MSC Public Certification Report

for

US and Canada Pacific Hake Mid-water Trawl Fishery

MRAG Americas, Inc.

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CLIENT DETAILS:
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1 Executive Summary

An assessment team of Mark Pedersen, Max Stocker, and Robert J. Trumble conducted the assessment using CR v1.3. The assessment team met with scientists, managers, and other stakeholders from the US and Canada from 20-22 November 2014 in person and by teleconference in Seattle and by teleconference on 25 and 26 November 2014. The fisheries of the US and Canada for Pacific Hake are exceptionally well managed and are characterized by state of the art stock assessments and harvest strategies designed and implemented jointly. The stock is in good condition. Both countries implement high levels of control over the fisheries to minimize environmental impacts. The overarching legislation and regulation affecting Principle 1 and Principle 2 are highly developed, and applied specifically to the fisheries. On the basis of this re-assessment of the fisheries, the Assessment Team recommends that the US and Canadian fisheries for Pacific Hake maintain certification. The US fishery received no conditions, but the team identified two performance indicators for the Canadian fishery that scored less than 80 and received conditions:

> 2.1.3. Retained species information: The Canadian fishery meets scoring issues a and c of the SG 80 and partially met scoring issues b and d of the SG80 so a score of 75 is warranted.
>
> 2.2.3 Bycatch species information: The Canadian fishery meets scoring issues a and c of SG80 so a score of 70 is given.

Final Principle Scores		
Principle	**Score US**	**Score Canada**
Principle 1 – Target Species	88.9	
Principle 2 – Ecosystem	97.7	91.3
Principle 3 – Management System	100	100

2 Authorship and Peer Reviewers

2.1 Assessment Team

The assessment team consists of Mr. Mark Pedersen, Dr. Max Stocker, and Dr. Robert J. Trumble. Dr. Trumble serves as assessment team leader. Qualifications of the team are:

Mr. Mark G. Pedersen is a Senior Aquatic/Marine Scientist and President of Margenex International, founded in 1991. Mr. Pedersen has extensive experience in strategic planning and business development related to natural resources management. Technical specialties include: aquatic and marine environmental issues; biology of economically important marine fishes, salmon species, and shellfish; fishery management policy and regulations; seafood business and statistics for commercial, artisanal, and recreational fisheries along the Pacific coast of North America, Peru, and Micronesia, in the Baltic Sea, India, Papua-New Guinea, Australia, and the northwest coast of Africa (Mauritania, Guinea, and Ghana); and calculation of lost fishing vessel revenues and fishermen's potential earnings due to accidents. He has served as a Marine Stewardship Council (MSC) certification expert for five Pacific coast commercial fisheries. He has directed, managed, and/or participated in numerous projects involving fishery characterization, fish habitat enhancement, and mitigation for development impacts; fish migrations, fish stock assessments. His work also involves project compliance with local, state, national, and international environmental regulations including the US Endangered Species Act, and World Bank, International Finance Corporation, and Espoo Environmental Standards; and strategic planning and design of natural resource related projects. His responsibilities include project management, research, analysis, preparation and presentation of proposals and reports, and negotiation with government agencies. In addition to technical responsibilities, Mr. Pedersen has

presented numerous talks at seminars and scientific symposia, and frequently serves as an expert witness before courts, legislatures, international commissions, and other formal hearing bodies. He has published more than 30 articles in international scientific journals and report series.

Dr. Max Stocker is a scientist with over 30 years of extensive experience in fisheries science. He is currently proprietor of Stocker & Associates Consultants conducting Marine Stewardship Council certification projects. Dr. Stocker acted as marine fisheries consultant under contract with Fisheries and Oceans Canada (DFO) to provide scientific advice on highly migratory species in the Pacific Ocean. He was the lead Canadian scientist for highly migratory species for the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC). He served as co-chair of the Stock Assessment Working Group of the Scientific Committee of the WCPFC and chaired the ISC Albacore Working Group. From 1978-2006 Dr. Stocker held the position of research scientist with DFO at the Pacific biological Station conducting population dynamic studies, conducting peer reviewed stock assessments of many marine species, and communicating results to fisheries managers and stakeholders. He authored and co-authored over 90 scientific papers and reports, and made over 50 presentations in national and international scientific meetings. Dr. Stocker chaired the Pacific Scientific Advice Review Committee (PSARC) for many years and edited and published over 30 advisory documents on the stock status of marine species and the implications of harvest management on these stocks. Additionally, Dr. Stocker served as in-house stock assessment consultant to the New Zealand Fishing Industry Board in the early 1990s conducting peer reviewed stock assessments, participating in the peer review process, and advising the Board on inshore and deepwater fisheries.

Dr. Robert J. Trumble (Assessment Team Leader) joined MRAG Americas in 2000 as a senior research scientist and became Vice President in 2005. He has wide-ranging experience in marine fish science and management, fishery habitat protection, and oceanography. Dr. Trumble serves as Certification Manager for MRAG. He has overseen all MRAG pre-assessments and full assessments. He has received MSC training on numerous occasions, including the Risk-based Framework, and has led an RBF on three occasions. Previously, he served as Senior Biologist of the International Pacific Halibut Commission in Seattle, Washington, in various research and management positions at the Washington Department of Fisheries, and with the US Naval Oceanographic Office. Dr. Trumble has extensive experience working with government agencies, commercial and recreational fisheries groups, Indian tribes, and national and international advisory groups. He received appointments to the Scientific and Statistical Committees of the South Atlantic Fishery Management Council and the Pacific Fishery Management Council, the Groundfish Management Team of the North Pacific Fishery Management Council, the affiliate faculty of Fisheries at the University of Washington, and the Advisory Committee of the Washington Sea Grant Program. Dr. Trumble received a Ph.D. in Fisheries from the College of Fisheries, University of Washington.

These individuals collectively have knowledge of the stock status and assessment, ecosystem impacts, and management systems applicable to this fishery.

2.2 Peer Reviewers

Mr. Tom Jagielo has a wide breadth of experience in marine fish science, habitat studies, and oceanography. Tom formed his own firm in 2008 to provide consulting services in quantitative fisheries science. Previously, he served for 24 years with the Washington Department of Fish and Wildlife, and 6 years with the Fisheries Research Institute at the University of Washington in Seattle. As a Senior Research Scientist for Washington, Tom specialized in groundfish stock assessment and survey design, adapting state of the art tools and methods to assess marine fish populations for sustainable fisheries management. He produced numerous stock assessments used by the Pacific Fishery Management

Council, including analysis of lingcod, black rockfish, and yelloweye rockfish populations. His early assessment of west coast lingcod identified the stock as overfished, and his rebuilding analysis ultimately resulted in a rebuilt population within the mandated 10 year time frame. His recent consulting projects have included 1) the design and implementation of a novel coastwide aerial survey used for management of west coast Pacific sardine, 2) a methodological review of Annual Catch Limits for the NOAA Fisheries Pacific Islands Regional Office, and 3) various habitat and marine fish science projects for the Environmental Defense Fund, the Alliance of Communities for Sustainable Fisheries, the At Sea Processors Association, and other organizations. Tom has extensive experience working with government agencies, commercial and recreational fisheries groups, Indian tribes, community organizations, and both national and international advisory groups. He received appointments to the Scientific and Statistical Committee of the Pacific Fishery Management Council, the Technical Subcommittee of the US-Canada Groundfish Committee, the Pacific Coast Ocean Observation System, and various other workshop panels and review bodies. Tom has published in peer-reviewed journals and symposium proceedings, presented papers at national and international meetings, and written reports for government agencies. Tom received a B.S. degree in Biology from the Pennsylvania State University, and a M.S. degree in Fisheries from the University of Washington. He also conducted post M.S. graduate studies in fisheries population dynamics and parameter estimation at the University of Washington.

Dr Paul Medley is an independent scientist with experience in mathematical modelling of fisheries and ecological systems and data management, including data acquisition to fit and test models, with the objective of providing scientific advice to fishery management. Bioeconomic modelling, with particular reference to interactions between different tuna fishing fleets, tropical fisheries, and developing new techniques for multispecies stock assessment based on maximum likelihood, Bayesian methods and decision theory. He has worked on a number of fisheries in detail including spiny lobster, conch, shrimp, squid and pelagics. He has been an invited expert for a number of stock assessment working group meetings and stock assessment reviews. He has a wide practical experience in marine biology, including design and implementation of surveys and fisheries experiments using SCUBA and small research vessels. This includes addressing wider environmental issues of ecological management, including maintenance of marine biodiversity. Dr. Medley was directly involved in Greater Caribbean fisheries and environmental management, and in the decision making process involving discussions with politicians, civil servants and the fishing community. Experience in small scale fisheries has led to the development of new software and other tools suitable for small scale co-managed fisheries. He has an in-depth understanding of the MSC methodology and has been involved in developing the MSC certification methodology and various MSC assessments, including a number of North Sea pelagics and groundfish, Barents Sea and West Coast USA groundfish, Antarctic toothfish, icefish and krill. He has also helped prepare some fisheries for MSC certification, namely Suriname seabob shrimp, Bahamas spiny lobster and Madagascar octopus. He regularly conducts technical stock assessment reviews for the Centre for Independent Experts for the United States mainly temperate fisheries and has conducted fisheries project reviews for the European Union projects.

3 Description of the Fishery

3.1 Unit(s) of Certification and scope of certification sought

The MRAG Americas assessment team determined that the fishery is within scope as required by the MSC.

The unit of certification consists of:

Species North Pacific Hake (*Merluccius productus)*

Geographical range of fishing operations	US federal EEZ waters off Washington, Oregon and California and Canadian EEZ waters off the British Columbia coast.
Method of capture	Mid-water trawl
Stock	Offshore stock of Pacific Hake/whiting The US component of the fishery is managed by the Pacific Fishery Management Council. The US Regulatory Authority for the fishery is the National Marine Fisheries Service, West Coast Region. The Makah fishery is managed by the tribe and is managed in accordance with the harvest control rules established by the NMFS.
Management	The fishery is managed by Fisheries and Oceans Canada. The Canadian share of 26.12% of the Total Allowable Catch is calculated using combined US/ Canada assessment conducted by the Joint Technical Committee and advice provided by the Advisory Panel, Science Review Group, and Joint Management Committee
Client group	The Pacific Whiting Conservation Cooperative (PWCC), the Association of Pacific Hake Fishermen (APHF) and the Oregon Trawl Commission (OTC).

This unit of certification represents the range of Pacific Hake, and includes all eligible fishermen of the US and Canada with authorization from the respective governments to fish for Pacific Hake.

3.2 Overview of the fishery

3.2.1 Description of the fishery

The Unit Stock

The northeast Pacific stocks of Pacific Hake, or Pacific whiting, (*Merluccius productus* Ayres 1855) ranges from Sanak Island in the western Gulf of Alaska to Magdalena Bay, Baja California Sur. There are two much smaller stocks with much smaller ranges potentially overlapping the Pacific Hake unit of certification: a Puget Sound stock and a Strait of Georgia stock. These separate, and much smaller, populations are not included in this analysis. US vessels permitted for the offshore hake fishery do not have permits to fish in the waters of Puget Sound or Gulf of Georgia. Canadian vessels in the Gulf of Georgia may not mix catch with certified offshore hake: offshore and most Gulf of Georgia hake vessels must have 100% observer coverage, and all landings have 100% dockside monitoring to confirm area of landing. The offshore stock of Pacific Hake (the unit stock of this certification) is migratory and inhabits the continental slope and shelf within the California current system from Baja California to British Columbia. They are found near the bottom or in the water column to depths of 914 m (3,000 ft) (Quirollo 1992). They are most common in water shallower than 229 m (750 ft). This stock exhibits seasonal migratory behavior, ranging from offshore and generally southern waters during the winter spawning season to coastal areas between northern California and northern British Columbia during the spring, summer and fall when the fishery is conducted. In years with warmer water temperatures the stock tends to move farther to the north during the summer and older Hake tend to migrate farther than younger fish in all years (Bailey *et al*. 1982).

Management Operation

The setting of the annual catch quota and international allocation of coastal Pacific Hake (*Merluccius productus*) fisheries off the west coast of the United States and Canada is now

conducted jointly by the two countries. This species is harvested primarily by commercial mid-water pelagic trawls. Historically, with implementation of the Magnuson-Stevens Fishery Conservation and Management Act in the U.S. and the declaration of a 200 mile fishery conservation zone in both countries in the late 1970s, annual quotas (or catch targets) had been used to limit the catch of Pacific Hake in both zones by foreign and domestic fisheries. During the 1990s, however, disagreement between the U.S. and Canada on the division of the total catch led to quota overruns. Prior to 1997, separate Canadian and U.S. assessments for Pacific Hake were submitted to each nation's assessment review process. This practice resulted in differing yield options being forwarded to each country's managers. Multiple interpretations of Pacific Hake status made it difficult to coordinate an overall management policy. Between 1997 and 2011, the Stock Assessment and Review (STAR) process for the Pacific Fishery Management Council (PFMC) had evaluated assessment models and the U.S. Pacific Fishery Management Council process, including NOAA Fisheries, has generated management advice that has been largely utilized by both nations. Since 2012, the Scientific Review Group, under the auspices of the Pacific hake Agreement (details follow) has reviewed the assessment models.

A Joint US-Canada Agreement for Pacific Hake (called "the Agreement") (U.S. Government Printing Office 2004) was formally ratified in 2006 (signed in 2007) by the United States as part of the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (MSA 2007). Although the Agreement has been considered to be in force by Canada since June 25, 2008, an error in the original U.S. text required that the Agreement be ratified again before it could be implemented. This second ratification occurred in 2010 (NOAA Fisheries 2014a). Under the Agreement, Pacific Hake stock assessments are prepared by a Joint Technical Committee (JTC) comprised of both U.S. and Canadian scientists, and reviewed by a Scientific Review Group (SRG), with national representatives to both groups appointed by their respective governments. Additionally, the Agreement calls for both of these bodies to include industry-nominated scientists, who are selected and appointed jointly by both nations. In the US, the Pacific Fishery Management Council recommends management and enforcement measures to NMFS. The Fisheries and Oceans Canada (DFO) in Canada meets regularly with the Groundfish Trawl Advisory Committee (GTAC), comprised of fishers, processors, coastal community leaders, and labour, First Nations and the Province of BC to review the fishery and obtain information and advice on management actions, including catch data, stock movement and any potential Canadian Joint Venture opportunities. In addition, Washington coastal tribes have treaty rights that are taken into account in the management of the fishery.

Since 1999, catch targets have been determined using an F40% default harvest rate with a 40:10 control rule (the default harvest policy) that decreases the catch linearly from a depletion of 40% to a depletion of 10%. Further considerations have often resulted in catch targets to be set lower than the recommended catch limit. The Agreement between the United States and Canada, establishes U.S. and Canadian shares of the coast-wide allowable biological catch at 73.88% and 26.12%, respectively, and this distribution has been adhered to since ratification of the Agreement.

In the U.S., all retained and discarded bycatch species are managed by the PFMC process under the MSA (2007) under its Management Plans (e.g. for groundfish, salmon, etc.) and management measures, including comprehensive monitoring, are implemented by the NMFS, in collaboration with Washington treaty tribes and the states of Washington, Oregon, and California (PFMC and NMFS 2012).

Groundfish resources and associated species in Pacific Ocean waters off Canada are managed under authority of the Fisheries Act and implemented by DFO through annual addendums for the Hake fishery (DFO 2013a) to the Integrated Fishery Management Plans (DFO 2013b).

3.2.2 Historical development of the Fishery

During the fishery's first 25 years, the majority of removals were from foreign or joint-venture fisheries. Large-scale harvesting of Pacific Hake in the U.S. zone began in 1966, when factory trawlers from the Soviet Union began targeting Pacific Hake. During the mid-1970s, factory trawlers from Poland, Federal Republic of Germany, the German Democratic Republic and Bulgaria also participated in the fishery. During 1966-1979, the catch in U.S. waters is estimated to have averaged 137,000 t per year. A joint-venture fishery was initiated in 1978 between two U.S. trawlers and Soviet factory trawlers acting as mother-ships (the practice where the catch from several boats is brought back to the larger, slower ship for processing and storage until the return to land). By 1982, the joint-venture catch surpassed the foreign catch, and by 1989, the U.S. fleet capacity had grown to a level sufficient to harvest the entire quota, and no further foreign fishing was allowed, although joint-venture fisheries continued for another two years. In the late 1980's, joint ventures involved fishing companies from Poland, Japan, the former Soviet Union, the Republic of Korea and the People's Republic of China.

Historically, the foreign and joint-venture fisheries produced fillets as well as headed and gutted products. In 1989, Japanese mother-ships began producing surimi from Pacific Hake using a newly developed process to inhibit myxozoan-induced proteolysis. In 1990, domestic catcher-processors and mother ships from Alaskan fisheries entered the Pacific Hake fishery in the U.S. zone. The development of surimi production techniques was expanded to include Pacific Hake. Shore-based processors of Pacific Hake had been constrained by a limited domestic market for Pacific Hake fillets and headed and gutted products. The construction of surimi plants in Newport and Astoria, Oregon, led to a rapid expansion of shore-based landings in the U.S. fishery in the early 1990's, when the PFMC set aside an allocation for that sector. In 1991, the joint-venture fishery for Pacific Hake in the U.S. zone ended because of the increased level of participation by domestic catcher-processors and mother ships, and the growth of shore-based processing capacity. In contrast, Canada, at its discretion, allocates a portion of the Pacific Hake catch to joint-venture operations once shore-side capacity is filled (JTC 2013).

