Species at Risk Act
Management Plan Series

Management Plan for the Yelloweye Rockfish (*Sebastes ruberrimus*) in Canada

Yelloweye Rockfish

2021

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Preface

The federal, provincial, and territorial government signatories under the Accord for the Protection of Species at Risk (1996) agreed to establish complementary legislation and programs that provide for the protection of species at risk throughout Canada. Under the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the federal competent ministers are responsible for the preparation of a management plan for species listed as special concern and are required to report on progress five years after the publication of the final document on the Species at Risk Public Registry, and every subsequent five years following.

The Minister of Fisheries and Oceans and the Minister responsible for the Parks Canada Agency are the competent ministers under SARA for the Yelloweye Rockfish and have prepared this plan, as per section 65 of SARA. In preparing this management plan, the competent ministers have considered, as per section 38 of SARA, the commitment of the Government of Canada to conserving biological diversity and to the principle that, if there are threats of serious or irreversible damage to the listed wildlife species, cost-effective measures to prevent the reduction or loss of the species should not be postponed for a lack of full scientific certainty. To the extent possible, this management plan has been prepared in cooperation with Indigenous organizations, other federal government departments and the Province of British Columbia as per section 66(1) of SARA.

As stated in the preamble to SARA, success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this plan, and will not be achieved by Fisheries and Oceans Canada, the Parks Canada Agency, or any other jurisdiction alone. All Canadians are invited to join in supporting and implementing this strategy for the benefit of the Yelloweye Rockfish and Canadian society as a whole.

A SARA management plan includes measures for the conservation of the species to manage the species of special concern to prevent it from becoming threatened or endangered. The competent minister (Minister of Fisheries and Oceans) must prepare a management plan that includes measures for the conservation of the species that the minister considers appropriate. These measures for the conservation of the species are set out to achieve the management objective identified in the management plan. Implementation of this strategy is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Acknowledgements

Fisheries and Oceans Canada (DFO) wishes to acknowledge the contributions of those who supported the development of the management plan for the Yelloweye Rockfish. The following Yelloweye Rockfish Technical Team developed this management plan and contributed valuable advice: Robert Tadey, Peter Katinic, Peter Hall, Devona Adams, Caroline Wells, Wanli Ou, and Chantelle Caron from DFO Fisheries Management, Lynne Yamanaka from DFO Science, and Pippa Shepherd from the Parks Canada Agency. Additionally, we thank the following other contributors of data and expertise which were invaluable during the development of the management plan: Rowan Haigh and Bruce Patten of DFO Science, Barry Ackerman, Dan Clark and Laurie Convey of DFO Fisheries Management, and Frank Snelgrove and Ann Bussell of DFO Conservation and Protection.

Executive summary

Yelloweye Rockfish (*Sebastes ruberrimus*, Inside and Outside waters populations) was listed as a species of special concern under the *Species at Risk Act* (SARA) in July 2011. This management plan is considered one in a series of documents for this species that are linked and should be taken into consideration together, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status report (2008).

Yelloweye Rockfish belong to the family *Sebastidae* and are easily identified by their vibrant orange to red colouration and bright yellow eyes. Yelloweye Rockfish are one of the largest rockfish species, reaching a maximum recorded length of 91 cm and weight of 11.3 kg, but with an average length of approximately 66 cm in British Columbia (BC). This species is also long-lived, the maximum recorded age of Yelloweye Rockfish in BC is 115 years, while the global maximum recorded age is 118 years. Yelloweye Rockfish are referred to by many names including red snapper, red rock cod, rasphead rockfish, red rockfish, red cod, goldeneye rockfish, and turkey rockfish.

Yelloweye Rockfish are found in the northeast Pacific Ocean and have been observed from Ensenada, Baja California, to Umnak Island, in the Aleutian Islands. They are more prevalent from Alaska to central California, and are thought to be rare in Puget Sound, Washington. Yelloweye Rockfish are present throughout the coastal waters of BC.

The principal known threat to Yelloweye Rockfish is fishing. Additional threats causing stress to Yelloweye Rockfish are pollution and contaminants, and structural habitat loss or degradation.

The management objective (section 6) for Inside and Outside waters populations of Yelloweye Rockfish in BC is to maintain their distribution and abundance at existing levels or higher in Canadian Pacific waters, by managing threats to the species within BC.

The management plan recommends an approach that recognizes uncertainties in the threats to the species, as well as the limited ability to directly manage or mitigate some of the threats. Further research to help clarify some of these uncertainties is required prior to recommending specific actions for mitigation. Additionally, management and mitigation tools may not be available or feasible at the national, provincial, or local scale that would allow for recovery of Yelloweye Rockfish within a relevant timeframe (for example, three generations). Where appropriate, the management plan recommends a precautionary approach that considers the impacts of these threats within the context of management tools available.

The broad strategies to manage Yelloweye Rockfish in Canadian Pacific waters are as follows:

1. fisheries and habitat management: adopt or maintain fisheries and habitat management practices that are beneficial to Yelloweye Rockfish and which ensure total fishery removals remain at sustainable levels

2. assessment and monitoring: maintain and develop strategies to assess and monitor the status of Yelloweye Rockfish populations, and the effectiveness of established protection measures

3. research: investigate knowledge gaps and threat uncertainties that will result in a benefit to Yelloweye Rockfish conservation and management

4. outreach and communication: support communication and outreach activities aimed at mitigating threats and reducing mortality of Yelloweye Rockfish

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1 Introduction

The Yelloweye Rockfish (*Sebastes ruberrimus,* Inside and Outside waters population) was listed as special concern under the *Species at Risk Act* (SARA) in 2011.

This management plan is part of a series of documents regarding Yelloweye Rockfish that should be taken into consideration together, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status report (COSEWIC 2008). A management plan includes measures for the conservation of the species to ensure that a species of special concern does not become threatened or endangered. It sets management objectives and identifies measures for the conservation of the species to support achieving those objectives.

2 COSEWIC species assessment information

Date of assessment: November 2008

Common name:
Yelloweye Rockfish, Pacific Ocean inside waters population

Scientific name:
Sebastes ruberrimus

COSEWIC status:
Special concern

Reason for designation:
This species is one of an inshore rockfish complex which is exploited by commercial, recreational and Indigenous fisheries. Life history characteristics make the species particularly susceptible to human-caused mortality, with a maximum recorded age of 120 years and generation time estimated at 66 years. Fishery-independent surveys over the past 20 years do not show significant declines, while declines over 19 years in commercial catch per unit effort are not believed to represent abundance accurately. Commercial catch quotas have been reduced and restrictions on harvesting are expected to keep catches low in the future; in addition, areas have been closed to commercial and recreational fishing. A designation of special concern is consistent with the life history characteristics and probable continued removals in fisheries.

Canadian occurrence:
Pacific Ocean

COSEWIC status history:
Designated special concern in November 2008.

Date of assessment: November 2008

Common name:
Yelloweye Rockfish, Pacific Ocean outside waters population

Scientific name:
Sebastes ruberrimus

COSEWIC status:
Special concern

Reason for designation:
This species is one of an inshore rockfish complex which is exploited by commercial, recreational and Indigenous fisheries. Life history characteristics make the species particularly susceptible to human-caused mortality, with a maximum recorded age of 120 years and generation time estimated at 70 years. Fishery-independent surveys over the past 10 years do not show significant declines, while declines over 19 years in commercial catch per unit effort are not believed to represent abundance accurately. Fishery quotas have been substantially reduced from the early 1990s to recent years, closed areas are in place, and restrictions on harvesting are expected to keep catches low in the future. A designation of special concern is consistent with the life history characteristics and probable continued removals in fisheries.

Canadian occurrence:
Pacific Ocean

COSEWIC status history:
Designated special concern in November 2008.

