advice about expected performance of the current MP; and

(iii) evaluate alternative MP and/or management measures aimed at

reducing productivity losses to sub-legal mortality. The key issue

in (iii) is identifying MPs that minimize the impact of such measures

on fishing opportunities in non-directed fisheries (i.e., trawl)

where sub-legal Sablefish are captured incidentally.

Advice arising from this CSAS Science

Response will be used to select a new MP for BC Sablefish for years

2020-2022 that is compliant with the DFO Sustainable Fisheries Framework

and A Fishery Decision-making Framework Incorporating the Precautionary

Approach policy [@DFO2009]. In addition, this Science Response informs

fishery managers and stakeholders about the fishery implications of limiting

productivity losses due to sub-legal Sablefish releases at-sea.

This Science Response results from the Science Response Process of September 23, 2019 on An evaluation of the performance of alternative Management Procedures for the Sablefish fishery in British Columbia, Canada.