The sectors involved in the Pacific Hake fishery in Canada exhibited a similar historical pattern, although phasing out of the foreign and joint-venture fisheries proceeded more slowly than in the U.S. Since 1968, more Pacific Hake have been landed than any other species in the groundfish fishery on Canada's west coast. Prior to 1977, fishing vessels from the former Soviet Union caught the majority of Pacific Hake in the Canadian zone, with Poland and Japan accounting for much smaller landings. After declaration of the 200-mile extended fishing zone in 1977, the Canadian fishery was divided among shore-based, joint-venture, and foreign fisheries. In 1992, the foreign fishery ended, but the demand of Canadian shore-based processors remained below the available yield, thus the joint-venture fishery continues today, although no joint-venture fishery took place in 2002, 2003, 2009 or 2012. The majority of the shore-based landings of the coastal Hake stock is processed into fillets for human consumption, surimi, or mince by processing plants at Ucluelet, Port Alberni, and Delta, British Columbia. Although significant aggregations of Hake are found as far north as Queen Charlotte Sound, in most years the fishery has been concentrated below 49° N. latitude off the south coast of Vancouver Island, where there have been sufficient quantities of fish in proximity to processing plants (JTC 2013). In the past few years the market product has changed to headed & gutted (H&G) frozen whole fish produced from the shoreside plants (a small amount of fillets also are produced). In addition, recently four Canadian freezer trawlers have started to H&G and freeze Hake at sea. Much of the Hake is sold to Eastern European customers. Today, nearly all of the Hake is processed shoreside.

Coast-wide fishery landings of Pacific Hake averaged 222,000 mt from 1966 to 2012, with a low of 90,000 mt in 1980 and a peak of 363,000 mt in 2005. Prior to 1966 the total removals were negligible relative to the modern fishery. The fishery in U.S. waters has averaged 166,000 mt, or 74.7% of the average total landings over the time series, with the catch from

Canadian waters averaging 56,000 mt. For this assessment, the terms catch and landings are used interchangeably because estimates of discard within the target fishery are included with landings, while discarding of Pacific Hake in non-target fisheries is not. Discard from all fisheries is estimated to be less than 1% of landings and therefore is likely to be negligible with regard to the population dynamics. Moreover, in the U.S., the PFMC establishes an annual set aside amount (take off the top of the TAC before allocation to the three non-tribal whiting sectors) to accommodate catch of Hake in non-whiting fisheries and research activities.

Recent coast-wide landings from 2008–2012 have been above the long-term average, at 243,000 mt. Landings between 2001 and 2008 were predominantly comprised of fish from the very large 1999 year class, with the cumulative removal from that cohort exceeding an estimated 1.2 million mt. In 2008, the fishery began harvesting considerable numbers of the then emergent 2005-year class. Catches in 2009 were again dominated by the 2005-year class with some contribution from an emergent 2006 year class and relatively small numbers of the 1999 cohort. The 2010 and 2011 fisheries encountered very large numbers of the 2008 year-class, while continuing to see some of the 2005 and 2006 year-classes as well as a small proportion of the 1999-year class. In 2012, U.S. fisheries caught mostly 2 and 4-year old fish from the 2008 and 2010-year classes, while the Canadian fisheries encountered older fish from the 2005, 2006, and 2008-year classes. A considerable number of 2-year old fish were caught by the U.S. at-sea fleet later in the year.

Total catches last exceeded the coast-wide catch target in 2002, when landings were 112% of the catch target. Over the last ten years, the average utilization has been 87%. From 2009 to 2012 much of the U.S. tribal allocation remained uncaught and Canadian catches have also been below the limit even though in retrospect the target harvest rate was surpassed in some years (Table 1).

Table 1: Recent trends in Pacific Hake landings and target catch.

Year	Total Landings (mt)	US-Canada Target Catch (m)
2003	205,177	228,000
2004	338,654	501,073
2005	363,157	364,197
2006	361,761	364,842
2007	291,129	328,358
2008	322,145	364,842
2009	177,459	184,000
2010	226,202	262,500
2011	286,055	393,751
2012	204,040	251,809

3.2.3 User rights

User Rights – United States

The U.S. allocates a portion of the U.S. quota to Washington state tribes (Makah, Quileute, and Quinault) that have Treaty fishing rights. The tribal fisheries are managed by the tribes and are managed in accordance with the harvest control rules established by the NMFS. Both the Makah and Quileute tribes have fishing plans that address operations, bycatch management, and catch reporting. At the present time the Makah tribe is the only tribe exercising Tribal fishing rights for Pacific Hake. Annually about 32,500 mt is available to the tribe for harvest. The harvest quota goes partially to a mothership operation and a shoreside program. In the mothership operation NMFS observers monitor the catch, which is reported to NMFS. Shoreside monitoring is conducted by tribal observers, and also reported to NMFS

via federal catch monitors at the non-tribal shore plants that take deliveries from tribal catcher vessels.

The Makah Tribe Hake fishery began in 1996. The Makah allocation since 1997 has ranged from 23,000 to 35,000 m.t. based on a sliding scale allocation agreement, which reflects the Makah's treaty right to harvest Hake within its usual and accustom (U & A) fishing area. The adjudicated ocean area for the Makah Tribe extends from the Canadian border south to 48 02 15 N and west to 125 44 W. As a Makah treaty fishery, all harvest vessels must be owned and crewed by enrolled Makah tribal members. Annual harvest specifications and management measures are developed in consultation with National Marine Fisheries Service and adopted by the Pacific Management Council, which are then published in the Federal Register. The Tribe participates in the federal observer program throughout the season. The Tribe actively participates in the Pacific Management Council process and the annual US/Canada Hake stock assessment. Tribal and NMFS enforcement agents monitor the fishery for compliance with tribal and federal regulations (Joner 2013). In-season monitoring of the tribal landings are made and if projections indicate their allocation will not be taken, there is a mechanism to roll over this surplus to the nontribal sectors.

For the U.S side, non-tribal harvest of Pacific Hake was covered under the Pacific Groundfish Trawl Rationalization implemented in January 2011 by Amendment 20 (and subsequent trailing amendments 21 and 22) to the Groundfish Management Plan. Under this scheme, each resource is harvested under an Individual Fisherman Quota (IFQ) in the shoreside fishery and Harvest Co-operatives in the two at-sea sectors. Harvest cooperatives target Pacific Hake and have allocations for five groundfish species (Pacific Hake, Darkblotched Rockfish, Pacific Ocean Perch (POP), Widow Rockfish, and Canary Rockfish).

Given the Widow Rockfish ACL alternatives analyzed for 2013-2014 and the finding that the widow rockfish stock is successfully rebuilt, the status quo Amendment 21 allocation to whiting sectors is 500 mt, of which 290 mt is allocated to the at-sea sectors. Recent bycatch of Widow Rockfish since 2005 has ranged from 1-73 mt in the catcher-processor sector and from 13-73 mt in the mothership sector (Table 2).

Table 2 Bycatch of Widow Rockfish by non-tribal whiting trawl sectors,

Year	Shoreside a/			Catcher-processors			Motherships		
	Widow Catch (mt)	Whiting Catch (mt)	Widow Catch Rate (Widow/ Whiting)	Widow Catch (mt)	Whiting Catch (mt)	Widow Catch Rate (Widow/ Whiting)	Widow Catch (mt)	Whiting Catch (mt)	Widow Catch Rate (Widow/ Whiting)
2005-11 avg.	86.0	73,213	0.001340688	38.0	71,389	0.000476377	44.7	45,575	0.000979320
2005-11 max	123.8	97,381	0.002662680	72.8	108,121	0.000993271	73.0	57,432	0.001526700
05-11 min (year)	49.4 (2006)	40,801	0.000507518	1(2009)	34,620	0.000027730	12.9 (2011)	24,091	0.000256646

a/ Beginning in 2011 the shoreside whiting and non-whiting sectors were combined into a single sector and managed with IFQs. For this table, the 2011 data were analyzed at the trip level to determine trips that targeted whiting vs. those that targeted other groundfish species. The 2011 catch data presented in the table are the sum of catches from all Whiting target trips to make these data comparable with previous years.

To qualify to receive a quota share (QS) permit, a person or entity must be the current owner of a Pacific Coast Groundfish trawl-endorsed limited entry permit with landing history; or

must be a Whiting shoreside processor that received deliveries of ≥1 metric ton of whiting from Whiting trips in each of any two years from 1998-2004. QS permits consider landings history and bycatch ratios for overfished species. Individual Bycatch Quota (IBQ) for Pacific halibut exist; halibut may be caught, but not retained, and discards count against the IBQ.

At-sea Whiting harvest cooperatives must have a Mothership (MS) permit, an MS/Catcher Vessel (CV)-endorsed limited entry trawl permit, or a Catcher-processor (C/P)-endorsed limited entry trawl permit. To qualify for initial issuance of an MS permit, a person must own, or operate under a bareboat charter, a vessel on which at least 1,000 mt of Pacific whiting was processed in the mothership sector in each year for at least two years from 1997-2003. The duration of the program is open-ended, but the Council can end program through the normal Council process.

Individual species and aggregate quota share accumulation limits are in place, but the plan requires those above the limits to divest by the end of 2014. Vessels have limits on the amount of quota pounds (QP) that can be registered to a vessel at any one time and cumulative over the year. The mothership sector of the at-sea whiting cooperatives limit the amount a vessel may catch to no more than 30% of the Whiting allocation to the mothership sector and limit the mothership processor to processing no more than 45% of the whiting allocation to the mothership sector. Qualified owners of limited entry trawl permits will also receive 80% of the whiting QS. Eligible shoreside processors will receive the remaining 20% of the whiting QS.

For the first two years of the program, QS could not be transferred, although QP may be transferred. The QS (after two years) and QP are fully transferable among eligible persons or entities.

Groundfish are managed through a number of measures including harvest guidelines, quotas, trip and landing limits, seasonal closures, gear restrictions, and area restrictions such as the Rockfish Conservation Areas (RCAs). RCAs are areas where specific gears or sectors are prohibited from fishing. All sectors of the groundfish fishery are currently constrained by the need to rebuild groundfish species that have been declared overfished, and rebuilding plans have been developed to help these species recover. In the near-term, the overall groundfish harvest has been significantly reduced because of the low quotas necessary to rebuild stocks.

The trawl rationalization program is a limited access privilege program under the MSA with 100% monitoring of the catch through at-sea observers and dockside catch monitors. It consists of: 1) an IFQ program for the shore-based trawl fleet; and 2) two distinct cooperative programs for the mothership and catcher-processor trawl fleets. The trawl rationalization program is intended to increase net economic benefits, create individual economic stability, provide full utilization of the trawl sector allocation, consider environmental impacts, and achieve individual accountability of catch and bycatch.

The U.S. program continues to be adjusted as the Pacific Fishery Management Council develops trailing actions to address topics including, but not limited to: cost recovery, safe harbors/community fishing associations, and development of the Adaptive Management Program (NOAA Fisheries 2011).

User Rights – Canada

Fisheries and Oceans Canada (DFO) has responsibility for management of all species within Canada's 200-mile limit of jurisdiction and sets an overall Total Allowable Catch or TAC, conducts stock assessment work, and enacts other regulatory measures. Hake is a trans-boundary stock. There is an international Hake agreement with the US under which an overall total TAC, and allocations for Canada and the US, are set. DFO manages the

Canadian portion of the fishery. Canada and the US jointly sponsor stock assessment work and other scientific research on Hake.

A Canadian Individual Vessel Quota (IVQ) system was introduced in 1997. Each limited entry groundfish trawl (Category "T") license holder, including Pacific Hake, received an IVQ representing a percentage of the species-specific TAC. Fifty-five different stock-specific TACs were developed to be included in this system. The IVQ allocation formula is based on a combination of vessel catch history and vessel length.

Following implementation of this new system, license holders were then allowed to transfer stock specific quota amongst themselves based on the business strategy that best fit their individual operations. Some vessels wanted to specialize by area (south vs. north coast), or depth (deepwater vs. inshore fishing), or gear (bottom vs. midwater trawl), or species (rockfish vs. cod, Hake, and flatfish), or market (fresh vs. frozen). Many vessels stayed diversified in their ITQ holdings, moving fish annually on a temporary basis to other vessels as needed. Some operators chose to exit the fishery, while others expanded their operations to improve economies of scale. An additional component of the groundfish trawl IVQ plan was the implementation of 100 per cent at-sea observer coverage on all groundfish trawl trips (Monroe *et al*. 2009).

The Canadian commercial TAC for each species, including Hake, is allocated in three different parcels:

- 80% of the TAC is allocated as IVQ
- 10% of the TAC is allocated as Groundfish Development Quota (GDQ) based on joint vessel owner-processor proposals evaluated by the Groundfish Development Authority (GDA) on the basis of regional development, employment, sustainable fishery practices and other criteria (i.e., largely social objectives)
- 10% is allocated annually to vessel owners in the same proportion as the first 80% unless there is evidence of unfair and inequitable treatment of crews.

The GDA makes recommendations on GDQ applications and any crew Code of Conduct complaints. Each year the 142 Groundfish Trawl "T" license holders are required to choose a fishing option:

- Option A - permitted to fish midwater trawl coastwide and bottom trawl in all areas except the Strait of Georgia (subject to IVQ holdings); subject to 100% at-sea observer coverage and 100% Dockside Monitoring Program coverage of offloads.
- Option B - not permitted to fish midwater trawl coastwide but bottom trawl only in the Strait of Georgia

The Canadian Groundfish Integration Program introduced in 2006 brought all five groundfish fleets - halibut, sablefish, groundfish trawl, rockfish and lingcod/dogfish - under a single Integrated Fisheries Management Plan (IFMP). Prior to Groundfish Integration, the five different limited entry licensed fleets essentially operated independently. One fleet's directed catch could be another fleet's releases, there was no accounting program across all fleets for all bycatch, and mortality from releases was not deducted from TACs and IVQs. Under Groundfish Integration, DFO can manage on a stock-specific basis, and superior catch data have improved TAC management and stock assessment. Additionally, under the IVQ program, individual catch responsibility and comprehensive catch monitoring have significantly reduced bycatch, releases and wastage (G.S. Gislason & Associates Ltd. *et al*. 2010). Common management principles include:

- IVQs for all sectors (previously rockfish and lingcod/dogfish were not managed under IVQs),

- 100% monitoring of all landings & releases: 100% on-board observers for groundfish trawl, choice of an on-board observer or on-board electronic monitoring/camera system for hook & line and trap gears,
- a market-based "cap and trade" system of temporary transfers between participants to allow fishermen to access IVQ to cover their actual catch,
- mandatory retention of rockfish (a main species group of concern that has close to 100% mortality upon capture), and
- a mortality "hit" against the individual's IVQ for releases, based on assigned mortality rates derived from mortality research on released fish.

Any vessel participating in the bottom trawl fishery would have to have a trained and certified observer on board to record the total catch mortality (kept and released) by species and area for each bottom trawl tow. The vessel owners are required to cover the full cost of the observers (Grafton *et al*. 2007).

3.3 Principle One: Target Species Background

There are numerous articles in the primary literature, grey literature and books that describe details of the life-history and ontogeny of Pacific Hake. The best single source of this information is summarized by Bailey et al. (1982).

3.3.1 The Target Species

3.3.1.1 Introduction

Pacific Hake (*Merluccius productus*), also called Pacific Whiting, is a semi-pelagic schooling species distributed from 25^{o} North To 55^{o} North along the west coast of North America (JTC 2013a). The coastal stock of Pacific Hake is currently the most abundant groundfish species in the California Current system (JTC 2013a).

3.3.1.2 Stock Delineation

Smith (1995) recognizes three habitats utilized by the coastal stock of Pacific Hake: 1) a narrow 30,000 km^{2} feeding habitat near the shelf break of British Columbia, Washington, Oregon, and California populated 6–8 months per year; 2) a broad 300,000 km2 open-sea area of California and Baja California populated by spawning adults in the winter and embryos and larvae for 4–6 months; and 3) a continental shelf area of unknown size off California and Baja California where juveniles brood.

Smaller populations of Hake occur in the major inlets of the North Pacific Ocean (Strait of Georgia, Puget Sound, and Gulf of California). Genetic studies show that Hake occurring in the Strait of Georgia and the Puget Sound are genetically different from the coastal migratory Hake (Iwamoto et al. 2004, King et al. 2012). Vrooman and Paloma (1977) have also found genetic differences between the costal Hake population and the Hake off the west coast of Baja California. King *et al*. (2012) conducting a genetic and parasite load study also found evidence of some summer mixing of coastal Hake with inshore Queen Charlotte Sound Hake.

3.3.1.3 Distribution

The coastal stock of Pacific Hake is migratory and inhabits the continental slope and shelf within the California current system from Baja California to Southeast Alaska (Quirollo 1992, Mecklenburg *et al*. 2002). Adult Hake migrate annually from spring to fall from the southern

offshore spawning areas to feed off the coasts of Oregon, Washington and British Columbia (Bailey *et al* 1982, Stauffer 1985).

All life stages of Hake are found in euryhaline waters at 9–15 ^{o}C (NOAA 1990). Adults are epi-mesopelagic (Bailey *et al*. 1982, NOAA 1990, Sumida and Moser 1980). Pacific Hake form dense aggregations along the continental shelf break and near the edges of mid-shelf banks and basins (Bailey *et al* 1982, Swartzman 2001). Highest densities of Hake are located over bottom depths of 200–300 m (Dorn *et al*. 1994). Pacific Hake school at depth during the day, then move to the surface and disband at night for feeding (Sumida and Moser 1984, Tanasichuck *et al*. 1991).