3 Species status information

In Canada, Yelloweye Rockfish (Inside and Outside waters populations) was listed as a species of special concern under SARA in July 2011. This designation characterizes the species as one that may become threatened or endangered due to biological characteristics and identified threats.

In the United States, the Puget Sound/Georgia Basin Distinct Population Segment (DPS) is listed as threatened under their *Endangered Species Act*. In 2002, the National Marine Fisheries Service (NMFS) declared that the Yelloweye Rockfish stock in the outer Pacific waters of Washington, Oregon, and California was overfished, indicating that less than 25% of the estimated pre-fishery population existed.

4 Species information

4.1 Species description

Yelloweye Rockfish (*Sebastes ruberrimus*) belong to the family *Sebastidae* and are easily identified by their vibrant orange to red colouration and bright yellow eyes (Hart 1973). Adults usually have a light to white stripe on the middle of their body, along the lateral line. Juveniles are a darker red than adults and have two light stripes on their sides, one on the lateral line and a shorter one below the lateral line (Mecklenburg et al. 2002). The fins of Yelloweye Rockfish are also often fringed with black tips (Kramer and O'Connell 1995). Yelloweye Rockfish are one of the largest rockfish species, reaching a maximum recorded length of 91 cm and weight of 11.3 kg (Love et al. 2002), but with an average length of approximately 66 cm in British Columbia (BC; Yamanaka et al. 2006). This species is also long-lived; the maximum recorded age of Yelloweye Rockfish in BC is 115 years (Yamanaka et al. 2006), while the global maximum recorded age is 118 years (Munk 2001). Yelloweye Rockfish are referred to by many names including red snapper, red rock cod, rasphead rockfish, red rockfish, red cod, goldeneye rockfish, and turkey rockfish (Lamb and Edgell 1986).

4.2 Populations and distribution

4.2.1 Global population

Yelloweye Rockfish are found in the northeast Pacific Ocean and have been observed from Ensenada, Baja California, to Umnak Island, in the Aleutian Islands. They are more prevalent from Alaska to central California, but are thought to be rare in Puget Sound, Washington (Love et al. 2002). Yelloweye Rockfish are present throughout the coastal waters of BC (figure 1; COSEWIC 2008).

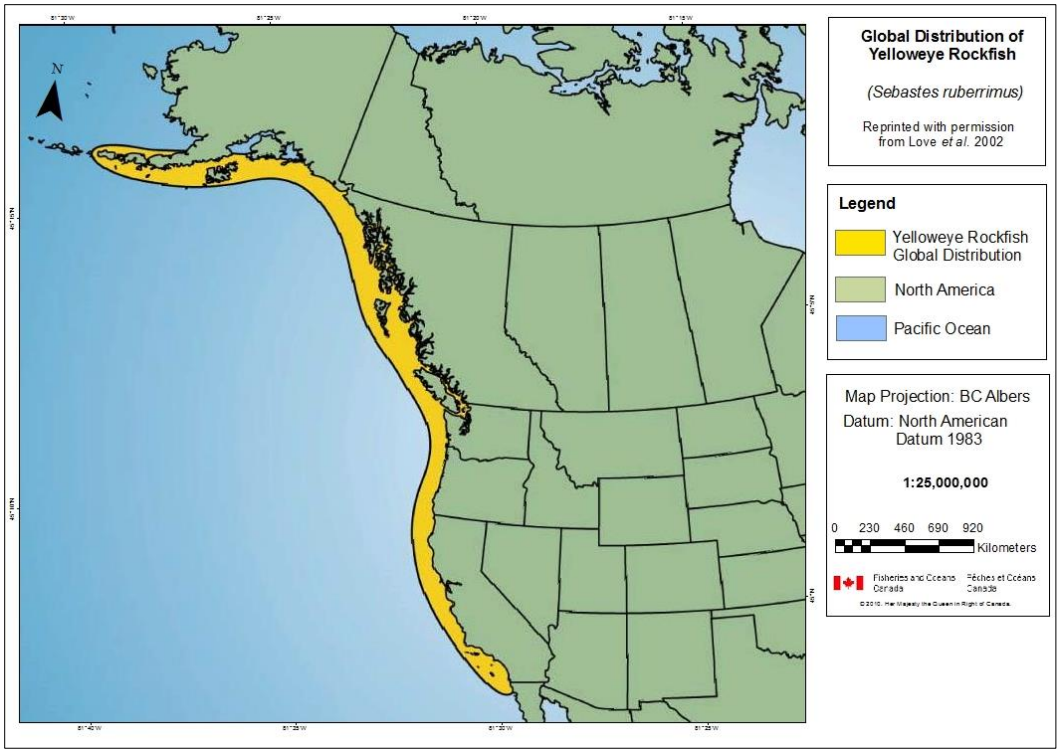

Figure 1: Global distribution of Yelloweye Rockfish (reprinted with permission from Love et al. 2002).

In United States (US) waters, Yelloweye Rockfish populations vary in abundance and status. Population abundance estimates of the Yelloweye Rockfish Puget Sound/Georgia Basin Distinct Population Segment are thought to be low and declining. In general, rockfish in Puget Sound have declined in abundance by 70% over the last 40 years, with Yelloweye Rockfish showing greater declines than other species (Williams et al. 2010). The 2011 stock assessment of the coastal Yelloweye Rockfish population (California, Oregon, and Washington, not including the Puget Sound/Georgia Basin DPS) estimated that the stock's spawning output had been depleted to 21.4% relative to unexploited conditions (Taylor and Wetzel 2011). This coastal Yelloweye Rockfish population has been considered overfished since 2002 (Wallace 2001; Wallace 2007). Yelloweye Rockfish stocks in Alaska are considered healthy and are not currently subject to overfishing, but are managed closely to ensure overfishing does not become an issue (Alaska Dept. of Fish and Game 2015).

4.2.2 Canadian population

The Canadian distribution of Yelloweye Rockfish is approximately 20% of its global range (Love et al. 2002). There are two distinct populations, or Designatable Units (DUs, as referred to by COSEWIC) of Yelloweye Rockfish within the coastal waters of BC; the "Inside" and "Outside" waters populations (figure 2). The Pacific Ocean Inside waters population includes the Strait of Georgia, Johnstone Strait, and a portion of Queen Charlotte Strait, with Malcolm Island (in Queen Charlotte Strait) and D'Arcy Island (in the Gulf Islands) as its recorded western and southern boundaries respectively. The Pacific Ocean Outside waters population extends from at

least southeast Alaska through to northern Oregon and includes the whole of the BC offshore, north, and central coast waters. The two populations are distinguished on the basis of age at maturity, and genetic population structure, indicating restricted gene flow. These differences may reflect local adaptation to the marine eco-regions that presumably have different selective regimes (COSEWIC 2008). Based on a 2006 analysis of catch and survey data, the extent of occurrence of the species is estimated to be 77,585 km^2 for the Outside area and 4,182 km^2 for the Inside area (Yamanaka et al. 2006).

Estimates of the Yelloweye Rockfish populations were provided in the Stock Assessment for the Inside waters population of Yelloweye Rockfish (*Sebastes Ruberrimus*) in British Columbia, Canada for 2010 (Yamanaka et al. 2012) and the Stock Assessment for the Outside Population of Yelloweye Rockfish (*Sebastes Ruberrimus*) in BC, Canada in 2014 (DFO, 2015a). The Inside population biomass was estimated to be 780 metric tonnes (mt) in 2009, approximately 12% of the estimated unexploited biomass of 6,466 mt in 1918. The Outside population biomass was estimated to be 3,821 mt in 2014, which is approximately 18% of the estimated initial biomass of 21,955 mt in 1918.