The summertime Pacific Hake aggregations exhibited spatial scale variability between 20-30 km (Dorn 1997). In survey data, adults most frequently occur between 100 and 150 m, with nearly all taken at depths of 50–400 m (Allen and Smith 1988). Juveniles move to deeper water as they get older (NOAA 1990).

3.3.1.4 Migration

The Pacific Hake is unorthodox amongst the groundfishes because it is highly migratory, moving into many areas of the West Coast, including nearshore shelf, shelf break, and slope. Offshore stocks spawn off Baja California in the winter at depths exceeding 1000 m (Saunders and McFarlane 1997) then the mature adults begin moving northward and inshore, following food supply and Davidson currents (NOAA 1990). Post-spawned females tend to make this migration prior to post-spawned males (Saunders and McFarlane 1997). Pacific Hake reach as far north as south eastern Alaska by late summer or fall. The spring northward feeding migration takes place during favorable ocean conditions when polar transport dominates. During warm years Pacific Hake have been observed to migrate farther north than during cool years (Dorn 1995). Older Pacific Hake migrate the furthest north each season, while 2- and 3-year old Hake are seldom found in Canadian waters north of southern Vancouver Island (JTC 2013a). In the fall Hake begin the southern migration to spawning grounds and further offshore (Bailey *et al*. 1982, Dorn 1995, Smith 1995, and Stauffer 1985). Limited information exists regarding the southward migration in the fall. Pacific Hake typically disappear from areas off the southwest coast of Vancouver Island around the time of the fall transition (Thomson *et al* 1989).

3.3.1.5 Life History

Eggs of the Pacific Hake are neritic and float to neutral buoyancy (Bailey 1981, Bailey *et al*. 1982, NOAA 1990). Eggs and larvae of the coastal stock are pelagic in 40–140 m of water (Smith 1995). Moser *et al*. (1997) investigated the abundance and distribution of Pacific Hake eggs at sites off central and southern California, and reported that most of the eggs were at depths of 50–150 m. They also reported that the early-stage eggs were deeper (75–150 m) in the water column compared to the depth (50–100 m) of later-stage eggs. Larvae tend to aggregate near the base of the thermocline or mixed layer (Stauffer 1985). Horne and Smith (1997) analyzed CalCOFI data on the abundance and distribution of Pacific Hake larvae from sites off central and southern California for 1955–1984, and reported that the biomass of Pacific Hake larvae is strongly influenced by mortality and drift with prevailing currents. They reported that the location of spawning largely determined the survival of the larvae, with higher survival occurring in warm years (when spawning adults moved northward) compared to cold years (when spawning adults moved southward).

Juveniles reside in shallow coastal waters, bays, and inland seas (Bailey 1981, Bailey *et al*. 1982, Dark 1975, Dark and Wilkins 1994, Dorn 1995, NOAA 1990, Smith 1995), and move to deeper water as they get older (NOAA 1990). Juveniles are less abundant in upwelled nearshore coastal waters compared to non-upwelled water. Vetter and Dayton (1999)

evaluated the importance to juveniles of submarine canyons in southern California with high levels of organic enrichment by macrophyte detritus. They compared these canyons to flat areas, and reported that the canyons had much higher megafauna abundance and species richness, and the relative abundance of juvenile Pacific Hake was hundreds of times higher in the canyons at depths of 150–200 m. Overall, highest densities of Pacific Hake are usually between 50 and 500 m, but adults occur as deep as 920 m and as far offshore as 400 km (Bailey 1982, Bailey *et al*. 1982, Dark and Wilkins 1994, Dorn 1995, Hart 1973, NOAA 1990, Stauffer 1985). Spawning is greatest at depths between 130 and 500 m (Bailey *et al*. 1982, NOAA 1990, Smith 1995).

3.3.1.6 Reproduction

The coastal stock of Pacific Hake spawns from December through March, peaking in late January (Smith 1995). Spawning takes place hundreds of km offshore of southern and Baja California at depths of 100-500 m (Alverson and Larkins 1969, Bailey *et al*. 1982). There have been reports that spawning has been occurring north of southern and Baja California (Bailey 1980, Saunders and McFarlane 1997, Dorn 1986). This northward shift of spawning could be attributed to the warming trend observed in the California current system.

In the Strait of Georgia, spawning occurs from March through May and peaks in late April (Beamish and McFarlane 1985, Shaw *et al*. 1990). In Puget Sound, spawning occurs primarily during February through April, peaking in March. Spawning aggregations begin to form up to a month before actual spawning. Pacific Hake may spawn more than once per season, so absolute fecundity is difficult to ascertain. Coastal stocks have 180–232 eggs/gram body weight, but Puget Sound and Strait of Georgia stocks have only 50–165 eggs/gram body weight (Mason 1986). Bailey (1982) estimated that a 28-cm female had 39,000 eggs, while a 60-cm female had 496,000 eggs.

Eggs are spherical and 1.14–1.26 mm in diameter with a single oil droplet (Bailey *et al*. 1982). Embryonic development is indirect and external (NOAA 1990). Hatching occurs in 5–6 days at 9–10oC and 4–5 days at 11–13oC (Bailey 1982, Hollowed 1992). Larvae hatch at 2–3 mm total length (Stauffer 1985, Sumida and Moser 1980) with a yolk sac that is gone in 5–7 days (Bailey 1982). Larvae metamorphose into juveniles at 35 mm, typically in 3–4 months (Hollowed 1992). As larvae grow they move inshore to the continental shelf and slope (Bailey 1981, Grover *et al*. 2002). Survival of larvae is strongly influenced by environmental conditions (e.g., upwelling, advection, and water temperature) experienced during the first few months after spawning (Bailey 1981, Bailey and Francis 1985, Hollowed 1992, Agostini 2005). Juveniles range from 35 mm to 40 cm depending on gender (Bailey *et al*. 1982, Beamish and McFarlane 1985, Hollowed 1992).

The coastal Pacific Hake stock has been observed to have episodic strong year classes (Figure 1). The Year class strengths can vary by as much as two orders of magnitude or more relative to weak year classes (JTC 2012, Bailey and Francis 1985, Methot and Dorn 1995). The occurrence of these dominant year classes appears to be largely independent of spawning stock size, so a reliable stock-recruitment relationship has been difficult to establish (Bailey and Francis 1985, JTC 2012).

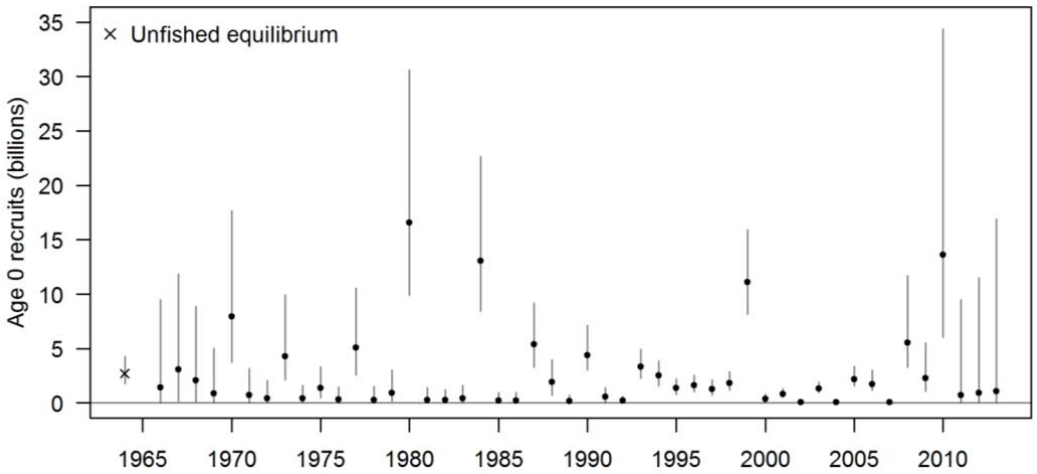


Figure 1 Posterior age-0 recruitment time-series for the base-case model with 95% posterior credibility intervals (JTC 2013; Fig.25 p. 106).

3.3.1.7 Mortality

Eggs and larvae of Pacific Hake are eaten by pollock, herring, invertebrates, and sometimes Pacific Hake. Juveniles are eaten by lingcod, Pacific cod, and rockfish species. Adults are preyed upon by sablefish, albacore, pollock, Pacific cod, soupfin sharks, and spiny dogfish (Fiscus 1979, NOAA 1990). Another important group of predators of adult Pacific Hake are marine mammals, including the northern elephant seal (*Mirounga angustirostris*), northern fur seal (*Callorhinus usrsinus*), California sea lion (*Zalophus californianus*), and several species of dolphins and whales (Methot and Dorn 1995).

Pacific Hake live more than 20 years. Natural mortality rate (m) was estimated by Dorn et al. (1994) at 0.23 yr^{-1}. Hamel and Stewart (2009) applying a meta-analytical approach incorporating multiple life-history correlates resulted in a log-normal prior with mean 0.193 and a coefficient of variation of 0.1.

3.3.1.8 Growth

Dorn (1992) reported that Pacific Hake growth can be quite variable. Examining length-at-age data from the acoustic and bottom trawl surveys Helser *et al*. (2008) found variation in the von Bertalanffy growth parameters k (Brody growth coefficient) and L∞ (asymptotic size). Both k and L∞ declined from the early to mid-1970s and the mid-1980s. Hollowed and Francis (1987) showed that Pacific Hake growth was depressed during the 1983–84 El Niño. The functional growth form from the 2008 Pacific Hake assessment is shown in Figure 2.

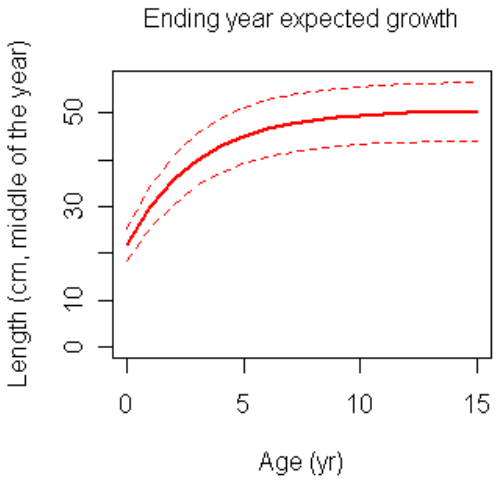


Figure 2 Functional growth form assumed in the Hake model (Helser et al. 2008; Fig. 28 p. 77).

Current assessment models use a matrix of empirically derived population weight at age (JTC 2013a). In this approach mean weight at age (Figure 3) is calculated from samples pooled from all fisheries and the acoustic survey for the years 1975 to 2012. The use of empirical weight at age is a convenient method to capture the variability in both the weight-at-length relationship within and among years, as well as the variability in length-at-age, without requiring parametric models to represent these relationships.

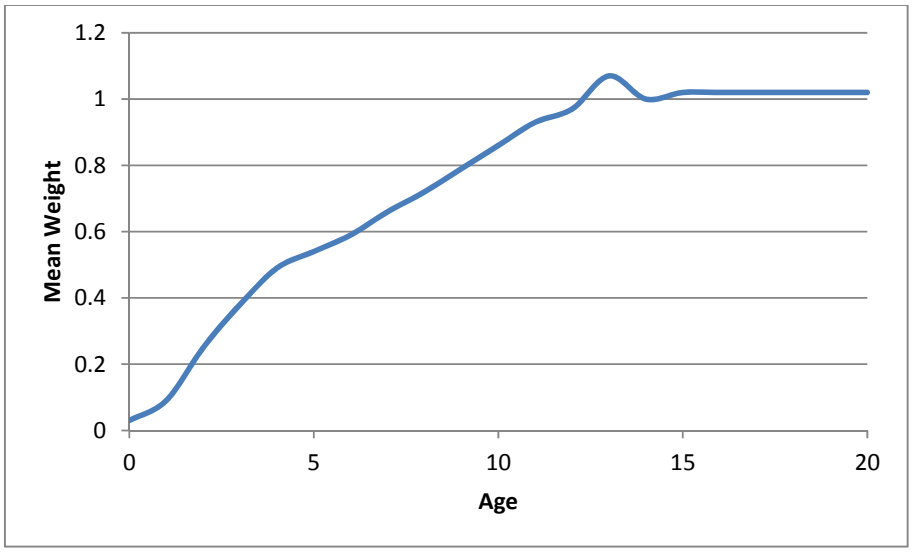


Figure 3 Empirical mean weight-at-age (kg) used in the 2013 Pacific Hake stock assessment (JTC 2013a; Fig. 10 p. 93).

3.3.1.9 Maturity

Pacific Hake mature from 2-6 year old, with 50% maturity being (Figure 4) reached at age 4 when they are about 37 cm long (Hamel *et al*. 2014). The fraction of mature fish, by size and age, in the 2013 Pacific Hake assessment is based on data reported in Dorn and Saunders (1997), and remains unchanged since the 2006 stock assessment. These data consisted of 782 individual ovary collections based on visual maturity determinations by observers (Dorn and Saunders 1997).

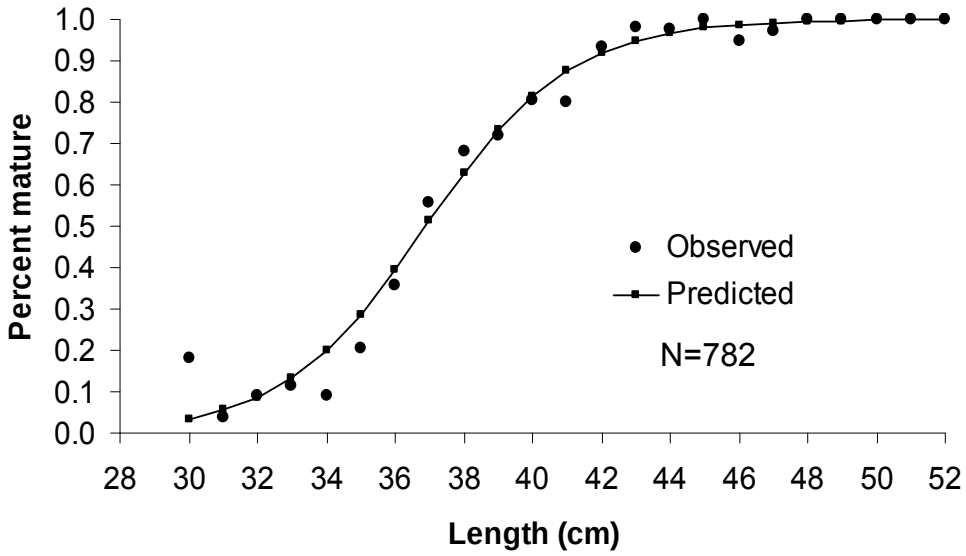


Figure 4 Observed and predicted fraction of Pacific Hake mature at length (Helser et al. 2008; Fig. 27)

Ovaries have been collected from Hake caught during the 2012 bottom trawl and acoustic surveys. These collections are currently being analyzed and are expected to be available for the 2014 assessment in order to update the maturity ogive (JTC 2013a).

The maturity at age depicted in Figure 5 stems from the operating model used for the Pacific Hake Management Strategy Evaluation conducted under the Canada/U.S. Hake agreement (JTC 2013a, Appendix A).

Figure 5 Pacific Hake maturity (proportion) at age (JTC 2013a, Table A.2, p. 141).

3.3.1.10 Behaviour

All life stages feed near the surface late at night and early in the morning (Sumida and Moser 1984). Larvae eat calanoid copepods, as well as their eggs and nauplii (Sumida and Moser 1984, McFarlane and Beamish 1986). Juveniles and small adults feed chiefly on euphausiids (Tanasichuck 1999, NOAA 1990). Large adults also eat amphipods, ocean shrimp, squid, herring, smelt, crabs, sometimes juvenile Pacific Hake, and pelagic schooling fish (e.g., eulachon and herring) (Gotshall 1969, Bailey 1982, Dark and Wilkins 1994, McFarlane and Beamish 1986, NOAA 1990, Livingston and Bailey 1985). Buckley and Livingston (1997) reported the results of stomach content analyses of Pacific Hake collected from 1989 to 1992 along the west coast of the U.S., from southern California to Vancouver Island. They found that diet varied with latitude and season. In general, in all areas the diet was dominated by fishes, but euphausiids were also consistently found in the diets of Pacific Hake from all areas. Clupeidae (primarily Pacific herring) were dominant prey in fish from sites off of Vancouver Island, Washington, and Oregon, whereas northern anchovy and rockfish dominated the diets in central and southern California, respectively. In areas where a broad range of sizes of Pacific Hake were found, considerable cannibalism was observed among fish larger than 40 cm fork length, with a frequency of occurrence of 39%. Some of the major seasonal differences in diet for Pacific Hake from sites off of Oregon and Washington included dominance by euphausiids in fish 30–49 cm fork length in the summer compared to dominance by fish and shrimp in the autumn; and in fish from sites off of California, a dominance of fish in the spring compared with a dominance of cannibalized Pacific Hake in the autumn (Buckley and Livingston 1997).