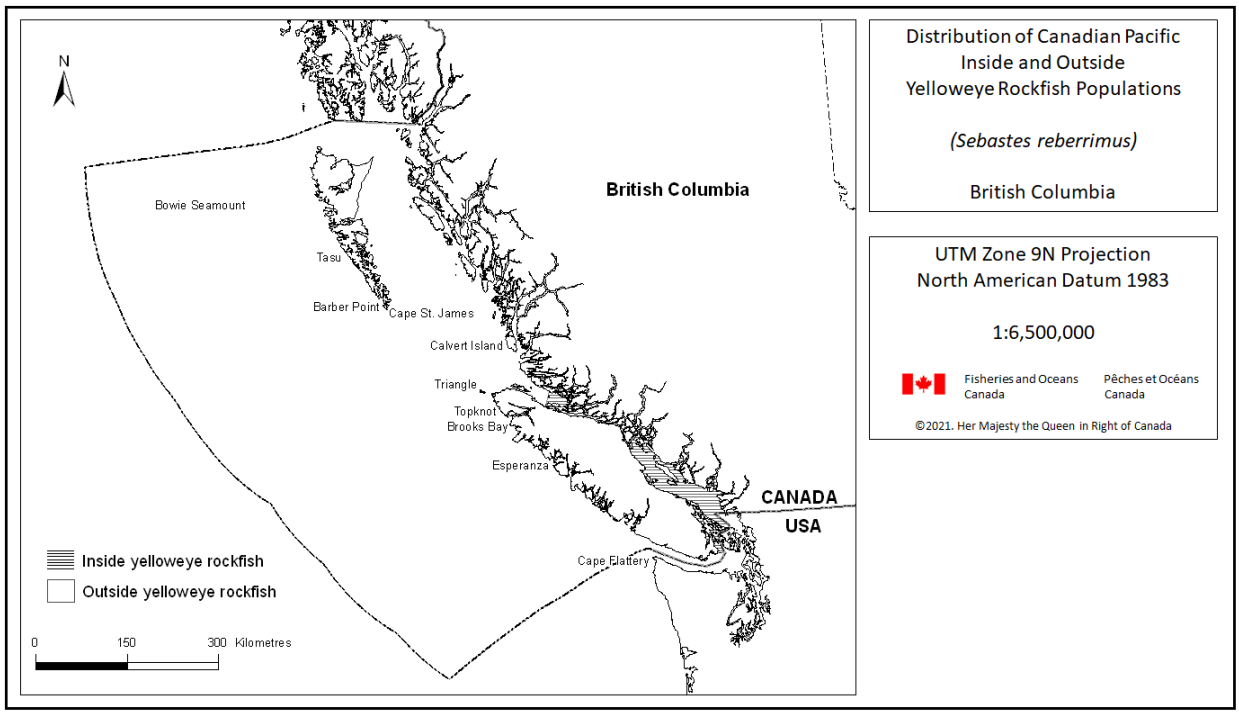

Figure 2: Distribution of Canadian Pacific Inside and Outside Yelloweye Rockfish (*Sebastes ruberrimus*) populations (COSEWIC 2008).

4.3 Needs of the Yelloweye Rockfish

4.3.1 Habitat and biological needs

In BC waters, adult and sub-adult Yelloweye Rockfish have been observed at depths of 30 m to 232 m over substrates that are hard, complex, and which have some vertical relief, such as broken rock, rock reefs, ridges, overhangs, crevices, caves, and cobble and boulder fields (O'Connell and Carlisle 1993, Yamanaka et al. 2006). Adult Yelloweye Rockfish are generally solitary, demersal residents, which exhibit high site fidelity with a strong affinity for high-relief, rocky reef substrate (Coombs 1979, DeMott 1983, Love et al. 2002, Hannah and Rankin 2011).

Yelloweye Rockfish have multiple reproductive cycles during their life spans. Spawning is known to occur across a broad span of months from winter to summer (Love et al. 2002). Rockfishes are viviparous and gestation periods are generally between one to two months (Love et al. 2002). In BC, parturition (birth of live young) for Yelloweye Rockfish occurs between April and September, peaking in May and June (COSEWIC 2008).

During the larval-juvenile phase, rockfish are distributed in the upper mixed layer (< 300 m) and are dispersed, often very far, by ocean currents (Loeb et al. 1995, Kokita and Omori 1999). When juveniles reach 2.5 to 10 cm in length, at approximately 6 to 9 months of age (Love et al. 2002), they settle to benthic habitats at depths of 30 to 168 m, moving deeper as they age and occupying habitats similar to adults, but often in areas with smaller crevices available for refuge (Yamanaka et al. 2006, Krieger and Wing 2002). Specific habitat needs for pelagic larval and juvenile Yelloweye Rockfish in BC are not known.

Rockfish are opportunistic feeders that take prey readily available to them, substituting prey items of the same general size and type (COSEWIC 2008, Rosenthal et al. 1988), and targeting different food sources during different phases of their life history (Steiner 1979, Rosenthal et al. 1988, Moser and Boehlert 1991, Love et al. 2002, Yamanaka et al. 2006). Yelloweye Rockfish feed primarily on other species of rockfish, juvenile gadids, sand lance, and herring (Rosenthal et al. 1988). Other prey species include shrimp, lithodid crab, green sea urchin, and lingcod eggs (COSEWIC 2008). Yelloweye Rockfish are also known to be preyed upon by other fish, marine mammals, and several species of marine birds (Olesiuk and Bigg 1988, Olesiuk et al. 1990, Mills et al. 2007).

4.3.2 Limiting factors

Limiting factors for Yelloweye Rockfish include their life history traits of late age of sexual maturity and increased fecundity with age, their physiology, highly variable recruitment success, and pinniped predation. Human activities may combine with these factors and result to influence the populations' conservation potential. Limiting factors are intrinsic to the biology and ecology of the species and, as such, cannot be mitigated and may make the species more vulnerable to human activities.

Life history traits:

Yelloweye Rockfish have a late average age of reproduction for females at 32.5 years and 37.5 years for the Outside and Inside populations respectively (Yamanaka et al. 2006). As such, individuals are often vulnerable to fishing gear long before reaching spawning age. For long lived species, with low natural mortality rates and late maturation, natural replacement of the population occurs at a much slower rate and removing immature individuals from a population prior to spawning can lead to depletion of the population faster than it can replace itself.

Additionally, female rockfish get more fecund with age and size producing a larger number of eggs and larvae, as well as larvae with higher growth rates and greater resistance to starvation, thereby increasing survivability and recruitment levels (Berkeley et al. 2004, Bobko and Berkeley 2004). However, older and larger rockfish tend to be more vulnerable to fishing gear and are more likely to be removed from the population, thereby truncating the upper end of the age distribution and reducing overall reproductive potential.

Despite producing between 1.2 and 2.7 million eggs annually (Love et al. 2002), the late age of sexual maturation for the species results in an overall low reproductive potential. Removal of larger, older, more fecund females and individuals that have not had an opportunity to breed can also shift the population dynamics to favour maturation at a younger, smaller stage, thus further depressing the reproductive potential of the population (Berkeley et al. 2004, Palumbi 2004).

Physiology:

Most rockfish are not able to tolerate the rapid pressure changes experienced when being brought to the surface from depth, which often results in gas expansion in the swim bladder. The rapid pressure change typically results in a condition called barotrauma, which leads to bulging eyes, stomach and esophageal extrusion, and other unseen internal injuries (Parker et al. 2006). Barotrauma is assumed to be fatal (COSEWIC 2008) due to the bodily injuries sustained and additionally because rockfish subject to barotrauma become more vulnerable to predation. Scientific studies on the use of recompression devices have been undertaken in the US to determine the efficacy of these devices for mitigation of the impact of barotrauma on rockfish species. Section 7.3 identifies a specific conservation measure aimed at evaluating the efficacy of recompression devices for recreational fisheries management in BC.

Highly variable recruitment:

Recruitment can be highly variable for rockfish species as it is influenced to a large extent by larval success (Larson et al. 1994, Wilson et al. 2008), which is, in turn, highly dependent on environmental factors such as ocean currents, conditions in the pelagic zone, large-scale atmosphere-ocean fluctuations, and prey availability (Yoklavich et al. 1996). Links between episodic patterns in year-class success and environmental conditions have been made in California; however, directed research on the environmental influences of rockfish recruitment has not been conducted in BC.

Pinniped predation:

Pinniped populations, such as Harbour Seal (*Phoca vitulina*), Steller Sea Lion (*Eumetopias jubatus*), and California Sea Lion (*Zalophus californianus*), which are known to consume rockfish (Olesiuk 1993; Tollit et al. 2009), have been increasing along the entire coast of BC since the 1960s, likely due to the cessation of culling programs (Ford 2014). Similar to their vulnerability to overfishing, Yelloweye Rockfish may be vulnerable to pinniped predation due to their late age of maturity and low natural mortality rate. Increased pinniped populations may contribute to declines and/or may limit rebuilding of Yelloweye Rockfish populations (see discussion in Yamanaka et al. 2012).

5 Threats

5.1 Threat assessment

Assessment of threats allows for the prioritization of recommended management and other actions to prevent both the Inside and Outside waters populations of Yelloweye Rockfish from becoming threatened or endangered. Threats were assessed based on their current likelihood of occurrence and severity of effect to the populations. In addition, the causal certainty of an effect was assessed to identify where causal linkages between the threat and stresses on the population were present or lacking and to identify threats where further monitoring or research may be useful in addressing uncertainties or knowledge gaps. Where certainty of effect is not demonstrated for Yelloweye Rockfish, weight of scientific evidence for other rockfish species may have been deemed adequate to assess the level of concern of a threat to Yelloweye Rockfish. For more details on the threat assessment process, refer to the Guidance on Assessing Threats, Ecological Risk and Ecological Impacts for Species at Risk (DFO 2014).

The principal known threat to Yelloweye Rockfish, as identified in the COSEWIC Assessment Report (2008), is fishing. Additional threats that cause stress to Yelloweye Rockfish are: pollution and contaminants, climate change, natural disasters and structural habitat loss or degradation. The threats to Yelloweye Rockfish and their attributes are outlined in table 1. Each threat's attributes were considered in determining whether managing the threat is of high, medium, or low concern for the sustainable management and recovery of the species. The cumulative effect of any combination of these threats, in conjunction with limiting factors (see section 4.3.2), may result in more serious consequences than that of any single threat acting upon the population alone.

Table 1: Classification of threats to Yelloweye Rockfish in Canadian Pacific Waters.

Category	Threat	Level of concern[1]	Extent[2]	Occurrence[3]	Frequency[4]	Severity[5]	Causal certainty[6]
Biological resource use	Fisheries: targeted catch	High	Widespread	Current	Continuous	High	High
Biological resource use	Fisheries: incidental catch	High	Widespread	Current	Continuous	Unknown	High
Biological resource use	Fisheries: illegal, unreported, and unregulated (IUU)	Medium	Unknown	Current	Unknown	Unknown	High
Pollution	Pollution and contaminants	Low	Widespread	Current	Continuous	Unknown	Medium
Habitat loss or degradation	Structural habitat loss and degradation	Low	Widespread	Current	Continuous	Unknown	Low

[1] Level of concern: signifies that managing the threat is of (high, medium, or low) concern for the recovery of the species, consistent with the population and distribution objectives.
[2] Extent: the proportion of the population affected by the threat.
[3] Occurrence: the timing of occurrence of the threat and whether a threat is historical, current and/or anticipatory.
[4] Frequency: the temporal extent of the threat over the next 10 years or 3 generations, whichever is shorter.
[5] Severity: reflects the population-level effect (high; very large population level effect, moderate, low, unknown).
[6] Causal certainty: reflects the degree of evidence that is known for the threat (high: available evidence strongly links the threat to stresses on population viability; medium: there is a correlation between the threat and population viability, for example, expert opinion; low: the threat is assumed or plausible).

5.2 Description of threats

5.2.1 Fisheries

Fisheries represent the most significant threat to Yelloweye Rockfish. This species is caught in targeted fisheries, incidental fisheries, and in illegal, unreported, and unregulated (IUU) fisheries in Canadian Pacific waters. Fishing has resulted in reduced population sizes and reduced population viability leading to stock depletion which has likely been exacerbated by the life history characteristics of this species (see limiting factors section 4.3.2).

Fishing may also contribute to ecosystem level impacts by diminishing or changing the ecological role of organisms under normal circumstances and under additional anthropogenic and natural pressures (Link et al. 2009). For example, fishing activities may exacerbate resource competition among rockfish species (Larson 1980). In Puget Sound, it is thought that more abundant rockfish species, such as Copper (*S. caurinus*) and Quillback Rockfish (*S. maliger*), may prey on and compete for resources with the juveniles of less abundant species, such as Bocaccio (*S. paucispinis*), Canary (*S. pinniger*) and Yelloweye Rockfish, thus limiting the ability of the latter species to recover from their depleted states (Drake et al. 2010).

Although fisheries represent the most significant threat to Yelloweye Rockfish, the contribution of specific fisheries to the overall threat is uncertain, as fisheries monitoring and catch reporting programs vary among commercial, recreational, and Indigenous fisheries.

Highly accurate and reliable catch estimates are available for commercial groundfish fisheries due to 100% at-sea and dockside monitoring requirements.

Several other non-groundfish commercial fisheries including the commercial salmon troll and trap fisheries (that is, crab and prawn) also encounter Yelloweye Rockfish. The commercial salmon troll and crab fisheries are not permitted to retain Yelloweye Rockfish. Salmon troll catch estimates rely on fisher reports of releases in logbooks, whereas the commercial crab fishery is not required to record bycatch of Yelloweye Rockfish. Thus, total bycatch estimates of Yelloweye Rockfish are unknown in these fisheries.

The commercial prawn fishery is also not permitted to retain Yelloweye Rockfish and prawn fishers are not required to report bycatch of this species. However, in 2002 a rockfish bycatch monitoring program was launched with the objective of estimating total annual rockfish bycatch in the commercial prawn fishery (Rutherford et al. 2010). The fishery is monitored in-season by third party monitors that are required to record and identify all bycatch down to the species level. These monitors record the total number of rockfish by species for every commercial string of trap gear sampled throughout the entire duration of the commercial fishing season. This monitoring program provides estimates of rockfish bycatch encountered, including Yelloweye Rockfish, in the commercial prawn fishery.

Recreational fisheries are monitored using a variety of tools, including creel surveys and logbook programs. These programs only operate at certain times of the year in some areas and rely in part on fisher-reported data. Rockfish catch is also not reported to the species level in some areas due to the challenges of rockfish identification and limited resources. As a result of

these limitations, current recreational catch data for Yelloweye Rockfish is partial and its accuracy is unknown.

Indigenous fisheries are also monitored using a variety of tools. A portion of food, social and ceremonial (FSC) catch, and domestic catch for treaty nations, is landed on groundfish dual fishing trips, which allow licence holders to fish and retain groundfish under the authority of a commercial licence, and an Aboriginal communal fishing licence issued under section 4 of the *Aboriginal Communal Fishing Licences Regulations*, on the same fishing trip. Landings are monitored in a manner comparable to the commercial groundfish fishery; however, the proportion of total FSC catch landed on dual fishing licences is unknown. FSC and domestic fishing also occurs outside of dual fishing. Monitoring and reporting programs for this catch varies among Indigenous organizations, hence the completeness and accuracy of this data is unknown.

Fisheries: targeted catch

Targeted fishing of Yelloweye Rockfish is the main threat to both the Inside and Outside waters populations (COSEWIC 2008, Yamanaka et al. 2012, DFO 2015a). Yelloweye Rockfish are currently targeted by a number of fisheries in BC; these include the commercial groundfish hook and line fishery, the recreational fishery, Indigenous fisheries for FSC purposes, and scientific surveys. These fisheries contribute to the highest known source of mortality to adult Yelloweye Rockfish. Targeted fisheries are widespread throughout the species range and they occur currently and continuously.