3.3.2 Stock Assessment

3.3.2.1 Introduction

Prior to 1997, separate Canadian and U.S. assessments for Pacific Hake were submitted to each country's assessment review process. This practice resulted in differing yield options being forwarded to each country's managers for this shared trans-boundary fish stock. Multiple interpretations of Pacific Hake status made it difficult to coordinate an overall management policy. Between 1997 and 2011, the Stock Assessment and Review (STAR) process for the Pacific Fishery Management Council (PFMC) has evaluated assessment models and the PFMC council process, including NOAA Fisheries, has generated management advice that has been largely utilized by both countries. The Joint US-Canada Agreement on Pacific Hake was formally ratified in 2006 (signed in 2007) by the United States as part of the reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act. Although the treaty has been considered in force by Canada since June 25, 2008, an error in the original U.S. text required that the treaty be ratified again before it could be implanted. This second ratification occurred in 2010. Under the treaty, Pacific Hake stock assessments are to be prepared by the Joint Technical Committee (JTC) comprised of both U.S. and Canadian scientists and reviewed by the Scientific Review Group (SRG), with memberships to both groups appointed by both parties to the agreement (JTC 2012). Additionally, the Agreement calls for the JTC and SRG to include industry nominated scientists. These are selected and appointed by each of the two parties (JTC 2013a).

In 2012, the Pacific whiting Agreement was officially enacted and members of a provisional Joint Technical Committee (JTC), comprised of Canadian and U.S. scientists, continued to collaborate in the production of a single stock assessment document (JTC 2013a). Pacific Hake stock assessments now represent the work of the joint U.S. and Canadian JTC and their associates. Extensive modeling efforts conducted from 2010 to 2012, as well as highly productive discussions among analysts resulted in unified documents for the assessments from 2011-2013 (JTC 2013a).

3.3.2.2 Stock Assessment Methods

Age-structured assessment models of various forms have been used to assess Pacific Hake since the early 1980s, using total fishery landings, fishery length and age compositions, and abundance indices. Modeling approaches have evolved as new analytical techniques have been developed. Initially, a cohort analysis tuned to fishery CPUE was used (Francis et al. 1982). Later, the cohort analysis was tuned to NMFS triennial acoustic survey estimates of absolute abundance at age (Francis and Hollowed 1985, Hollowed et al. 1988). In 1989, the Hake population was modeled using a statistical catch-at-age model (Stock Synthesis) that utilized fishery catch-at-age data and survey estimates of population biomass and age-composition data (Dorn and Methot 1991). In 1999 Dorn *et al*. (1999) converted the model to AD Model Builder (ADMB; Fournier *et al*. 2012). Beginning in 2001, Helser *et al*. (2001, 2002, 2004, 2005 and 2006; Helser and Martel 2007) used the same ADMB model to assess the Hake stock.

The 2013 Pacific Hake assessment reports a single base-case model representing the collective work of the JTC (2013a). The assessment depends primarily upon the acoustic survey biomass index (1995, 1998, 2001, 2003, 2005, 2007, 2009, 2011 and 2012) for information on the scale of the current Hake stock. The aggregate fishery age- composition data (1975-2012) and the age-composition data from the acoustic survey contribute to the models ability to resolve strong and weak cohorts.

The 2013 assessment is fully Bayesian, with the base-case model incorporating prior information on two key parameters (natural mortality, M, and steepness of the stock-recruit relationship, *h*) and integrating over estimation and parameter uncertainty to provide results that can be probabilistically interpreted. From a range of alternate models investigated by the JTC, a subset of sensitivity analyses are also reported in order to provide a broad qualitative comparison of structural uncertainty with the base case. These sensitivity models are thoroughly described in this assessment document (JTC 2013a).

3.3.2.3 Acoustic Survey

The assessment depends primarily upon nine years of an acoustic survey biomass index as well as catches for information on the scale of the current Hake stock (Figure). The joint U.S. and Canadian integrated acoustic and trawl survey has been the primary fishery-independent tool used to assess the distribution, abundance and biology of coastal Pacific Hake, along the West coasts of the United States and Canada (JTC 2013a). The acoustic survey includes all waters off the coasts of the U.S. and Canada thought to contain all portions of the Hake stock older than age-1. The survey biomass index is based on measurement of age-2 and older Hake. The 2011 survey index value is the lowest in the time-series, and the 2012 index is more than 2.5 times greater.

The age-composition data from the aggregated fisheries (1975-2012) and the acoustic survey contribute to the assessment model's ability to resolve strong and weak cohorts. Both sources indicate a strong 2008 cohort in the 2011 and 2012 data, and a strong 2010 cohort in the 2012 data, which may partially explain the recent increase in the survey index (JTC 2013a).

In 2012, a supplemental acoustic survey was conducted based on recommendations from the U.S. and Canadian fishing industries and Hake Agreement committees after observing results from the 2011 survey and the 2012 stock assessment (e.g., the stark contrast between the 2009 and 2011 acoustic surveys). NMFS-NWFSC coordinated with NMFS-SWFSC to develop a joint Pacific sardine (*Sardinops sagax*) and Pacific Hake acoustic survey. Survey research vessels included the NOAA R/V *Bell M. Shimada* and the Canadian Coast Guard Ship *W.E. Ricker*. The success of the 2012 survey depended upon use of an industry-supplied trawl vessel (the F/V *Forum Star*) that performed survey trawls in coordination with the Bell M. Shimada, which allowed the research vessel to focus on acoustic survey work rather than having to also conduct survey trawls.

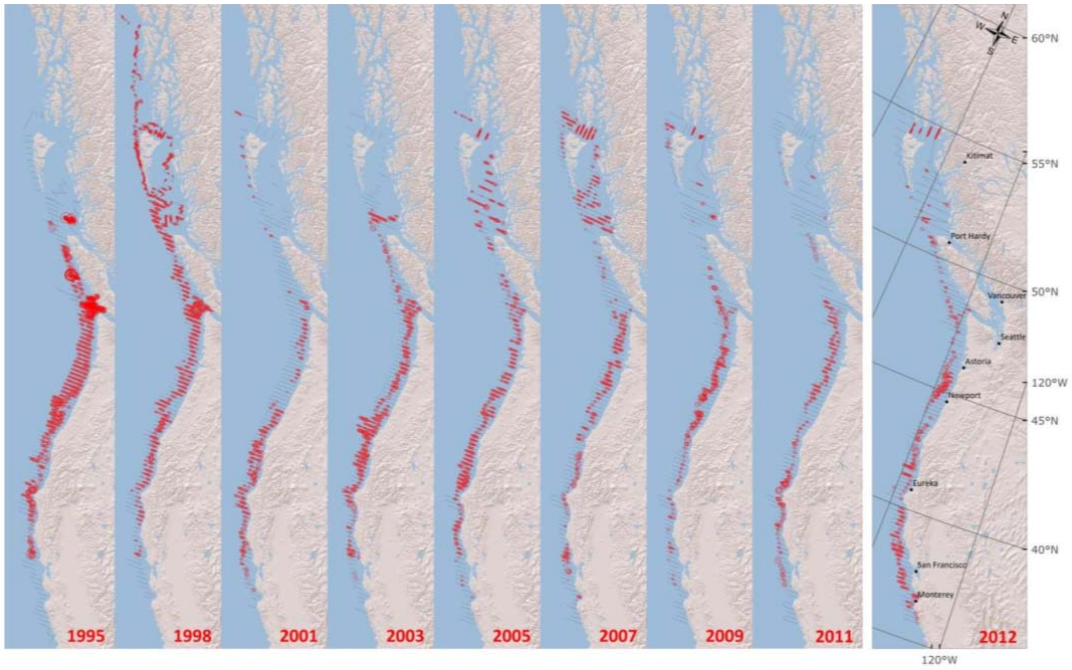


Figure 6 Spatial distribution of acoustic backscatter of Pacific Hake from joint U.S.-Canada acoustic surveys 1995-2012 (JTC 2013a; Fig. 1 p. 86).

The distribution of Hake in 2011 and 2012 was most similar to the distribution of Hake in 2001, when the population was also dominated by young fish. The 2012 survey biomass estimate is 1,380,724 mt, which is approximately 2.65 times the 2011 acoustic survey biomass estimate of 521,476 mt. Only 8.69% of this biomass was observed in Canadian waters in 2012. No Humboldt squid were observed in 2012, although considerable numbers were caught in both the survey and fishery in 2009 (JTC 2013a).

3.3.2.4 Bottom Trawl Survey

The Alaska Fisheries Science Center conducted a triennial bottom trawl survey along the west coast of North America from 1977 to 2001 (Wilkins 1998). The final survey was conducted by the Northwest Fisheries Science Center in 2004. With the growing time-series length of the NWFSC acoustic survey (now 9 years), future assessments should re-evaluate the use of the survey as an index of the adult and/or juvenile (age 0- 1) Hake population (JTC 2013a).

3.3.2.5 Pre-recruit Survey

The NWFSC and Pacific Whiting Conservation Cooperative (PWCC), in coordination with the SWFSC Rockfish survey have conducted an expanded survey (relative to historical efforts) targeting of juvenile Hake and rockfish, from 1999-2009. Trends in the coast-wide index have shown very poor correlations with estimated Year class strengths in recent assessment models for year classes that were consistently observed in the fishery and survey. Therefore, this index has not been used in any assessment. Because the pre-recruit survey has not been conducted since 2009, it has not been revisited in subsequent stock assessments (JTC 2013a).

3.3.3 2013 Pacific Hake (Whiting) Stock Status

3.3.3.1 Introduction

2013 was the second year for implementation and function of the various committees defined under the *Agreement Between the Government of the United States of America and the Government of Canada on Pacific Hake/Whiting* (hereafter Hake Agreement). The committees, including the Joint Technical Committee (JTC), the Scientific Review Group (SRG), the Joint Management Committee (JMC), and the Advisory Panel (AP), conducted all necessary meetings. Verbal testimony received from participants in these committees the surveillance and audit team concluded that the agreement process worked effectively in 2013.

The following stock status summary was adopted from the 2013 Stock Assessment of Pacific Hake in U.S. and Canadian Waters prepared by the International Joint Committee for Pacific Hake (JTC 2013a).

3.3.3.2 Catch

Recent coast-wide landings from 2008–2012 have averaged 241,000 mt (Figure 7). The total commercial fisheries catch for 2012 was reported to be 204,000 mt. This represents a reduction in the catch of 29% over the 2011 catch of 286,000 mt. Landings between 2001 and 2008 were predominantly comprised of fish from the very large 1999, with the cumulative removal from that cohort exceeding an estimated 1.2 million mt. In 2008, the fishery began harvesting considerable numbers of the then emergent 2005. Catches in 2009 were again dominated by the 2005 with some contribution from an emergent 2006 and relatively small numbers of the 1999 cohort. The 2010 and 2011 fisheries encountered very large numbers of the 2008, while continuing to see some of the 2005 and 2006 year classes as well as a small proportion of the 1999. In 2012, U.S. fisheries caught mostly 2 and 4-year old fish from the 2008 and 2010 year classes, while the Canadian fisheries encountered older fish from the 2005, 2006, and 2008 year classes. The U.S. at-sea fleet caught a considerable number of 2-year old fish later in the year.

Since 2001, total catches have been below coast-wide fishery limits. The Hake Agreement establishes U.S. and Canadian shares of the coast-wide allowable biological catch at 73.88% and 26.12%, respectively, and this distribution has been adhered to since ratification of the Agreement. From 2009 to 2012 much of the U.S. tribal allocation remained uncaught and Canadian catches have also been well below the limit.

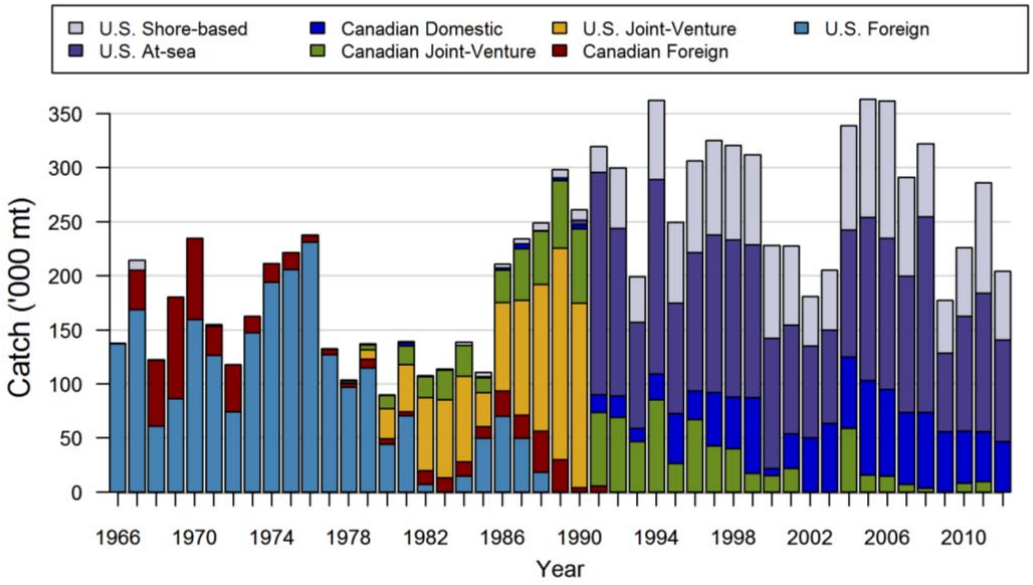


Figure 7 Total Pacific Hake catch used in the assessment by sector, 1966-2012. U.S. tribal catches are included in the U.S shore-based landings (JTC 2013a).

3.3.3.3 Stock Status

Results of the base-case stock assessment model indicate that Pacific Hake female spawning biomass (Figure 8; Table 3) was below the unfished equilibrium in the 1960s and 1970s (JTC 2013a). The stock is estimated to have increased rapidly after two or more large recruitments in the early 1980s, and then declined steadily after a peak in the mid- to late-1980s to a low in 2000. This long period of decline was followed by a brief increase to a peak in 2003 (a median female spawning biomass estimate of 1.34 million mt in the SS model) as the large 1999 year classes matured. The stock is then estimated to have declined with the aging 1999 year class to a female spawning biomass time-series low of 0.42 million mt in 2009. This recent decline is similar to that estimated in the 2012 assessment, but at a slightly greater absolute value. The current (2013) median posterior spawning biomass is estimated to be 72.3% of the estimated unfished equilibrium level (SB0) with 95% posterior credibility intervals ranging from 34.7% to 159.7%. The estimate of 2013 female spawning biomass is 1.50 million mt, which is more than double the projected spawning biomass from the 2012 assessment (0.64 million mt). The difference in projected biomass is largely driven by increases in the estimated size of the 2008 and 2010 year classes.

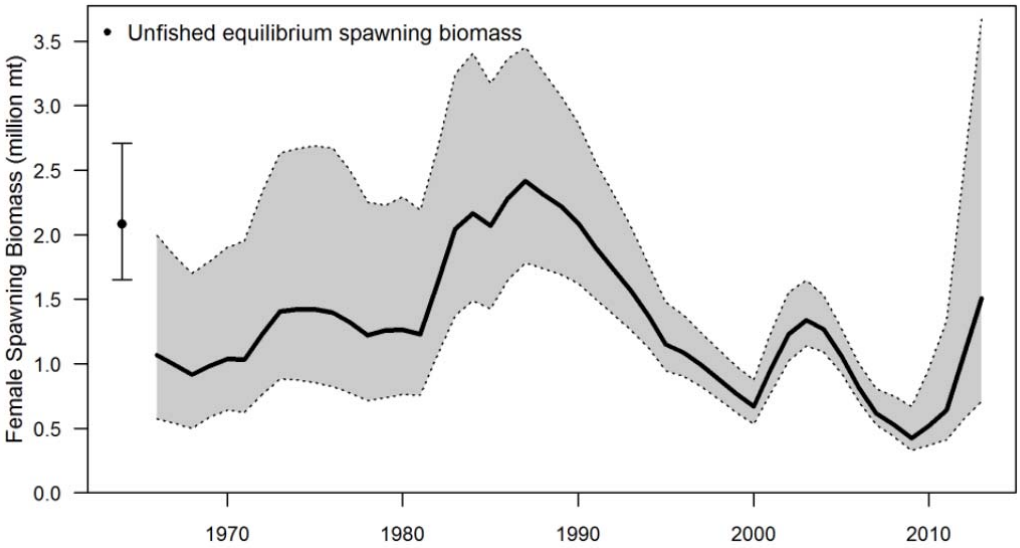


Figure 8 Median of the posterior distribution for female spawning biomass through 2013 (solid line) with 95% posterior credibility intervals (shaded area) (JTC 2013a).

Table 3 Recent trends in estimated Pacific Hake female spawning biomass (million mt) and depletion level relative to estimated unfished equilibrium (JTC 2013a).

Year	Spawning biomass (mt)			Depletion (SB_t/SB_0)		
	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2004	1.093	1.268	1.530	0.475	0.605	0.769
2005	0.929	1.064	1.277	0.401	0.508	0.640
2006	0.705	0.811	1.000	0.307	0.390	0.491
2007	0.527	0.617	0.808	0.236	0.297	0.384
2008	0.436	0.529	0.751	0.199	0.255	0.345
2009	0.327	0.424	0.670	0.152	0.204	0.303
2010	0.371	0.520	0.964	0.172	0.255	0.418
2011	0.409	0.642	1.333	0.194	0.315	0.579
2012	0.575	1.078	2.542	0.275	0.516	1.109
2013	0.709	1.504	3.676	0.347	0.723	1.597

Pacific Hake fishing intensity (Table 4) is estimated to have been below the F40% target until 2007 (JTC 2013a). The base-case model estimates of prior fishing intensity indicate that the target was likely exceeded in three of the last five years. However, the harvest in those years did not exceed the catch limits that were specified, based on the best available science at the time. The exploitation fraction does not necessarily correspond to fishing intensity because fishing intensity accounts for the age-structure of the population. For example, the fishing intensity remained nearly constant and above target from 2010 to 2011. However, the exploitation fraction declined in these years because of many estimated 1 year-old fish.