Fisheries: incidental catch

Known incidental interceptions of Yelloweye Rockfish occur in the commercial groundfish trawl, salmon troll, recreational fishing, prawn trap, and shrimp trawl fisheries, as well as in other scientific research surveys. Yelloweye Rockfish interceptions in these fisheries depend on fishing effort and the type of gear employed and estimates of incidental Yelloweye Rockfish catch depend on fishery monitoring and catch reporting levels, which vary greatly among these fisheries. These fisheries combined likely contribute to the second highest known source of mortality to adult Yelloweye Rockfish, are widespread, current, and continuous, and may be a greater risk to the species while it is in a depleted state, especially where incidental catch is not fully accounted for within sustainable harvest levels.

Fisheries: illegal, unreported, and unregulated catch (IUU)

IUU fishing is a known threat to fish stocks around the world and can also be a major contributor to marine habitat degradation. In Canadian waters, Yelloweye Rockfish fisheries are highly regulated, and the risk of unregulated harvest of Yelloweye Rockfish beyond Canada's Exclusive Economic Zone (EEZ) is low due to the species' near shore habitat preference. Within the EEZ, illegal and unreported Yelloweye Rockfish harvest could occur by national or foreign vessels that do not have permission to harvest this species, by vessels that are conducting activities in contravention of Canada's laws and regulations, and by vessels that fail to report or misreport their fishing activities.

The attributes of illegal, unreported, and unregulated fishing are largely uncertain due to the nature of the activity, thus the extent, frequency, and severity of this threat are unknown. IUU fishing may be a more significant risk in small or declining populations, especially if not accounted for within sustainable harvest levels. Additionally, sustainable Yelloweye Rockfish harvest levels in the commercial groundfish and recreational fisheries have been based on the assumption that large areas of the coast have been closed to inshore rockfish fishing in Rockfish Conservation Areas (RCAs). Illegal harvest in closed areas could negate the sustainable harvest targets if the magnitude of the threat is larger than expected.

5.2.2 Pollution and contaminants

Pollution and contaminants originating from a multitude of sources pose a threat to the Yelloweye Rockfish populations in BC. Sources of pollution and contamination in BC waters include waste from ocean-going vessels, petroleum spills and leaks from marine traffic, and pollution from terrestrial activities and urban areas such as sewage, agricultural runoff, and industrial discharge.

Pollution and contamination is a current and continuous threat; however, the severity of impacts from pollution and contamination on the Yelloweye Rockfish population is unknown and further research is necessary to understand the magnitude of this threat on population viability. Management of this threat is currently considered a low-level concern for the sustainable management and recovery of the species.

5.2.3 Structural habitat loss or degradation

As Yelloweye Rockfish have specific habitat needs, the loss and/or degradation of such complex habitat may have negative impacts on the species. Fishing with bottom contact gear (DFO 2006) and development activities can alter benthic habitats. However, impacts to Yelloweye Rockfish survival and recruitment from habitat degradation or loss have not directly been demonstrated.

5.2.4 Climate change

Climate change is widespread and current; however, the severity of potential impacts and the frequency of climate change related events that impact Yelloweye Rockfish are unknown at this time. A greater understanding of climate related impacts will be necessary to incorporate climate change considerations into the management of this species.

5.3 Knowledge gaps

5.3.1 Boundaries between Inside and Outside populations

The boundaries between the Inside and Outside Yelloweye Rockfish populations were proposed based on genetic relationships of individual specimens to baseline genetic information from the Inside and Outside populations. The western boundary, passing through Queen Charlotte Strait on the northern end of Vancouver Island, is well delineated with a strong scientific basis; however, it is unclear whether the natural boundary is static or dynamic. The southern boundary

lacks a strong scientific basis, which has led to a more arbitrary boundary placement along the Canadian portion of the Strait of Georgia marine ecozone (Powles et al. 2004).

Additionally, the Inside and Outside waters populations are not managed based on their biological boundaries. Rather, management areas for the various fisheries that intercept Yelloweye Rockfish are delineated by Pacific Fishery Management Areas, Groundfish Management Areas, and Pacific Marine Fishery Commission boundaries, depending on the fishery. Because the Inside and Outside Yelloweye Rockfish populations are managed as separate units, the choice of where to delineate their biological and management boundaries could impact the populations. Additional clarity on population boundaries may inform adjustments to management areas if deemed necessary.

5.3.2 Yelloweye Rockfish habitat requirements

The habitat requirements of BC's Inside and Outside waters Yelloweye Rockfish populations are also considered uncertain. Specifically, the habitat of pelagic and newly settled juvenile to sub-adult Yelloweye Rockfish has not been identified. Yelloweye Rockfish larvae and juveniles, while in their pelagic phase, are generally grouped into the larger *Sebastes* complex for research purposes, and studies specifically aimed at understanding the pelagic dispersal locations and habitat needs of Yelloweye Rockfish at this stage have not been conducted. Such research will be necessary in the future to understand issues such as recruitment variability and the impacts of climate change as per conservation measures identified in table 2.

Also, although there is evidence that settled juvenile and sub-adult Yelloweye Rockfish occupy habitats similar to adults, studies have rarely been able to directly sample these age groups to define broader habitat needs such as diet. As well, in situ observations of juvenile Yelloweye Rockfish are less frequent and small sample sizes preclude a great understanding of juvenile habitat preferences. In general, surveys of Yelloweye Rockfish, at all life stages, have not been extensive in BC, which has hindered our understanding of the full breadth of habitat requirements for this species as per conservation measures identified in table 2.

6 Management objective

The management objective establishes, to the extent possible, the number of individuals and/or populations, and their geographic distribution, that are necessary to prevent the species from becoming endangered or threatened, or allow for the removal of the species from schedule 1 of SARA. The management objective for Inside and Outside waters populations of Yelloweye Rockfish in BC is to maintain their distribution and abundance at existing levels or higher in Canadian Pacific waters, by managing threats to the species within BC.

A purpose of SARA is to manage species of special concern to prevent them from becoming listed as threatened or endangered. Thus, the management objective focuses first on maintaining abundance levels within the species' known range and preventing population declines that would lead to a threatened or endangered status.

As fisheries have been identified as the primary threat to Yelloweye Rockfish, it is important to manage this threat to achieve the management objective of this management plan. Fisheries and Oceans Canada's (DFO) Fishery Decision-Making Framework Incorporating the Precautionary Approach (a policy within DFO's Sustainable Fisheries Framework [SFF; DFO 2009]) also provides policy tools to sustainably manage Canadian fisheries. The framework entails establishing a harvest strategy that will identify appropriate removal rates to maintain a sustainable, healthy status for stocks. Thus the management objective also focuses on increasing Yelloweye Rockfish abundance as necessary to meet the commitments of the SFF.

The management plan recommends an approach to Yelloweye Rockfish management that recognizes the uncertainties prevalent in the threats to the species, as well as the limited ability to directly manage or mitigate some of the threats. Further research to gain clarity on threat uncertainties is required in many cases prior to recommending specific actions for threat mitigation. Additionally, management and mitigation tools may not be available or feasible at the national, provincial, or local scale that would allow for recovery of Yelloweye Rockfish within a relevant timeframe (for example, three generations). Where appropriate, the management plan recommends using a precautionary approach that considers the impacts of these threats within the context of the management tools available, for fisheries management decision making.

7 Broad strategies and conservation measures

This management plan includes four broad strategies and related measures for the conservation of the species to prevent the Yelloweye Rockfish from becoming threatened or endangered, or allow for the removal of the species from schedule 1 of SARA.