Table 4 Recent trends in fishing intensity (relative spawning potential ration (1-SPR/1-SPR$_{40\%}$)) and exploitation fraction (catch divided by vulnerable biomass) (JTC 2013a).

	Fishing intensity			Exploitation fraction		
Year	2.5th percentile	Median	97.5th percentile	2.5th percentile	Median	97.5th percentile
2003	37.8%	50.6%	64.4%	5.1%	6.3%	7.5%
2004	59.2%	74.1%	88.9%	10.6%	12.8%	14.8%
2005	67.5%	82.7%	96.0%	15.6%	18.7%	21.4%
2006	79.4%	94.7%	107.6%	18.3%	22.7%	26.0%
2007	83.5%	99.3%	112.0%	21.2%	27.5%	32.2%
2008	92.8%	109.4%	122.5%	20.8%	29.2%	35.2%
2009	71.7%	94.7%	110.3%	11.7%	18.4%	23.8%
2010	79.6%	104.7%	120.9%	18.2%	30.7%	42.3%
2011	74.8%	105.2%	125.3%	10.5%	21.5%	33.5%
2012	46.4%	81.0%	108.5%	6.3%	14.5%	26.4%

The exploitation history in terms of both the biomass and F-target reference points (Figure) shows that historically the fishing intensity has been low and the biomass has been high. Recently, the estimated depletion level has been below 40% and the fishing intensity high, until 2012 when fishing intensity was below target and depletion was above 40%. Uncertainty in the 2012 estimates of fishing intensity and depletion show a 9% joint probability of being above the target fishing intensity and below 40% depletion (JTC 2013a).

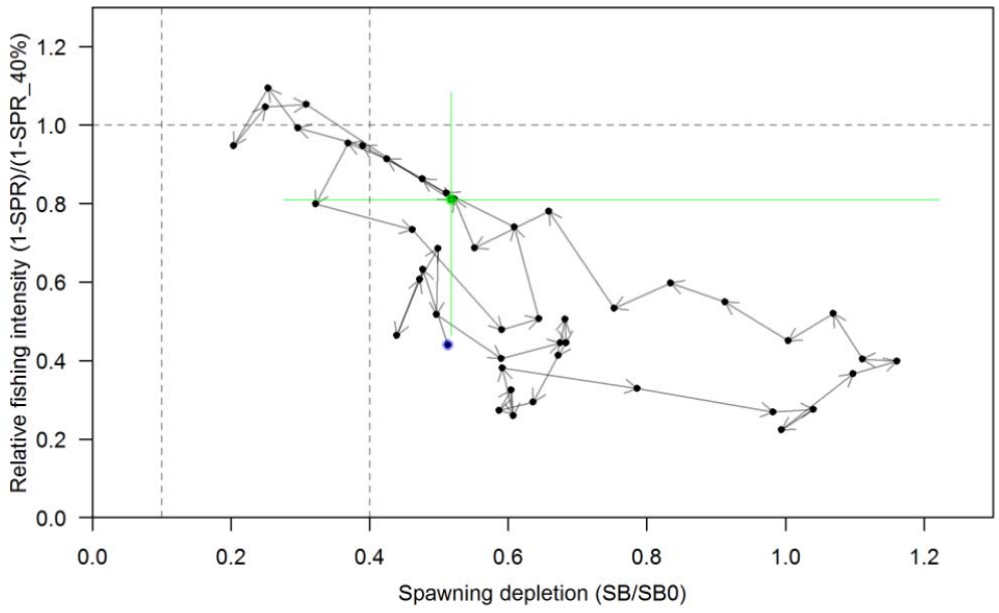


Figure 8 Temporal pattern (phase plot) of posterior median fishing intensity vs. posterior median depletion through 2012. The blue circle indicates 1966 and the green circle denotes 2012. Green bars indicate the 95% posterior credibility intervals along both axes. Arrows indicate the temporal progression of years and the dashed lines indicate the fishing intensity target (vertical) and the 40:10 control rule limits (vertical, 10% and 40%) (JTC 2013a).

3.3.3.3 Recruitment

Pacific Hake recruitment is highly variable (JTC 2013a). Large year classes in 1980, 1984, and 1999 have been a major component of the fishery in the 1980s and early 1990s, and the early 2000s. Recently, strong year classes are estimated in 2008 and 2010, although the uncertainty about 2010 year class strength is large given the limited exposure to fisheries. In the last decade, estimated recruitment has been at some of the lowest values in the time-series as well some of the highest (Table 1).

Table 1 Recent Pacific Hake recruitment estimates (billions of age-0) (JTC 2013a).

Year	2.5th percentile	Median	97.5th percentile
2004	0.012	0.069	0.228
2005	1.557	2.172	3.379
2006	1.151	1.721	3.048
2007	0.017	0.088	0.295
2008	3.288	5.526	11.720
2009	1.088	2.269	5.519
2010	6.037	13.606	34.396
2011	0.060	0.737	9.509
2012	0.054	0.916	11.500
2013	0.054	1.061	16.926

3.3.3.4 Reference Points

As in the 2012 assessment the 2013 assessment estimated reference points for Pacific Hake using the base-case model (Table 6). The estimated unfished equilibrium spawning biomass estimate was 2,081,000 mt (95% posterior credibility interval ranges from 1,653,000 to 2,709,000 mt). The spawning biomass that is 40% of the unfished equilibrium spawning biomass ($SB_{40\%}$) is estimated to be 833,000 mt. This is slightly larger than the equilibrium spawning biomass implied by the F40% default harvest rate target which is 744,000 mt or 36% of SB0 (JTC 2013a).

Table 6. Summary of Pacific Hake reference points for the base-case model (JTC 2013a).

Quantity	2.5th percentile	Median	97.5th percentile
Unfished female SB (SB_0, thousand mt)	1,653	2,081	2,709
Unfished recruitment (R_0, billions)	1.761	2.687	4.303
Reference points based on $F_{40\%}$			
Female spawning biomass ($SB_{F40\%}$ thousand mt)	556	744	942
$SPR_{MSY\text{-}proxy}$	–	40%	–
Exploitation fraction corresponding to SPR	18.4%	21.8%	25.9%
Yield at $SB_{F40\%}$ (thousand mt)	243	337	479
Reference points based on $SB_{40\%}$			
Female spawning biomass ($SB_{40\%}$ thousand mt)	661	833	1,084
$SPR_{SB40\%}$	40.6	43.2	51.4
Exploitation fraction resulting in $SB_{40\%}$	14.4%	19.2%	23.3%
Yield at $SB_{40\%}$ (thousand mt)	238	328	469
Reference points based on estimated MSY			
Female spawning biomass (SB_{MSY} thousand mt)	328	500	840
SPR_{MSY}	18.3%	28.2%	46.5%
Exploitation fraction corresponding to SPR_{MSY}	17.6%	34.5%	59.5%
MSY (thousand mt)	248	357	524

A set of management metrics was identified as important to the Joint Management Committee (JMC) and to the Advisory Panel (AP). These metrics summarize the probability

of various outcomes from the base case model given each potential management action (Table 7).

Table 7. Probabilities of various management metrics given different catch alternatives (JTC, 2013a).

Catch	Probability $SB_{2014}<SB_{2013}$	Probability $SB_{2014}<SB_{40\%}$	Probability $SB_{2014}<SB_{25\%}$	Probability $SB_{2014}<SB_{10\%}$	Probability Fishing intensity in 2013 > 40% Target	Probability 2014 Catch Target < 2013 Catch
0	0%	2%	0%	0%	0%	0%
250,000	2%	4%	0%	0%	2%	1%
300,000	6%	5%	1%	0%	4%	2%
350,000	11%	6%	1%	0%	9%	4%
400,000	18%	6%	1%	0%	15%	9%
450,000	25%	7%	1%	0%	22%	14%
500,000	33%	8%	1%	0%	30%	20%
603,000	50%	9%	2%	0%	45%	36%
626,364	53%	10%	2%	0%	50%	39%
650,000	57%	10%	2%	0%	55%	42%
696,000	62%	11%	3%	0%	59%	50%

The probability that the spawning stock biomass in 2014 remains above the 2013 level is 50% with a catch of 603,000 mt. The probability that the fishing intensity is above target in 2013 is 50% with a catch of 626,364 mt. There is less than a 12% probability that the spawning stock will drop below 40% in 2014 for all catch levels considered (JTC 2013a).

The JTC investigated a broad range of alternative models, and presented a subset of key sensitivity analyses in the main document. A major source of uncertainty in the 2013 status and target catch is in the estimate of the size of the 2010 (JTC 2013a). The posterior distribution of derived parameters from the base model encompasses the median estimates of most sensitivity models.

3.3.3.5 Management Strategy Evaluation (MSE)

At the direction of the JMC, the JTC developed a Management Strategy Evaluation (MSE) in 2012 to explore the basic performance of the default harvest policy in the context of annual vs. biennial surveys. The results of these explorations showed that biomass levels and average catch are variable, mainly because of the high recruitment variability seen with Pacific Hake coupled with potentially large stock assessment estimation biases. Even though the Pacific Hake fishery is relatively data-rich, with a directed fishery-independent survey program, substantial biological sampling for both commercial fisheries and the acoustic survey, and reliable estimates of catch, the data are less informative about incoming recruitment, which is partially responsible for large differences between the simulated abundance and the estimated abundance (JTC 2013a).

The MSE simulations show two main results. First, the current F40%-40:10 management strategy with perfect knowledge of current biomass resulted in a median long-term average depletion of less than 30% (<B30%). Second, there was little difference in median values between strategies involving annual and biennial surveys. At the present time, the JTC considers these conclusions preliminary because the simulations involved a limited range of uncertain processes that are known or suspected to occur for Pacific Hake. For example, the structure and assumptions of the stock assessment model used in the annual assessment-management cycle matched the assumptions of the operating model used to generate stock dynamics and assessment data. Such a match typically underrepresents the potential range

of future outcomes possible under any combination of harvest policy and survey frequency (JTC 2013a).

3.3.3.6 Consideration of the Scientific Review Group (SRG)

The SRG endorsed and commended the work of the JTC and the survey team (SRG 2013). Nine summary conclusions were reported in the Scientific Review Group report of the February 19-22, 2013 meeting in Vancouver, BC (SRG 2013).

1. The 2012 acoustic-trawl survey was successfully completed. The US and Canadian teams that conducted this survey are to be applauded for their effort, and we acknowledge the strain that conducting this survey in back-to-back years placed on their programs. For the first time, the survey was conducted in conjunction with the acoustic-trawl survey for sardine, and we recommend that a review of the merits of this approach be conducted.

2. The survey result was a relative biomass of 1,381,000 mt, a substantial increase from the 2011 survey biomass of 521,000 mt. The survey and the fishery were dominated by age 2 (63.7% survey; 34.6% fishery) and 4 (16.1% survey; 34.5%) year old fish from the 2010 and 2008-es. The survey has verified the strength of the 2008 and finds that the 2010 seems even stronger, but it now adds uncertainty to the forecast.

3. The standard assessment model was used to analyze the time series of data extended through 2012. The median estimated female spawning biomass is 1,503,000 mt at the beginning of 2013 and is expected to be stable to increasing through 2015 due to an expected very large 2010 and the above average 2008 year. This level of estimated spawning biomass has not been seen since 1993. The consistency between the 2013 assessment result and the 2012 assessment result provides strong retrospective evidence that 2009 survey and the 2011 assessment overestimated the stock abundance at that time. Unlike 2011, there is now agreement between the most recent acoustic survey and commercial fishery age composition data as well as the most recent acoustic survey biomass index. This alignment of data from separate sources engenders greater confidence in the 2013 assessment result.

4. Although utilization of the total quota has been around (85%) in recent years, the retrospective estimates of fishing intensity hovered around the target from 2006 to 2011. This implies that for at least the most recent period the assessment model has overestimated the total allowable catch when applying the default harvest policy to overly optimistic estimates of stock status.

5. The model forecasts that a catch of 626,364 mt in 2013 and 715,041 mt in 2014 would have equal probabilities of producing a fishing intensity that is greater than or less than the F40% default harvest rate. The two young age groups that are supporting the fishery will be ages 3 and 5 during the 2013 fishing season, this is near their peak biomass and potential maximum contribution to lifetime yield. However, there is still considerable risk in fishing them too hard until their strength is verified, particularly the 2010 year class, which is still very young and thus not yet well characterized .

6. As noted, there is considerable uncertainty in the 2010 year class strength because it has only been observed for one year. Some recent year classes with strong occurrence at age 2 were subsequently downgraded as years of data were added (notably, the recent 2008 year class). A conservative estimate of the 2010 year class strength (using only the lower 10% of the model estimated recruitment)

reduces the strength from a median estimate of 11.6 billion recruits (a near record size) to 6.9 billion recruits, which is still large and near the size of the 1970 and 1999 recruitments. If this is the true state of nature, a catch of 336,000 mt would allow the stock to maintain its biomass level, at least approximately, from 2013 to 2014.

7. The SRG and the JTC recommend a range of 336,000 – 626,000 mt as (available) harvest level in 2013. The upper end would implement the default harvest policy and would allow some continued biomass growth into 2014 if the current assessment result is accurate. The lower level would still not exceed the harvest policy even if the 2010 year class is only 51% of its current estimate. If the lower 2010 recruitment strength is realized, a 2013 harvest of 626,000 mt has a 91% chance of reducing biomass in 2014. Yield would also decline in this case.

8. The SRG finds that yield-per recruit and spawning biomass per recruit analyses are informative and should be included in the annual JTC report.

9. The JTC has made an excellent start in development of a Management Strategy Evaluation to investigate the performance of the Hake/whiting assessment and management system. They have achieved a proof-of-concept, but the SRG finds that some structural concerns preclude endorsing current results as a base MSE from which conclusions could be drawn. Thus it is premature to use current results to indicate the merits of annual surveys versus biennial surveys. The next stage of MSE development will benefit from inputs from all parties.

The SRG also made three high priority research recommendations: 1) continued development of the Management Strategy Evaluation (MSE), 2) life-history data improvements, and 3) acoustic research (SRG, 2013).

3.3.3.7 Harvest Recommendations

The Joint Management Committee met on March 18 and 19, 2012 in Lynnwood, Washington to consider the stock assessment provided by the JTC and the findings and recommendations of the SRG. Following consideration of the presented information and recommendations from the Advisory Panel, the Joint Management Committee (JMC 2013) approved the following recommendation for the coastwide Pacific Hake total allowable catch.

Consistent with Article II 3.(e) of the Agreement, and after reviewing the advice of the Joint Technical Committee (JTC), the Scientific Review Group (SRG), and the Advisory Panel (AP), the JMC recommends a coastwide TAC of 336,200 metric tons (mt). Based on Article III 2. of the Agreement, the Canadian share of the coastwide TAC is 26.12 percent, or 87,815 mt, and the U.S. share is 73.88 percent, or 248,385 mt. Consistent with Article II 5.(b) of the Agreement, an adjustment (carryover from 2012) of 7,552 mt is added to the Canadian share, for an adjusted Canadian TAC of 95,367. In the same manner, an adjustment of 21,360 mt is added to the United States share, for an adjusted United States TAC of 269,745 mt. This results in a coastwide adjusted TAC of 365,112 mt for 2013.

The JMC (JMC 2013) recommended establishment of an interim working group made up of scientists, fishery managers, and stakeholders to consider the JTC and SRG recommendations in developing a draft work plan for further consideration by the JMC in May, 2013. This work plan will include further consideration and development of the Management Strategy Evaluation (MSE) process for consideration at the next meeting of the JMC, scheduled for May 22, 2013.

The Advisory Panel (AP) provided an oral report to the JMC at the March 2013 meeting. The AP stated that the Hake Agreement science process was sound. However, the two AP parties could not agree on how the science should be used to determine harvest advice for

2013. They expressed support for the Hake Agreement process and support for an annual acoustic survey. A report from the Canadian section of the AP stated that it believes that it is important to act with precaution in setting the 2013 coast-wide TAC (Can AP 2013) because of the uncertainty around the 2010 year class, and allowing the younger age classes observed to grow.

The JMC recommendation was transmitted via letter to the Parties on March 19, 2013. Subsequently NMFS and DFO formally implemented the JMC's recommended 2013 TAC (Federal Register 2013b.

3.4 Principle Two: Ecosystem Background

3.4.1 Context

Physical and biological characteristics of the California Current Large Marine Ecosystem (CCLME) where the U.S. and more than 90% of the Canadian fisheries for Pacific Hake operate are summarized in great detail in several comprehensive documents (PFMC (Pacific Fishery Management Council) and NMFS 2010; PFMC 2008a). It extends from southern California northward, fluctuating around the northern end of Vancouver Island (Ware and McFarlane 1989, Levin and Schwing, 2011, Field et al. (2006) depending on La Niña and El Niño conditions. The description in section 3.4.5 has a summary from these references.

Depending on annual fishing conditions, a small amount of the Canadian hake fishery operates in the transition zone between the CCLME and the Gulf of Alaska Large Marine Ecosystem in Queen Charlotte Sound.

3.4.2 Bycatch and retained catch

3.4.2.1 Catch Information

U.S Fishery

The coastal Hake fishery is a targeted mid-water trawl fishery that generally has very low bycatch rates. Dorn (1995) estimated that the historic non-directed catch in the at-sea fishery is less than 3% by weight. In 2012, less than 1% bycatch occurred in the total catch (Bellman *et al*. 2013) by all sectors of the U.S. mid-water trawl fisheries for Pacific Hake (Appendix Table 1). The common bycatch species are yellowtail rockfish (*Sebastes flavidus*), spiny dogfish (*Squalus acanthias*), widow rockfish (*Sebastes entomelas*), and minor slope rockfish. A total of 49 species are listed in Appendix Table 1, and represented 0.8 % of the total Hake catch. Pacific salmon are also captured as bycatch, but at very low rates (Dorn 1997). Al-Humadhi *et al*. (2012) estimated an average of 6,562 individuals per year from 2002 through 2010, of which 87% are Chinook (*Oncorhynchus tshawytscha)* (Appendix Table 2). However, the bycatch of salmon is a particular concern because of the extremely low levels of abundance of many West Coast salmon stocks. Green Sturgeon and Eulachon also occur, but rarely (see discussion below).

Currently seven groundfish species remain categorized as overfished in the U.S. west coast since the Sustainable Fisheries Act was reauthorized (MSA 2007). These species include Bocaccio (*Sebastes paucispinis*), Canary Rockfish (*Sebastes pinniger*), Cowcod (*Sebastes levis*), Darkblotched Rockfish (*Sebastes crameri*), Pacific Ocean Perch (POP) (*Sebastes alutus*), Petale Sole (*Eopsetta jordani*), and Yelloweye Rockfish (*Sebastes ruberrimus*). Since then, Widow Rockfish has recovered. In general, under U.S. management these species may not be taken or retained, but when captured in association with fisheries targeting other stocks they are subject to bycatch quota share. In addition to bycatch

restrictions, the incidental catches of overfished species are managed through gear restrictions and closures of Rockfish Conservation Areas (RCAs) (MSA 2007).

Research to reduce bycatch is active. In May 2012, NMFS's Northwest Fisheries Science Center-Habitat and Conservation Engineering group and the Pacific States Marine Fisheries Commission (PSMFC) conducted a collaborative workshop to develop a rockfish excluder (bycatch reduction device or BRD) for testing in the 2012 Pacific Hake fishery. The design uses two vertical sorting grids and an exit ramp that sort fish by size as they move back toward the codend. Fish that are smaller than the sorting grid openings (i.e., Pacific Hake) will pass through and be retained, whereas larger fish (i.e., rockfishes) will be excluded. Other bycatch reduction research involves the use of artificial light to enhance the escapement of Chinook Salmon when used in conjunction with a BRD in Pacific Hake midwater trawl nets. A promising design has been developed, and recent data suggest that the use of artificial lights may further enhance the escapement of Chinook Salmon by attracting them toward the open escape window areas of the BRD (U.S. Department of Commerce 2013).

Canadian Fishery

Similar bycatch species are taken by the Canadian Pacific Hake fleet. Canadian bycatch characteristics are similar to those of the US, representing about 0.5 % of the total Hake catch. The common bycatch species are Yellowtail Rockfish, Walleye Pollock (*Theragra chalcogramma*) Pacific Ocean Perch (*Sebastes alutus*), and Redstripe Rockfish (*Sebastes proriger*).

A species of particular concern is Bocaccio, which the most recent 2012 stock assessment placed in the "critical zone" according to DFO's policy "A Fishery Decision Making Framework Incorporating the Precautionary Approach". This policy requires the development of a rebuilding plan for species in the critical zone, which DFO developed in 2013 with input from fishing interests. The plan sets out stepped reductions of total Bocaccio harvest from the 2006-12 average of 145 mt to a target level of 75 mt over 3 years (2013-14 to 2015-16). To achieve the reductions, management measures for various groundfish fisheries were introduced (see appendix 9 of the Groundfish IFMP). These measures build on the initiative taken by the trawl industry in 2004 to direct proceeds of all trawl Bocaccio landings toward research and management. Bocaccio was also recommended as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in November 2013. The federal government has recently reviewed the recommendation and made a decision not to list (Minister of Justice 2014) Boccacio under Canada's Species at Risk Act (SARA). The negative socio-economic impacts of adding the Bocaccio to the List would be significant. A 45% reduction in the harvest of the target species would be required in order to reduce the incidental catch of Bocaccio to 50 mt, which would facilitate the population recovery of this species. Reducing the harvest would result in considerable costs, with annual profit losses to the commercial harvest sector in the range of $27.5 million, would affect 700 jobs in the fishery and result in a $40.5 million loss in GDP and $24.5 million loss in house-hold income, all in the first year.

Bycatch of Pacific salmon ranges from 3,000 to 7,000 fish per year, of which 99% Chinook. Eulachon bycatch was estimated at 0.181 mt in 2013 (Ackerman 2013).

Under Canada's Ocean's Act of 1996 and the subsequent Ocean Strategy (2005), fisheries management is required to move toward the overarching objective of ecosystem-based management. Management strategies for groundfish fisheries are now directed at reducing bycatch of vulnerable species and minimizing the adverse effect of fishing on sensitive benthic habitats through area closures (particularly for the trawl fishery in Eastern Queen Charlotte Sound and Hecate Strait) and via the creation of Rockfish Conservation Areas in coastal British Columbia.

Hake is managed under the groundfish Integrated Fisheries Management Plan (IFMP) (DFO 2013b), and the 2013 Pacific Offshore Hake Harvest Plan (DFO 2013a). The IFMP recognizes the multi-species nature of groundfish catches in British Columbia. This plan prohibits the retention of Pacific Halibut (*Hippoglossus stenolepis*), salmon, Eulachon (*Thaleichthys pacificus*), sturgeons, Pacific Herring (*Clupea pallasii)*, and wolf eel (*Anarrhichthys ocellatus)*. All other species are subject to coast-wide quotas under the individual vessel quota system (DFO 2006). The bycatch allowance for the Hake fishery depends on whether or not the vessel is subject to observer monitoring (DFO 2013a).

Determination of main and minor species

The MSC Fishery Certification Requirements v1.3 requires the assessment team to determine and document how it evaluated all Principle 2 species and under which component (retained, bycatch, or ETP). Bycatch of groundfish in the U.S. and Canada are presented in Appendix Tables 1 and 2.The MSC defines retained and bycatch species as follows:

. **Retained Species**: Species that are retained by the fishery (usually because they are commercially valuable or because they are required to be retained by management rules).
. **Bycatch species**: Organisms that have been taken incidentally and are not significantly retained (usually because they have no or low commercial value). The MSC CR v1.3 provides discretion to assessment teams to evaluate the impact of the fishery on all retained and bycatch species (MSC scoring elements).

The Assessment Team developed the following logic to assign species as either retained or bycatch:

- If ≤ 50% of the Pacific Hake mid-water catch of a species was discarded, the species was classified as retained. The assessment team had to further agree whether a retained or bycatch species was, in MSC terms, “main” or “minor”. The Team used its judgment to develop a qualifier set intended to allow consideration of the weight (…if the total catch of the fishery is large, in which case even 5% may be a considerable catch) and vulnerability of a species (Section GCB3.5.2 MSC Guidance v1.3). On that basis a species may be considered for a “main” categorization if the catch of that species comprises >5% of the Hake catch; comprises approximately 10%, or more, by weight, of the ACL/TAC for that species; or if the species is considered to be highly vulnerable or valuable and comprises 2% or more by weight of the ACL/TAC for that species. The assessment team is required to use their expert judgment to determine and justify the categorization of main and minor. In this instance, the team used three sources of information to support their judgment:

1) The catch of each species estimated as a proportion of the species’ ACL.
2) Vulnerability was based on Cope et al. (2011), which identified highly vulnerable species (Vulnerability index (V) > 2.2).
3) The species was worth more than $1.00/lb to the fishers and any catch is rarely (<5%) discarded.

If discards, as a percentage weight in the Pacific Hake mid-water catch of the species, were > 50%, then the species was classified as bycatch. If a bycatch species comprises approximately 10%, or more, by weight, of the ACL/TAC for that species; or if the species is considered to be highly vulnerable or valuable and comprises 2% or more by weight of the ACL/TAC for that species, it is categorized as a main bycatch species. All others are minor bycatch species.

3.4.2.2 Main retained species

United States

Based on the above criteria, five species are categorized as “Main Retained”: four rockfishes: Yellowtail, Widow, Shortraker (*Sebastes borealis*), Rougheye (*Sebastes aleutianus*), and Spiny Dogfish. Even though the catch of Rougheye and Shortraker are relatively very small (far below 5% of the Pacific Hake catch), the team considered them as Main because they have high vulnerability (>2.2) to fishing and the catch in the Pacific Hake fishery exceeded 10% of the ACL for these species. The others met the 10%, or more, of the weight of the ACL for that species.

The following descriptions are summarized from Appendix B, Part 2, Groundfish Life History Descriptions, of the PCGFMP, (PFMC 2005a). References cited within can be found in full in that document.

Yellowtail Rockfish. Yellowtail Rockfish range from Unalaska Island, Alaska, to San Diego, California. Only juvenile yellowtails have been found in Puget Sound. Older juveniles and adults are usually found over high relief, such as boulders and sheer rock walls, although they are seen rarely over cobble-mud bottoms. Yellowtails are a schooling fish that sometime swim well off the bottom and in schools of thousands. They can be found from the surface to 549 m (1,800 ft) in water depth (Love et al. 2002). The following information is summarized from Wallace and Lai (2005), Status of the Yellowtail Rockfish in 2004. All citations quoted below can be found in that report.

Yellowtail Rockfish is managed as two stocks – northern (Vancouver, Columbia and Eureka) and southern (Monterey and Conception). Only the northern stock has recently been assessed in the past decade (Wallace and Lai 2005), and is the most relevant to the Hake fisheries. The northern stock has in turn been modelled as three assessment areas: Southern Vancouver from Cape Elizabeth (47^{o} 20’N) to approximately 49^{o} N, Northern Columbia from Cape Falcon (45^{o} 46’N) to Cape Elizabeth (47^{o} 20’N), and Eureka/South Columbia from Cape Mendocino (40^{o} 30’N) to Cape Falcon (45^{o} 46’N). The center of yellowtail abundance is from Oregon to British Columbia (Alverson *et al*. 1964, Westrheim 1970; Gunderson and Sample 1980), which suggests that while US / Canada movement may be a source of uncertainty, but uncertainty associated with the US / Mexico border is probably not significant. The Canadian Department of Fisheries and Oceans (DFO) manages their fishery as two unit stocks; a "boundary" stock equivalent to the Southern Vancouver assessment component mentioned above and a "coastal stock" from PMFC area 3D to the northern Canada/U.S. border (Stanley 1993).

Wallace and Lai (2005) provide the most recent status of the Yellowtail Rockfish stocks north of Cape Mendocino. The estimated age 4+ biomass in 2004 was 72,152 mt (CV 26%), increasing from 58,025 mt in 2003. The SSB had remained above 40% of unfished B_0 since 1995. The depletion ranged from 49% to 60 from 1995 to 2005. Since 2004 catches have remained very low relative to the ABC. For example between 2006 and 2012, the ABC averaged 4,540 mt which total catches averaged 629 mt (PFMC and NMFS 2006, 2009, and 2011) or about 14% of the ABC. Based on projections for each of the stocks under much larger catches based on the target fishing mortality rate, the N. Vancouver, N. Columbia and S. Eureka stocks are highly likely be at or around the target biomass (40% B_0). With much lower catches, there is a high probability that the overall stock size is above the target level. The U.S. Hake fisheries take about 10% of the acceptable biological catch (ABC).

Widow Rockfish. The following information is summarized from He *et al.* (2011), Status of the Widow Rockfish resource in 2011. All citations quoted below, unless otherwise noted, can be found in that report. Widow Rockfish is managed as a single stock within the US EEZ from the Canadian to Mexican border (He *et al.* 2011).

While the stock is assessed as one unit, assessments since 1989 have modelled northern (Vancouver and Columbia) and southern components (Eureka, Monterey and Conception) due to evidence of area–specific growth and maturity. Stock-level recruitment is allocated to both areas based on model fit to the fisheries and survey data. He *et al.* (2011) do not report on any tagging studies on Widow Rockfish movements and migrations. There is no evidence of separate genetic stocks of Widow Rockfish which supports treatment as one stock exploited by separate fisheries (Hightower and Lenarz 1990; Rogers and Lenarz 1993; Ralston and Pearson 1997, Williams *et al*. 2002, Field and Ralston 2005). It is unclear whether there are significant interactions across the northern (US / Canada) and southern (US / Mexico) boundaries of the stock unit.

The stock assessment for Widow Rockfish (He *et al.* 2011) employed an age-based population model similar to those used in previous assessments. As in the 2009 assessment model, this assessment used the Stock Synthesis program (V3.22b). This assessment employed major modifications of model structures and utilized new data that were not available or not used in the previous assessments. A wide range of model runs were explored for model selection and evaluation. The assessment, which has been endorsed by the SSC and PFMC at its November 2011 meeting, indicates that spawning biomass is above the $B_{40\%}$ target with 2011 depletion estimated at 51.1% with 95% of asymptotic intervals of 41.0% and 61.2%. The stock assessment (He et al. 2011) shows that the stock fell below the management target from the late 1990s to early 2000s; that the stock rose above the target biomass in the early to mid 2000s, and that the stock has not fallen below the minimum stock size threshold. The lower 95% of asymptotic intervals has been above the minimum stock size threshold since the early 2000s. The stock has been classified as rebuilt by the PFMC, and there is a high degree of certainty that the stock is above the target reference point.

Rougheye Rockfish. Rougheye Rockfish (*S. aleutianus*) are reported from the Aleutian Islands to San Diego, California (Eschmeyer *et al.* 1983), but are rare south of 40°10' N. latitude. They are also found in Pacific waters off Japan to California and Japan to Navarin Canyon in the Bering Sea (Allen and Smith, 1988). Rougheye Rockfish are common in offshore waters and are rare in nearshore waters (Hart 1973). They occur from 25 to 875 m deep, but about 94% occur between 50 and 450 m (Allen and Smith 1988). Records of rougheye rockfish occurring at depths to 2,820 m are probably misidentification of shortraker rockfish (Allen and Smith 1988). They have also been reported to commonly occur at 100–450 m. Rougheye Rockfish are sometimes found in small schools. Rougheye Rockfish are found on the bottom (Eschmeyer *et al.* 1983). Off California, young Rougheye Rockfish recruit to soft substrata (Love *et al.* 1991). When observed from a manned submersible, the greatest densities of rougheye rockfish were associated with soft substrata, frequent boulders, and slopes greater than 20^{o}. It is hypothesized that their association with soft substrata may be prey-related (Krieger and Ito 1999). Rougheye Rockfish are piscivorous, but also prey upon shrimps, crabs and other crustaceans (Love *et al.* 2002). Adults are most commonly observed over steeply sloped bottom (Sigler and Zenger 1989).

Rougheye Rockfish larvae are released during May off Oregon (Wyllie Echeverria 1987), and from February to June off British Columbia (Love *et al.* 2002). Also off British Columbia, the sizes at 50% maturity are 40 cm for males and 47 cm for females, and are about 20 years old (Westrheim *et al.* 1968, Love *et al.* 2002). Rougheye Rockfish can grow to 97 cm in length (Eschmeyer *et al.* 1983, Love et al. 2002), and reach the age of approximately 200 years (Munk 2001). Rougheye Rockfish are one of the longest-lived species of rockfish on the West Coast and therefore natural mortality is likely to be lower than for other rockfish species (Hicks *et al*. 2014)

Since 2000, the spawning biomass has stabilized and possibly increased because of reduced catches and above average recruitment in 1999. The 2013 spawning biomass relative to unfished equilibrium spawning biomass is above the target of 40% of unfished spawning biomass. However, in the 1980's the exploitation rate and SPR exceeded the

current estimates of the harvest rate limit ($SPR_{50\%}$). Recent exploitation rates on Rougheye Rockfish were predicted to be near target levels. Sustainable total yields (landings plus discards) were 194 mt when using an $SPR_{50\%}$ reference harvest rate with a 95% confidence interval from 120 to 269 mt. In recent years, the stock has experienced exploitation rates that have been higher and lower than the target while the biomass level has remained above the target level (Hicks *et al*. 2014). The mid-water Hake fishery took 101 mt of the 237 mt all gear catch in 2012. Since 2003, the depletion ratio has ranged from 44.8% to 47.3% (Figure 8); the minimum depletion ratio at 95% confidence interval over this time period is 30%, above the minimum stock size threshold ratio of 0.20.

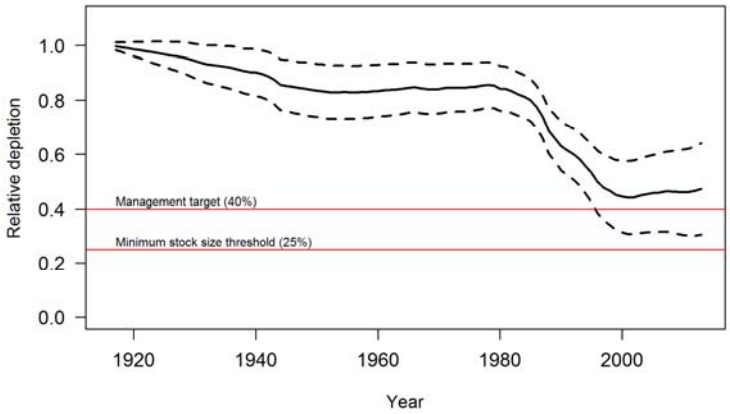


Figure 8. Estimated relative depletion with approximate 95% asymptotic confidence intervals (dashed lines) for the base case assessment model (Hicks *et al*. 2014).