Section 7.1 provides an overview of the actions related to conserving the species already completed or underway. Section 7.2 identifies broad strategies for the conservation of Yelloweye Rockfish. The measures for the conservation of the species to be implemented are summarized in an implementation schedule (tables 2 and 3) in section 7.3, which prioritizes actions and identifies leads, partners and timelines, to the extent possible at this time.

7.1 Actions already completed or currently underway

7.1.1 Fisheries management

Commercial groundfish integration program:

In response to significant conservation concerns for rockfish species, DFO, with support from the Commercial Industry Caucus, developed the Commercial Groundfish Integration Program (CGIP) pilot in 2006. The program was permanently implemented in 2010. CGIP applies to all commercial groundfish fisheries and the management of these fisheries is integrated, with all groups subject to 100% at-sea monitoring and 100% dockside monitoring, individual vessel accountability for all fish, individual transferable quotas (ITQs), and reallocation of these quotas between vessels and fisheries to cover catch of non-directed species.

Yelloweye Rockfish – Outside and Inside Population Rebuilding Plans:

The Yelloweye Rockfish – Outside and Inside Population Rebuilding Plans were published in the Groundfish Integrated Fisheries Management Plans in 2016 and 2018, respectively. Both rebuilding plans identify rebuilding objectives, mortality caps for all sources of fishing mortality, and management measures. The management measures in the Outside rebuilding plan are aimed at achieving catch reductions, which will be implemented over several years for commercial, recreational, and Indigenous fisheries. These management measures are intended to reduce catch in support of the rebuilding objective. For more detailed information on the management of groundfish, refer to DFO's Integrated Fisheries Management Plans.

Recent amendments to the *Fisheries Act* include the creation of Fish Stocks provisions, which establish binding requirements on the Minister to maintain stocks at or above levels necessary to promote sustainability and to develop and implement rebuilding plans for stocks that have declined to their critical zone. The Fish Stocks provisions only apply to major stocks prescribed by regulation. The outside and inside Yelloweye Rockfish populations are included under the proposed list of major stocks to be added by regulation, and thus may become subject to the Fish Stocks provisions of the *Fisheries Act*. For more detailed information on the proposal to list major fish stocks and requirements for stock rebuilding plans, refer to DFO's pre-consultation materials on the regulatory intent, which ended in February 2019.

Inshore Rockfish Conservation Strategy:

In 2002, the Inshore Rockfish Conservation Strategy (Yamanaka and Logan 2010) introduced four key principles for the conservation and recovery of inshore rockfish species (Yelloweye, Quillback, China, Tiger, and Copper Rockfish), to:

1. account for all rockfish catch
2. decrease fishing mortality
3. establish rockfish protection areas
4. improve stock assessment and fishery monitoring

For fisheries, the strategy led to the implementation of additional management measures aimed at reducing catch and improving fisheries monitoring and catch reporting. Overall, the total allowable catch (TAC) of Yelloweye Rockfish in the commercial groundfish fisheries was reduced by 50% in the outside waters and 75% in the inside waters. Under the strategy, 164 Rockfish Conservation Areas (RCAs) were also established coast wide by 2007. The RCAs are aimed at protecting inshore rockfish species by prohibiting commercial and recreational fishing activities that are likely to intercept inshore rockfish. FSC fisheries are excluded from this prohibition. In total, RCAs protect 28% of the Inside and 15% of the Outside inshore rockfish habitat (Yamanaka and Logan 2010).

Fisheries monitoring and catch reporting:

The Department's Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries (DFO 2012) aims to guide implementation of effective monitoring and reporting

programs in all Pacific fisheries. Work towards implementing improvements identified through the strategic framework is underway.

7.1.2 Surveys and research

Fishery-independent surveys were implemented or redesigned throughout the early 2000s, in order to provide abundance indices and biological data for stock assessment of Yelloweye and other inshore rockfish species (Yamanaka and Logan 2010). Currently the “Inside” (Strait of Georgia) hard bottom longline survey (2003, ongoing) sampling of rockfish catch during the annual International Pacific Halibut Commission (IPHC) halibut survey (2003, ongoing), and the Pacific Halibut Management Association (PHMA) “Outside” hard bottom longline survey (2006, ongoing) are used to collect biological and abundance data for hook and line-targeted rockfish species such as Yelloweye. During these surveys, length, weight, sex and maturity are assessed for each rockfish captured, and otoliths are collected for later age determination by the Schlerochronology Laboratory at the Pacific Biological Station. This information is incorporated into the stock assessments for the Yelloweye Rockfish Inside and Outside Waters populations.

Sampling during the IPHC and PHMA surveys is conducted under section 10(1) of the *Fisheries Act,* which makes provisions to allow portions of the TAC of any given species to be allocated for the purpose of financing scientific activities such as surveys through joint project agreements with industry and scientific partners.

7.1.3 Habitat and environmental protection

The management actions described below do not specifically target Yelloweye Rockfish; however, these actions provide a direct benefit to the species.

Groundfish bottom trawl footprint:

In April of 2012, significant protection of benthic habitat was achieved by restricting groundfish bottom trawling to areas previously trawled between 1996 to 2011, in order to reduce and manage coral and sponge bycatch and to limit further damage to benthic habitats. Important Yelloweye Rockfish habitat is likely to be directly protected within the trawl closure areas (DFO 2015b).

Glass sponge reef protection:

As of 2019, 17 sponge reef aggregations in the Strait of Georgia and Howe Sound are protected from bottom-contact fisheries via *Fisheries Act* closures, in accordance with the Policy for Managing the Impact of Fishing on Benthic Habitat, Communities and Species and its Ecological Risk Assessment Framework (ERAF) for cold-water corals and sponge dominated communities. Previously, the reefs were protected via voluntary avoidance of these areas by harvesters using bottom contact fishing gear (DFO 2015b).

Gwaii Haanas national marine conservation area:

In 2010, the Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site was established in the waters surrounding the Gwaii Haanas National Park Reserve and Haida Heritage Site on the southern portion of Moresby Island. An interim management plan and zoning plan was put in place in 2010 and the first integrated Land, Sea, People plan is in development.

Marine development management:

The pollution prevention provisions of the *Fisheries Act* include prohibitions against the deposit of deleterious substances into waters frequented by fish. Proposed amendments made in 2018 to the *Fisheries Act* include fisheries protection provisions that prohibit the destruction or harmful alteration of fish habitat. Both of these prohibitions apply to coastal and marine development activities that could occur in or near the habitats of Yelloweye Rockfish.

Marine traffic pollution control:

The International Maritime Organization's pollution prevention conventions have been applied in Canada through the *Canadian Shipping Act* and its various regulations managed by Transport Canada. These regulations aim to control pollution from shipping and other marine traffic (Transport Canada 2015a). In 2014, Transport Canada also initiated the improvement of tanker safety through enhanced prevention, preparedness, and response (Transport Canada 2015b).

Enforcement

Canada actively monitors fishing vessels within and beyond Canada's 200-mile limit, and works in conjunction with international partners through regional fisheries management organizations to discourage IUU fishing activities (DFO 2015c). As well, Canada's Catch Certification Program, implemented in 2010, certifies legally harvested exports to provide assurance to foreign markets and consumers that certified seafood products from Canada are not from IUU fisheries (DFO 2015d).

The 100% at-sea and dockside monitoring of the commercial groundfish fishery allows for strict enforcement of licence conditions of these fisheries. Validated at-sea and dockside information is used to enforce bycatch and quota limits as well as timing and location of fishing activities.

Other fisheries, such as the recreational, commercial salmon troll, and FSC fisheries are also monitored by Conservation and Protection Fishery Officers. On-the-water fisheries enforcement activities as well as DFO's Air Surveillance Program allows Fishery Officers to check for illegal harvesting practices (for example, contravening time or area closures and species' limits).