The stock is highly likely to be above its target level and there is a very high degree of certainty that is above the minimum stock size threshold ratio.

Shortraker Rockfish. Shortraker Rockfish are reported from Japan, to southeastern Kamchatka Peninsula in the Bering Sea (Allen and Smith 1988, Eschmeyer *et al.* 1983, Krieger 1992, Kreiger and Ito 1999), throughout the Aleutian Islands, and south to Point Conception, California (Allen and Smith 1988), but are rare south of 40°10' N. latitude. Shortraker Rockfish are an offshore, demersal species (Krieger 1992). They occur from 0 to 875 m deep, but primarily inhabit the middle shelf to the mesobenthal slope with 95% at depths of 50–650 m (Allen and Smith 1988). The most common depths for Shortraker Rockfish have also been reported as 100–600 m (Orr *et al.* 2000). Fishermen have reported schooling behavior above rugged, steep-slope habitat with most of the fish being relatively small (<5 kg). Shortraker rockfish can be found on soft bottom (Eschmeyer *et al.* 1983). In an observation study with a submersible in the eastern Gulf of Alaska, Shortraker Rockfish were mostly observed near boulders 0.5–4.0 m in diameter surrounded by soft bottom, or over fine-grained substrata of silt or pebbles (Krieger 1992). They also seemed to prefer sloping substrata of 3–12° and currents of 0.1–0.4 km/hr. Shortraker Rockfish are common over hard, steeply sloped bottoms (Sigler and Zenger 1989, Krieger and Ito 1999). Yang and Nelson (2000) found shrimp to be the most important food of Shortraker Rockfish, in addition to cephalopods (mainly squid), as well as mysids, bathylagids, and myctophids.

From Oregon to the Gulf of Alaska, 50% of both male and female Shortraker Rockfish mature at 45 cm (Love *et al.* 2002). Females have fully developed embryos from March through July, and generally release larvae from summer through fall at depths between 300 and 500 m (Love *et al.* 2002). They can grow to lengths of 1.2 m and weigh as much as 23 kg (Love 2002). They are among the longest-lived rockfishes, having been aged to 157 years (Love *et al.* 2002).

Regarding the stock status, there are three component species within these complexes that have very high PSA vulnerability scores (i.e., Aurora Rockfish (*Sebastes aurora*), Rougheye Rockfish, and Shortraker Rockfish) and one with a high vulnerability score (i.e., Blackgill

Rockfish (*S. melanostomus*)). As stated before, the new assessments for Aurora and Rougheye Rockfish indicate a healthy status for these two stocks and the OFLs estimated from these new assessments are significantly higher than those previously estimated using the data-poor DB-SRA method. Because Shortraker occurs with the two previously mentioned species in the slope other rockfish complex, and because Shortraker Rockfish is a minor species on the west coast and at the tail end of the distribution of the stock, such that catches in west coast fisheries have little effect on overall stock status (PFMC 2013e), it is reasonable to assume its status in the west coast region is not affected by the Hake fishery, such that the fishery would not hinder recovery if needed.

Some important points regarding the condition of both Rougheye and Shortraker are that they are managed as part of the "Minor slope rockfish (north and south)". OFLs for the complex range from 1,507 to 1,553 mt for 2012-2014. Rougheye accounts for 5% and Shortraker about 1.4% (PFMC 2011d) of the total. All gear total catches (retained + discard) for the complex ranged from 292 to 561 mt during 2007 – 2011, averaging 475 mt, far below the allowable levels of harvest. As a complex, these species are not overfished. In 2014, the PFMC considered splitting out Rougheye from the species complex, requiring mandatory sorting, and establishing groundfish closure areas (GCA). The whiting fleet is very aware of the potential to exceed the ACL for these two species units, and has been working towards reducing their catch, especially in the CP fleet. All sectors of the groundfish fisheries met to address the issue (PMFC 2014e). This resulted in a recommendation to the PFMC to maintain the status quo and allow the industry to continue to develop and implement voluntary measures to reduce Rougheye bycatch through the 2015-2016 management cycle. These include additional outreach and education efforts, information sharing, hot spot identification and avoidance, closed areas, and excluder development and use. The at-sea fleets monitor catch closely and identify bycatch hotspots to avoid those areas. The CP fleet, at least, has been using some in-net Bycatch Reductions Devices (BRD's) and there is on-going work at the NWFSC with cooperation from the fleet to design better BRDs (Hicks 2014). Analysis of the BRDs is on-going and five management options are being considered (PFMC and NMFS 2014). Rougheye "hot spots" are known based on analysis of catch location for several years, and shows 78% of the at-sea and ITQ mid-water trawl tows have no Rougheye bycatch. (PFMC and NMFS 2014).

The PFMC supported the industry recommendation by adopting a Preliminary Preferred Alternative (PPA) to maintain Rougheye within the slope complex along with a mandatory scientific sorting requirement for the 2015-2016 management cycle (PFMC 2014f).

Spiny Dogfish. The following descriptions are summarized from Appendix B, Part 2, Groundfish Life History Descriptions, of the PCGFMP, (PFMC 2005a). References cited within can be found in full in that document. Spiny Dogfish (*Squalus acanthias*) is managed in the "Other Fish" category by the Council. In the NE Pacific, this is a long-lived, late-maturing species that could be vulnerable to fishery impacts. Historical landings since the 1940s have been cyclically significant (up to 50,000 mt), depending on markets and swings in abundance (Taylor 2008). In the last few years, landings have averaged about 80 mt or only 10% of the catch.

A stock assessment completed in 2011 found the Pacific stock to be in good condition (Gertseva and Taylor 2012). It is currently thought to be around 63% B_0. Although the stock biomass has been slowly declining over last decades, it is still well above the target level (40% B_0). 2011 depletion was estimated to range 49.3 – 74.1%, well within biologically based limits. Since 2003, the depletion ratio has ranged from 63.12% to 65.68%. The 95% confidence intervals for the depletion ratio were calculated only for 2010 and 2011, the last two years of the assessment; the depletion ratio was 43.98% and 44.00% for these two years, at or above the target ratio of 0.40. Based on this assessment, there is a high degree of certainty that the stock is above target levels.

Dogfish catch “hot spots” are known, and the PFMC is considering establishing groundfish closure areas (GCA) for Dogfish, but additional analysis is needed before making a decision (PFMC and NMFS 2014).

Canada

From the table of catch by species in the Canadian Pacific Hake fishery, we have identified these species as main retained: Yellowtail Rockfish, Redstripe Rockfish (*S. proriger*), Bocaccio (*S. paucispinis*), and Walleye Pollock (*Theragra chalcogramma*).

Yellowtail Rockfish. The yellowtail rockfish is an important component of the rockfish catch in the commercial trawl fishery off British Columbia. Yellowtail rockfish range from southern California to the Gulf of Alaska. The principal area of commercial abundance is northern California to northern B. C. Yellowtail rockfish begin recruiting to the fishery at age five but can live to over 50 years of age. Young are born alive. Mating takes place in mid-fall and free-swimming larvae are released in late winter, early spring. Males and females mature between age five and 14.

Yellowtail rockfish are treated as two stocks in British Columbia. The southern or ”boundary” stock is shared with the United States fishery and is assumed to extend from northern Washington State to central Vancouver Island. The “coastal” stock includes the area from central Vancouver Island to the Alaska border. Commercial catches are made in depths of 100- 200 m using bottom and midwater trawls.

In 1998 (the most recent assessment) these stocks appeared to be declining, based on assessments using catch-at-age analysis and hake bycatch indices (DFO 1998). No biomass reference points have been established. Qualified harvest recommendations for Yellowtail are provided based on average catch history, trends in survey results, and expert opinion. During the period 2009 through 2013, all fisheries took 84%-101% (average 95%) of the annual TAC.

Redstripe Rockfish. Redstripe rockfish range from southern California to the Bering Sea at depths of 12 to 425 m. They are generally found over high-relief, rocky bottoms and can often be found in mid-water. They can occur singly but most often form dense aggregations. Evidence suggests that redstripe rockfish schools remain near the bottom during the day but rise up and disperse at night. Redstripe rockfish may live to about 50 years of age, although data from 1990-92 indicate that the mean age along the British Columbia coast is 20 years with a maximum of 48 years. Redstripes reach a maximum size of about 60 cm, but are generally smaller than other slope rockfish species. In B.C., the mean length is 33 cm with a maximum length of 49 cm. Males and females reach 50% maturity at a length of about 28 cm. Spawning occurs from May to July. Fertilized eggs remain within the ovary until larval extrusion and may obtain at least some of their nutrition from the female parent during development (DFO 1999a).

Abundance reference points have not been established for Redstripe Rockfish. A 1996 biomass survey off SW Vancouver Island indicated a biomass just under 1,000 mt, but the survey used only bottom trawl and *S. alutus* was the target species. A comparison 1995 commercial midwater trawl/bottom trawl suggested half of the Redstripes were taken by the midwater gear, suggesting the actual biomass may be considerably greater than had been estimated. Limited data gathered in the early 1990s suggested than 1982 was the last year of significant recruitment (DFO 1999a). Qualified harvest recommendations for Redstripe are provided based on average catch history, trends in survey results, and expert opinion. During the period 2009 through 2013, all fisheries took 29%-83% (average 57%) of the annual TAC (Ackerman 2014).

Bocaccio. Bocaccio can be found from Stepovak Bay, Alaska to central Baja California, but is mostly abundant from Oregon to northern Baja California. They occur from various depths

from the surface to 1,568 feet (478 m); most live between 150–1.000 foot (45.720–0.305 m).[2] Juveniles stay in shallower water because of the protection provided by floating kelp mats or driftwood. As the fish get older, they tend to move into deeper, colder water. The Bocaccio consume multiple marine species such as shellfish (pelagic shrimp and crab), anchovies, sardines, other small rockfishes, and squid. The Bocaccio is one of the larger rockfish and can grow up to 3 feet (0.91 m) in length and live to 45 years. Females grow faster than males and also live longer. There is a difference in maturity rates from north to south. Southern California Bocaccio mature at 14 inches and reproduce at around 18 inches (460 mm), while northern males mature at 22 inches and females at 24 inches. They are viviparous rockfish; in Southern California they spawn their larvae in 2 more batches and spawning occurs almost all year. In Central and Northern California they spawn from January to May, while further north spawning is restricted to January to March. One female can produce over 2 million eggs per season (Love 1996).

In 2012, a stock assessment for Canadian Bocaccio was prepared (DFO 2012c). This assessment used the non-equilibrium, age-aggregated Bayesian surplus production model. Overall results were similar to previous work, in that the reference case indicates that Bocaccio exploitable stock biomass had declined significantly from the 1930s, with the steepest decline occurring from 1985 to 1995. The rate of decline slowed after 1995, coincident with lower catches of the early 1990s; however, the decline has continued after 2000. The posterior median estimate for exploitable biomass in 2012 is 1,879 mt (CV=55%). The posterior median estimate of stock size relative to its unfished stock size (B2012/K) is 3.5%. Current abundance relative to Bmsy (B2012/Bmsy) is 7%. The 90% confidence limits of the median estimate of B2012/Bmsy lie between 0.029 and 0.182. There is a 99% mean probability that the population is less than the lower Precautionary Approach (PA) reference point of 0.4*Bmsy. The posterior median estimate for the replacement yield in 2012 is 143 tons (CV=55%), similar to current catch levels. During 2013 the trawl quota was 149.5 mt of which the fishery took 49% (72.7 mt) (Ackerman 2014).

In 2002, Committee on the Status of Endangered Wildlife in Canada (COSEWIC) recommended that Bocaccio be listed as threatened under the Canadian Species At Risk Act (SARA), and changed the recommendation to endangered in 2009. The IUCN has designated Bocaccio as critically endangered globally (IUCN 2007). There have been several years of extensive consultation as to whether to list or not list Bocaccio under SARA. Recreational and commercial fishers have been opposed it and environmental organizations, academics and the public were generally in support. The reasons not to list Bocaccio were comprehensively documented in the Canada Gazette (2010) and Order Giving Notice of Decisions Not to Add Certain Species to the List of Endangered Species P.C. 2011-729 June 23, 2011 (Minister of Justice 2014).

Based on updated science information and input from fishing interests, the DFO developed a rebuilding plan for stepped reductions of total Bocaccio harvest to a target level of 75 mt over 3 years (2013-14 to 2015-16). This plan accounts for First Nations' priority access for food, social, and ceremonial purposes. The DFO has worked with fishing interests to develop measures that will reduce Bocaccio catch and enable stock rebuilding over the long term. The goal of the rebuilding plan, consistent with DFO's Precautionary Approach policy, is to promote stock growth out of the critical zone by ensuring removals from all fishing sources are kept to the lowest possible level until the stock has cleared this zone.

Taking into consideration advice provided by fishing interests, the DFO established pilot measures for the 2013/2014 fishing season that are intended to reduce Bocaccio catch in the commercial and recreational fisheries that encounter them. Relevant conditions of licences and harvest plans in the appendices of the IFMP provide further information. The DFO reviews the efficacy of these pilot measures at the end of each fishing season and considers any additional measures necessary to achieve stock rebuilding (DFO 2013b). In the first of the three year period for reductions, catch was reduced from an estimated 137 mt in 2012 to an estimated 95.7 mt in 2013, about 11 mt from the rebuilding target of 75 mt.

Walleye Pollock. Walleye Pollock are distributed from California through the Bering and Chukchi Seas to Japan, but the largest fisheries occur between the Gulf of Alaska and Bering Sea. The vast majority of this species is captured with trawl gear and processed for frozen fish products and surimi. Walleye Pollock are schooling, midwater to bottom-dwelling fish, living anywhere between shallow, nearshore waters to 1,000 m. Most occur between 100-300 m depth. Generally, the fish move inshore during summer and offshore for winter, occupying greater depths during the cold months. They may live up to 17 years and reach a length of 100 cm. Males and females are externally indistinguishable and typically begin to reproduce at 3-4 years of age. Spawning occurs at different seasons depending upon location; in Alaska between March and May. Females spawn in several batches over a few weeks, producing up to 2 million small eggs. The eggs hatch in 1-3 weeks at the depth of spawning (usually 100-250 m), and larvae develop in shallow water (<30 m). Young-of-the-year juveniles feed on plankton near the surface at night and descend during the day. Older fish consume copepods, shrimp, euphausiids, and fish. Walleye Pollock are an important prey for a wide range of piscivorous fishes and marine mammals (NOAA Fisheries 2009).

No comprehensive stock assessment resulting in biomass reference point has been conducted on Canadian Walleye Pollock. Qualified harvest recommendations for Pollock are provided based on average catch history, trends in survey results, and expert opinion. During the period 2009 through 2013, trawl fisheries took an average 98% of the annual TAC (Ackerman 2014) and ranged from 83-113%. The IVQ program in Canada includes carryover provisions that allow for specified catch overage and underage amounts in a given year. For this reason, in a given year, the catch may exceed the TAC. However, overages that occur in one year are subtracted from the fisher's quota holdings the next year, thereby ensuring that the fishery remains within TACs over a multi year period.

3.4.2.3 Minor retained species

United States

The following species (Table 8) are categorized as minor retained species:

Table 8. List of minor retained species in the US Pacific Hake fishery.

Species	**Scientific name**	**Category**	**Depletion ratio / min 95% CI**
Rebuilding stocks			
Canary Rockfish	*Sebastes pinniger*	Retained minor	
Darkblotched Rockfish	*Sebastes crameri*	Retained minor	
Pacific Ocean Perch (N)	*Sebastes alutus*	Retained minor	
Petrale Sole	*Eopsetta jordani*	Retained minor	
Sablefish	*Anoplopoma fimbria*	Retained minor	
Non-rebuilding species			
Arrowtooth Flounder*	*Atheresthes stomias*	Retained minor	79 / 58.1
Dover Sole*	*Microstomus pacificus*	Retained minor	83.7 / 67
English Sole*	*Parophrys vetulus*	Retained minor	116 / 83
Lingcod (N)*	*Ophiodon elongatus*	Retained minor	61.9 / 48
Longnose Skate*	*Raja rhina*	Retained minor	66.44 / 64.46

Species	Scientific name	Category	Depletion ratio / min 95% CI
Longspine Thornyhead* (N)	*Sebastolobus altivelis*	Retained minor	75.2 / 53.5
Pacific Cod*	*Gadus macrocephalus*	Retained minor	
Aurora Rockfish	*Sebastes aurora*	Retained minor	65/48
Shortbelly Rockfish*	*Sebastes jordani*	Retained minor	$>B_{40}$
Shortspine Thornyhead* (N)	*Sebastolobus alascanus*	Retained minor	74.2 / 56.1
Minor shelf rockfish (N)		Retained minor	
Chilipepper Rockfish*	*Sebastes goodei*	Retained minor	70 / 50
Greenspotted Rockfish	*Sebastes chlorostictus*	Retained minor	
Greenstriped Rockfish*	*Sebastes elongatus*	Retained minor	84.9 / 72.4
Harlequin Rockfish	*Sebastes variegatus*	Retained minor	
Redstripe Rockfish	*Sebastes proriger*	Retained minor	
Rosethorn Rockfish	*Sebastes helvomaculatus*	Retained minor	
Silvergray Rockfish	*Sebastes brevispinis*	Retained minor	
Stripetail Rockfish	*Sebastes saxicola*	Retained minor	
Minor slope rockfish (N)			
Bank Rockfish	*Sebastes rufus*	Retained minor	
Blackgill Rockfish	*Sebastes melanostomus*	Retained minor	
Redbanded Rockfish	*Sebastes babcocki*	Retained minor	
Sharpchin Rockfish	*Sebastes zacentrus*	Retained minor	
Splitnose Rockfish*	*Sebastes diploproa*	Retained minor	65.55 / 51.22
Yellowmouth Rockfish	*Sebastes reedi*	Retained minor	
Other flatfish			
Rex Sole	*Glyptocephalus zachirus*	Retained minor	
Rock Sole	*Lepidopsetta bilineata*	Retained minor	
Other groundfish			
Grenadier Unidentified	*Macrouridae species*	Retained minor	
Spotted Ratfish	*Hydrolagus colliei*	Retained minor	
Non-FMP flatfish			
Slender Sole	*Lyopsetta exilis*	Retained minor	

Those species marked with an asterisk (33% of the minor retained species) have been individually assessed, and are being fished at rates that maintain stocks above the target

reference points (PFMC 2011d). Therefore, these minor stocks are considered as having a high degree of certainty to be above the point of recruitment impairment. The landings of these species are small, and the harvest by the Hake fishery is unlikely to affect the status of these stocks.