7.2 Broad strategies

The broad strategies to manage Yelloweye Rockfish in Canadian Pacific waters are as follows:

1. fisheries and habitat management: adopt or maintain fisheries and habitat management practices that are beneficial to Yelloweye Rockfish and which ensure total fishery removals remain at sustainable levels

2. assessment and monitoring: maintain and develop strategies to assess and monitor the status of Yelloweye Rockfish populations, and the effectiveness of established protection measures

3. research: investigate knowledge gaps and threat uncertainties that will result in a benefit to Yelloweye Rockfish conservation and management

4. outreach and communication: support communication and outreach activities aimed at mitigating threats and reducing mortality of Yelloweye Rockfish

7.3 Measures for the conservation of the species

Success in the conservation of this species is dependent on the actions of many different jurisdictions; it requires the commitment and cooperation of the constituencies that will be involved in implementing the objective and conservation measures set out in this management plan.

The measures set out in management plan provide the best chance of achieving the management objective for the Yelloweye Rockfish, including measures to be taken to address threats to the species and monitor its management, to guide not only activities to be undertaken by DFO, but those for which other jurisdictions, organizations and individuals have a role to play. As new information becomes available, these measures and the priority of these measures may change. DFO strongly encourages all Canadians to participate in the conservation of the Yelloweye Rockfish through undertaking conservation measures outlined in this management plan.

The Rebuilding Plan for Yelloweye Rockfish – Outside Population is now included in the 2016 Groundfish Integrated Fisheries Management Plan. This management plan and the rebuilding plan are consistent with and complementary to one another. The rebuilding plan supports the conservation measures identified below.

Table 2 identifies the measures to be undertaken by DFO to support the management of Yelloweye Rockfish.

Table 3 identifies the measures to be undertaken collaboratively between DFO and its partners, other agencies, organizations or individuals. Implementation of these measures will be dependent on a collaborative approach, in which DFO is a partner in conservation efforts, but cannot implement the measure alone. All Canadians are invited to join in supporting and implementing this management plan.

Federal funding programs for species at risk that may provide opportunities to obtain funding to carry out some of the outlined activities include the Habitat Stewardship Program for Species at Risk, the Aboriginal Fund for Species at Risk Program, and the Canadian Nature Fund for Aquatic Species at Risk.

Implementation of this management plan is subject to appropriations, priorities, and budgetary constraints of the participating jurisdictions and organizations.

Table 2. Conservation measures to be undertaken by Fisheries and Oceans Canada

#	Measures for the conservation of the species	Broad strategy	Priority[7]	Threats addressed	Timeline[8]
1	Continue with current management of Yelloweye Rockfish in the commercial groundfish fisheries and implement adaptive management to the following measures: • setting of total allowable catches (TACs) based on scientific advice which is consistent with the Departments Sustainable Fisheries Framework and impacts of other threats where appropriate and feasible • management of TACs via Individual Transferable Quotas and fishery mortality caps • 100% at-sea and dockside fisheries monitoring and catch reporting	1	High	• fisheries (targeted catch, incidental catch, illegal, unreported, and unregulated [IUU] catch)	Ongoing to 2025
2	Continue to support and enhance the enforcement of Yelloweye Rockfish management measures in all fishing sectors and the protection of inshore rockfish from all mortality associated with recreational and commercial fisheries in Rockfish Conservation Areas (RCAs) and other closed zones.	1	High	• fisheries (targeted catch, incidental catch, IUU catch)	Ongoing to 2025
3	Continue to account for all mortality of Yelloweye Rockfish from scientific surveys and research within stock assessments and sustainable harvest limits.	1	High	• fisheries (targeted catch, incidental catch)	Ongoing to 2025
4	Document all Canadian fisheries catch data sources and repositories containing Yelloweye Rockfish catch information and develop descriptive metadata to aid the consistent collation and interpretation of data for stock assessment and catch monitoring purposes. This work will be aimed at achieving complete coast wide estimates of catch in all fisheries on an annual basis.	1	High	• fisheries (targeted catch, incidental catch)	Ongoing to 2025

[7] "Priority" reflects the degree to which the measure contributes directly to the conservation of the species or is an essential precursor to a measure that contributes to the recovery of the species:

- "high" priority measures are considered likely to have an immediate and/or direct influence on the recovery of the species
- "medium" priority measures are important but considered to have an indirect or less immediate influence on the recovery of the species
- "low" priority measures are considered important contributions to the knowledge base about the species and mitigation of threats

[8] The timelines are intended to indicate the timeframe in which the work should be completed, but the actions can start at any time.

#	Measures for the conservation of the species	Broad strategy	Priority[7]	Threats addressed	Timeline[8]
5	Document Canadian Yelloweye Rockfish fisheries data sources and develop and regularly update descriptive metadata to aid in interpretation of fisheries data.	1	Low	• fisheries (targeted catch, incidental catch)	2025
6	Continue to implement and promote education and awareness of fisheries prohibitions in RCAs and other closed zones.	1	High	• fisheries (targeted catch, incidental catch, IUU catch)	Ongoing to 2025
7	Continue to promote and apply best management practices to mitigate and offset harm to Yelloweye Rockfish and its habitat from coastal and marine development.	1	High	• habitat loss and degradation • pollution and contamination	Ongoing to 2025
8	Continue to monitor and assess population abundance and trends: • continue groundfish and rockfish stock assessment research and fishery-independent surveys to obtain reliable abundance indices and biological sampling of Yelloweye Rockfish • conduct Yelloweye Rockfish populations stock assessment at a minimum of every ten years	2	High	• fisheries (targeted catch, incidental catch) • population abundance	Ongoing to 2025
9	Review Yelloweye Rockfish abundance indices on a regular and pre-determined basis between stock assessments to monitor the status of the stocks against the management objective, track population trends, and identify changes to management measures as appropriate.	2	Medium	• fisheries (targeted catch, incidental catch) • population abundance	Ongoing to 2025
10	Continue to undertake research and monitoring using non-intrusive visual survey methodologies and to evaluate these methodologies as a means to enhance stock monitoring, assessment, and habitat requirements.	2	Medium	• fisheries (targeted catch, incidental catch) • habitat loss and degradation	Ongoing to 2025
11	Conduct an evaluation of the Inshore Rockfish Conservation Strategy (IRCS): • re-examine the principles and objectives of the IRCS to ensure they remain appropriate and relevant given updated science and new fisheries management tools and policies • develop a RCA monitoring program which includes measurable objectives and performance measures to assess the performance of RCAs with regards to the recovery of Yelloweye and other inshore rockfish species	2	Medium	• fisheries (targeted catch, incidental catch, IUU catch) • habitat loss and degradation	2025

#	Measures for the conservation of the species	Broad strategy	Priority[7]	Threats addressed	Timeline[8]
	• use results of the IRCS evaluation to identify and recommend changes or additions to inshore rockfish and RCA management as necessary (for example alternative fishing mortality goals, changes to RCA locations or boundaries, additional protected areas, additional prohibitions within RCAs, etc.)				
12	Investigate the feasibility of implementing recompression devices in commercial, recreational, and Indigenous fisheries as a means to increase the survival of Yelloweye Rockfish released at sea.	3	High	• fisheries (incidental catch)	Ongoing to 2025
13	Develop a genetic sampling protocol to further refine the Inside and Outside waters Yelloweye Rockfish population boundaries and outline best practices for delineating the Inside and Outside populations in stock assessments and management practices.	3	Medium	• Inside and Outside waters Population knowledge gap	2025
14	Conduct research to understand significance of a potential age or size structure truncation in Yelloweye Rockfish populations and their influence on recruitment success and long-term sustainability to inform fisheries management decision making.	3	Medium	• fisheries (targeted catch, incidental catch, IUU catch)	2025
15	Conduct further research to refine our understanding of Yelloweye Rockfish habitat requirements at all life stages in Canadian Pacific waters.	3	Medium	• habitat loss and degradation	2025

Table 3. Conservation measures to be undertaken collaboratively between Fisheries and Oceans Canada and its partners, other agencies, organizations or individuals

#	Conservation measure	Broad strategy	Priority[7]	Threats addressed	Timeline[8]	Collaborators
16	Work with recreational, Indigenous and non-groundfish commercial fishing sectors to develop or improve methodologies to account for the total fishery removals (retained and released) of Yelloweye Rockfish in all fisheries: • continue work under the Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries to identify information needs and gaps for each fishery, and highlight areas of priority for implementing or improving fisheries monitoring and catch reporting programs ○ implement monitoring tools to address information gaps so as to achieve robust and consistent methods for assessing Yelloweye Rockfish fishing mortality on an annual basis ○ promote the development of independent, at-sea and dockside catch validation methods across fishing sectors • ensure the results of the Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries are used to improve fisheries monitoring and catch reporting methodologies and are implemented at the species level for Yelloweye Rockfish	1	High	• fisheries (targeted catch, incidental catch, illegal, unreported, and unregulated [IUU] catch)	Ongoing to 2025	Indigenous, recreational and non-groundfish commercial fishery sectors
17	Continue to engage as necessary with municipal, provincial and federal Governments through existing pollution reduction programs to reduce the overall level of marine and coastal contamination from known persistent, bioaccumulative toxins into the marine and coastal environments.	1	Low	• pollution and contamination	Ongoing to 2025	Other agencies
18	Develop an analysis of Yelloweye Rockfish spatial occurrence over time in order to identify areas of spatiotemporal importance to the species and/or areas with changing Yelloweye Rockfish frequency that may provide	2	Medium	• fisheries (targeted catch, incidental catch) • pollution and contaminants • climate change	Ongoing to 2025	Indigenous fishery sectors, industry, and environmental non-

#	Conservation measure	Broad strategy	Priority[7]	Threats addressed	Timeline[8]	Collaborators
	additional insight into the impacts of specific threats and assist in identifying appropriate management measures.			• habitat loss and degradation		governmental organizations (ENGOs)
19	Conduct and/or support research to directly investigate the impacts of pollution, such as hydrocarbons and persistent and bioaccumulative toxins, on Yelloweye Rockfish in British Columbia.	3	Low	• pollution and contaminants	2025	Indigenous fishery sectors, academia, industry, and ENGOs
20	Develop and deliver an Inshore Rockfish Conservation Strategy education and awareness program for the direct and indirect harvest sectors and the general public to: • improve species identification among harvesters, recreational fishery service providers, and catch monitoring service providers • increase Yelloweye Rockfish catch reporting among harvesters, recreational fishery service providers, and catch monitoring service providers • promote avoidance of non-directed Yelloweye Rockfish fisheries, and other inshore rockfish species during fishing activities • improve compliance with prohibitions within Rockfish Conservation Areas (RCAs) and other closed areas • foster public engagement in Yelloweye Rockfish conservation and the Rockfish Conservation Strategy	4	High	• fisheries (targeted catch, incidental catch)	Ongoing to 2025	Indigenous, recreational, and commercial fishery sectors
21	Continue development of appropriately formatted (GIS, CSV, smartphone/tablet application, etc.) closed area boundary data, for RCAs and other closed areas in BC waters, and make these files accessible to harvesters and other marine resource users for use in navigation and mapping devices.	4	High	• fisheries (targeted catch, incidental catch, IUU catch)	Ongoing to 2025	Academia, industry, ENGOs, Indigenous, recreational, and commercial fishery sectors

8 Measuring progress

The performance indicators presented below provide a way to define and measure progress toward achieving the management objective. A successful management program will achieve the overall aim of maintaining Yelloweye Rockfish distribution and abundance at existing levels or higher in Canadian Pacific waters, by managing threats to the species within BC. Progress towards meeting this objective will be reported on in the report on the progress of the management plan implementation.

Pursuant to section 72 of SARA, progress on implementation of management plans is assessed within five years of the date of posting to the Species at Risk Public Registry, and every subsequent five years following. The status of each of the broad strategies and conservation measures listed above will be reported upon at these five-year intervals, until the management plan objective has been achieved. The performance measures to monitor progress toward the management plan objective are listed in table 4:

Table 4: Performance measures for the conservation of Yelloweye Rockfish in Canadian Pacific waters.

	Performance measures
Management objective	• Maintain or increase Yelloweye Rockfish distribution and abundance in Canadian Pacific waters.
Broad strategy 1: fisheries and habitat management	As per recommendations of the Catch Monitoring Framework initiative: • improve fisheries monitoring and reporting in fisheries known to intercept Yelloweye Rockfish by 2025. • maintain or enhance fisheries management measures to ensure removals from fisheries that intercept Yelloweye Rockfish are accounted for and maintained within sustainable limits by 2025. • complete the inventory of Yelloweye Rockfish catch data sources and metadata by 2025.
Broad strategy 2: assessment and monitoring	• Develop and implement an Inshore Rockfish Conservation Strategy evaluation by 2025.
Broad strategy 3: research	• Complete scientific research to identify habitat requirements, the impacts of pollution, age/size structure truncation, and stock structure and population boundaries for provision in scientific advice and fisheries management decision making by 2025. • Complete assessment of recompression devices in various fisheries and include these in licence conditions and fisheries management plans if appropriate by 2025.
Broad strategy 4: outreach and communication	• Develop and distribute an education and awareness program and closed area boundary materials to harvesters, fishery service providers, other marine resources users, and the general public by 2025.

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Appendix A: effects on the environment and other species

In accordance with the Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals (2010), *Species at Risk Act* (SARA) recovery planning documents incorporate strategic environmental assessment (SEA) considerations throughout. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally sound decision-making.

Management planning is intended to benefit species at risk and biodiversity as a whole. However, it is recognized that management plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process is based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts to non-target species or habitats. The results of the SEA are incorporated directly into the plan itself, but are also summarized in this appendix.

This management plan will benefit the environment by promoting the recovery of Yelloweye Rockfish, thereby positively contributing to goal 5 (wildlife conservation) of the Federal Sustainable Development Strategy (FSDS). Because of shared threats, and similar techniques used to fill knowledge gaps and complement existing knowledge, the majority of actions contained in this management plan can also potentially benefit other species, and recovery planning initiatives for those that are species at risk. Maintaining biodiversity within Canadian Pacific waters helps to encourage the resiliency of various North Pacific Ocean ecosystems. As such, the management plan also positively contributes to goal 6 of the FSDS (ecosystem/habitat conservation and protection).

The potential for the management plan to inadvertently lead to adverse effects on the environment and other species was considered. The SEA concluded that this plan will benefit the environment, and potentially other species, and will not cause any significant adverse effects. For example, the benefits stemming from the use of marine vessels to perform research outweigh the relatively small negative impacts that those research platforms may have on air pollution (FSDS goal 2), water quality (FSDS goal 3), and anthropogenic noise and disturbance while undertaking management plan activities.

Appendix B: record of cooperation and consultation

The Canadian Pacific populations of Yelloweye Rockfish were assessed as special concern by the Committee for the Status of Endangered Wildlife in Canada (COSEWIC) in November 2008 and were listed as such under schedule 1 of the *Species at Risk Act* (SARA) in July 2011. Yelloweye Rockfish is an aquatic species that range throughout the marine waters of British Columbia. The Minister of Fisheries and Oceans (DFO) and the Minister responsible for the Parks Canada Agency are the competent ministers for Yelloweye Rockfish in Canadian waters. DFO established a working group of technical experts to develop the initial draft of this management plan. See the acknowledgements section of this document for a list of contributing authors.

Additional stakeholders, Indigenous organizations, and public input was sought through the publication of a proposed management plan on the Species at Risk Public Registry for a 60-day public comment period from December 27, 2018 to February 25, 2019. No comments were received during the 60-day comment period, and as a result, there were no changes made to the document.