Canada

The following species (Table 9) are categorized as minor retained species:

Table 9. List of minor retained species in the Canadian Pacific Hake fishery.

Species	**Scientific name**	**Category**	**Depletion ratio / min 95% CI**
Pacific Ocean Perch	*Sebastes alutus*	Retained minor	41/19 WVI and 37/16 HGI
Widow Rockfish	*Sebastes entomelas*	Retained minor	
Silvergray Rockfish	*Sebastes brevispinis*	Retained minor	56/41
Yellowmouth Rockfish	*Sebastes reedi*	Retained minor	41-61/29-43
Arrowtooth Flounder	*Atheresthes stomias*	Retained minor	
Canary Rockfish	*Sebastes pinniger*	Retained minor	15-22/7-31
Lingcod	*Ophiodon elongatus*	Retained minor	
Dover Sole	*Microstomus pacificus*	Retained minor	
Pacific Cod	*Microstomus pacificus*	Retained minor	Pending
Petrale Sole	*Microstomus pacificus*	Retained minor	
Rex Sole	*Microstomus pacificus*	Retained minor	
Redbanded Rockfish	*Sebastes babcocki*	Retained minor	
Sablefish	*Anoplopoma fimbria*	Retained minor	
Longnose Skate	*Raja rhina*	Retained minor	Data Poor
Shortspine Thornyhead	*Sebastolobus alascanus*	Retained minor	
Sharpchin Rockfish	*Sebastes zacentrus*	Retained minor	
Flathead Sole	*3.4.2.3.1 Hippoglossoides elassodon*	Retained minor	
English Sole	*3.4.2.3.2 Parophrys vetulus*	Retained minor	
Big Skate	*Raja binoculata*	Retained minor	Data Poor
Spotted Ratfish	*Raja binoculata*	Retained minor	
Southern Rock Sole	*Lepidopsetta polyxystra*	Retained minor	37/27; 80/58
Greenstriped Rockfish	*Sebastes elongatus*	Retained minor	
Grenadiers	Macrouridae	Retained minor	
Blue Shark	*Prionace glauca*	Retained minor	
Pacific Electric Ray	*Torpedo californica*	Retained minor	
Chilipepper	*Sebastes goodei*	Retained minor	
American Shad	*Alosa sapidissima*	Retained minor	
Chub Mackerel	*Scomber japonicus*	Retained minor	
Jack Mackerel	*Trachurus symmetricus*	Retained minor	
Octopus	*Enteroctopus spp*	Retained minor	
Ragfish	*Icosteus aenigmaticus*	Retained minor	
Robust Clubhook	*Moroteuthis robusta*	Retained minor	

Species	Scientific name	Category	Depletion ratio / min 95% CI
Squid			
Schoolmaster Gonate Squid	*Berryteuthis magister*	Retained minor	

Five (POP, Yellowmouth, Canary and Silvergray Rockfish and Rock Sole) of 33 minor retained species (15%) have been assessed. It should be also be noted that only three (POP, Widow, and Silvergray Rockfish) have more than 5% of their respective ACLs appear in the Hake fishery, and seven additional species have more than 1% of their respective ACLs appear in the fishery (Appendix Table 2). Most of the minor retained species catches are insignificant.

Pacific Ocean Perch. Pacific Ocean Perch (POP) is a long-lived, commercially important species of rockfish found along the rim of the North Pacific Ocean. It supports the largest rockfish fishery in British Columbia with an annual coastwide total allowable catch (TAC) of 5,448 t (metric tonnes) in 2010, which is being progressively reduced to 5,189 t over three years (DFO 2013d).

The stocks in Areas 3CD (Vancouver Island) and 5DE (Haida Gwaii) were assessed as two independent stocks using an annual two-sex catch-at-age model, implemented in a Bayesian framework to quantify uncertainty of estimated quantities. This is the first time that a population dynamics model has been used to assess either stock. For Area 3CD, the spawning biomass (mature females only) at the beginning of 2013 (B_{2013}) was estimated to be 0.41 (0.19-0.68) of B_0. Also, B_{2013} is estimated to be 1.53 (0.55-3.32) of the equilibrium biomass at maximum sustainable yield, B_{MSY}. For Area 5DE, B_{2013} is estimated to be 0.37 (0.16-0.67) of B0, and 1.61 (0.57-3.57) of B_{MSY}. For both stocks, catches at levels slightly above recent mean catches indicate essentially no change in the probabilities of the spawning biomass being above the reference points (DFO 2013d).

Yellowmouth Rockfish. The Yellowmouth Rockfish stock supports the third largest rockfish fishery in BC (after Pacific Ocean Perch and Yellowtail Rockfish), with an annual coastwide TAC (total allowable catch) of 2,444 mt. In 2010, Yellowmouth Rockfish along the Pacific coast of Canada was designated as Threatened by the COSEWIC (DFO 2011).

A two-sex, age-structured model was used to estimate biomass from 1940 to 2011. Model results are reported for the two accepted model runs (the first estimated natural mortality, M, and the second kept it fixed); values are the medians followed by the 5-95% credible intervals derived from Bayesian output.

The estimated ratio of spawning biomass (mature females) to the unfished equilibrium level (Bt /B0) over the most recent period of increase and decrease are: for run ‘Estimate M’, from a low of 0.52 (median of the MCMC posterior distribution) in 1989 increasing to 1.06 in 1999 and then declining down to 0.64 at the start of 2011; and for run ‘Fix M,’ from a low of 0.40 in 1990 increasing to 0.75 in 1999 and then declining down to 0.41 at the start of 2011. The increase through the 1990s is the result of a period of very strong recruitment in the early 1980s. Evidence for this high recruitment can be seen in the proportions-at-age data from the commercial fishery and research surveys. Projections have been made for up to three generations (90 years) for both model runs. For each level of constant catch, these give probabilities of future population status with respect to the above reference points and reference criteria, as well as estimates of the time taken to attain them (DFO 2011).

Canary Rockfish. The Canary rockfish population is assumed to be one designatable unit in B.C. Female canary rockfish mature at about 14 years of age with a generation time of 20.4 years. COSEWIC has assessed the Canary Rockfish population in B.C. as Threatened. Model runs indicate that current spawning biomass is most likely within the cautious zone as defined by the reference points in the draft DFO PA policy documents. The mean expected

values for current spawning biomass are estimated to be between approximately 0.15-0.22 of B_0,while the credible range for stock status is broader, spanning between 0.07 and 0.31. The mean estimate of B_{2008}/B_{MSY} ranges from 0.49-0.73. There is, however, large uncertainty around these estimates (DFO 2009a).

Recently, stock assessments have been addressed for Rock Sole, Silvergray Rockfish, Big and Longnose Skates, and Pacific Cod (CGRCS 2013).

For the remainder of the minor retained species, no biomass limit points have been developed. Qualified harvest recommendations for non-assessed stocks are provided based on average catch history, trends in survey results, and expert opinion.

3.4.2.4 Main bycatch species

United States

No main bycatch species of groundfish were identified for the U.S. Pacific Hake fishery.

Pacific salmon species occurring in the northeast Pacific include Chinook Salmon (*Oncorhynchus tshawytscha*), and Coho Salmon (*O. kisutch*), Pink Salmon (*O. gorbuscha*), Sockeye Salmon (*O. nerka*), Chum Salmon (*O. keta*) and Steelhead (*O. mykiss*). Chinook Salmon make up virtually all of the total salmon catch in the US Hake fishery (Al-Humadhi *et al*., 2010a). Where Chinook ranged from 3000 to 6000 fish annually from 2006 to 2010, Chum and Coho accounted for 19-300 fish and 21-450 fish, respectively (Appendix Table 3). Even though most Pacific salmon stocks are vulnerable, those Chinook Evolutionarily Significant Units (ESUs) that are not listed under the U.S. ESA were evaluated for determination as main species. The team determined that the small absolute catch of Chinook, the status determination for listing under ESA, and the protections for ESA-listed Chinook means that non-listed Chinook were not main species. The catch of Coho and Chum are considered minor because of the catch by the Hake fishery represents a *di minimis* portion of the total removals. All of these stocks of salmon are managed under the PFMC Salmon Plan and its 17 amendments (PFMC 2014c). These documents describe the life histories and history of catches and management. The PFMC Salmon Technical Team (STT) prepares annual post-season reviews of ocean salmon fisheries off the coasts of Washington, Oregon, and California to assess U.S. salmon fishery management and current stock status. This annual document is referred to as “The Salmon Review” or SAFE document. The salmon review includes information on regulations, catch and effort estimates, spawning escapement, and economics (PFMC 2014c). The extent of mitigation to recover listed salmon ESUs and to prevent jeopardy to non-listed ESUs includes clear management objectives for directed salmon fisheries and fisheries that take salmon as bycatch; by species and region; setting minimum spawning escapement thresholds; maximum exploitation rates; pre-season forecasts; and closed seasons; these mitigation measures often constrain directed salmon fisheries. Of the Chinook Salmon stocks considered by the Salmon SAFE (PFMC 2014c), all exceeded minimum stock size thresholds (limit reference point) and about two thirds exceeded the spawning escapement at MSY (target reference point). The Salmon SAFE did not provide quantitative measures of uncertainties for the estimates of stock status, such that the team could not quantitatively determine that the stocks are highly likely to be within reference points. The consistency of stocks above the minimum stock size thresholds (all stocks exceed the minimum in 4-6 years out of 6) and the preponderance above the MSY spawning escapement (four stocks exceeded MSY escapement target $\leq$3 times out of 6 years and eight stocks exceeded MSY escapement target $\geq$4 times out of 6 years) is consistent with at least likely within biological limits.

Canada

Other than Chinook Salmon, the catches of the other four species of Pacific salmon are insignificant in the fishery. Chinook salmon make up approximately 93% of the salmon catch by the Canadian hake fishery (Appendix Table 2), typically accounting for less than 9 mt of catch annually. Coho and Chum salmon make up the rest of the salmon catch, typically less than 1/3rd mt annually. Many populations of Chinook Salmon from southern British Columbia, entering the ocean south of Cape Caution, have experienced repeated years of low spawner escapements and there is a high degree of uncertainty about their longer term abundance and productivity. DFO is currently undertaking several initiatives in order to assess the current status of these stocks and to guide the implementation of appropriate actions for their conservation into the future. These actions are within the context of both the Wild Salmon Policy (WSP) and upcoming assessment of status by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), currently scheduled for autumn 2014 (DFO 2013g).

There are several references that describe the life histories, historic fishing, management, and current stock condition of the BC origin salmon stocks which could occur in the Canadian hake fishery (DFO 2005b; DFO 2013h; and DFO 2013i). Since 2002, DFO Stock Assessment staff has provided a categorical outlook for the next year's salmon returns. The Outlook is intended to provide an objective and consistent context within which to initiate fisheries planning. In particular, it provides a preliminary indication of salmon production and associated fishing opportunities by geographic area and species stock groups called an Outlook Unit. There are 26 Chinook Outlook Units comprising 76 Conservation Units (CU). For each Outlook Unit, an Outlook Category is provided on a scale of 1 to 4 (1 = Stock of Concern; 2 = Below Target; 3 = Near Target; 4 = Well Above Target). The category reflects the current interpretation of available quantitative and qualitative information, including pre-season forecasts if available, and the opinion of DFO Stock Assessment staff. Of the 26 Chinook Outlook Units, 7 are Stocks of Concern, 14 are Below Target, 4 are Near Target, and none are Well Above Target.

Rougheye Rockfish (*Sebastes aleutianus*) is categorized as a main bycatch species in the Canadian fishery because the fishery takes more than 10% of the ACL (17.2%) and most of the catch is discarded (68%). Rougheye Rockfish are also an important component of the trawl and hook-and-line fisheries of British Columbia. The species ranges from Japan and the Kamchatka Peninsula to the Bering Sea and Aleutian Islands, and down to southern California. They occur along the continental shelf slope at depths as shallow as 25 m and as deep as 2,830 m. Larger fish tend to lead solitary lives and live deeper than smaller fish, which form small schools. The preferred habitat consists primarily of boulder fields.

Very little is known of the biology of this species. Rougheye Rockfish appear to be the longest lived of any of the B.C. rockfish, with one recorded case of a 147- year-old. Adults reach a maximum length of 90 cm. Approximately half of all males are mature at 40-45 cm, females at close to 47 cm. Both males and females are approximately 20 years old at 50% maturity. The principle spawning period off B.C. is in April. Fertilized eggs remain within the ovary until larval extrusion and may obtain at least some of their nutrition from the female parent during development.

A biomass survey of the southwest coast of Vancouver Island in 1996 estimated rougheye rockfish biomass at 64 tonnes. Rougheye biomass was estimated at 4,881 mt, in a survey off the west coast of the Queen Charlotte Islands in 1997, but the actual biomass may be higher as the west coast of the Queen Charlotte Islands is marked by severe topography and much of the area is not accessible to trawl nets. Quantitative biomass forecasts are currently not conducted for this species. However, based on the longevity and assumed low productivity of Rougheye Rockfish, stocks should remain at low levels compared with other species, such as Pacific Ocean Perch (DFO 1999). No biomass reference points have been estimated. Qualified harvest recommendations for Rougheye are provided based on

average catch history, trends in survey results, and expert opinion. During the period 2009 through 2013, all fisheries took 75%-82% (average 78%) of the annual TAC, with trawlers taking 72-78 % of it (Ackerman 2014).

3.4.2.5 Minor bycatch species

United States

The following species (Table 10) are categorized as minor bycatch species in the U.S. fishery:

Table 10. List of minor bycatch species in the US Pacific Hake fishery.

Species	**Scientific name**	**Category**
Other groundfish		
Big Skate	*Raja binoculatas*	Bycatch minor
Pacific Electric Ray	*Torpedo californica*	Bycatch minor
Skate Unidentified	*Raja* species	Bycatch minor
Soupfin Shark	*Galeorhinus zyopterus*	Bycatch minor
Non-groundfish species		
Pacific halibut	*Hippoglossus stenolepis*	Bycatch minor
Dungeness Crab	*Metacarcinus magister*	Bycatch minor

Big Skate: The PFMC has set an ABC of 317.9 and an OFL for big skate at 458 mt for both 2013 and 2014 (PMFC and NMFS 2013). The average catch between 2006 and 2012 was 92 mt or 29% of the ABC, which suggests the stock is likely to be above target reference points.

Soupfin Shark: The PFMC has set an ABC of 42.8 mt and an OFL for soupfin shark at 61.6 mt for both 2013 and 2014 (PMFC and NMFS 2013).

Stock status and management of Pacific halibut and Dungeness crab are discussed separately because they are not groundfish species and prohibited from harvest in groundfish fisheries.

Pacific Halibut. The west coast EEZ represents the southern extent of the range of Pacific halibut (*Hippoglossus stenolepis*), and larger, commercially important fisheries are found in Canadian and Alaska waters. Pacific halibut is managed through International Pacific Halibut Commission (IPHC), an intergovernmental organization formed by treaty between Canada and the U.S. The IPHC assesses the Pacific halibut population annually by management area, deriving a management target called the constant exploitation yield, or CEY. Retention in all trawl fisheries is prohibited to discourage targeting. Bycatch allocation to the various fishery sectors for Individual Bycatch Quota (IBQ) is based on the CEY for Area 2A. IPHC computes a fishery CEY, which is determined by making certain deductions, including expected bycatch by fishery sector. The fishery CEY is then used to determine catch limits for target fisheries. The CEY is based on legal-sized fish—those greater than 81 cm in length. Both legal and sublegal sized fish (those less than 81 cm) must be covered by IBQ under the trawl rationalization program.

Under the IFQ program, Pacific halibut is managed at the permit level, through IBQ pounds. An IBQ accounts for bycatch mortality, which can assume some level of survivorship. This is the only species managed under IBQ for the west coast groundfish IFQ fishery. Each federal groundfish permit with a trawl endorsement is allocated IBQ pounds for halibut caught north of 40° 10' N. latitude. Pacific halibut caught south of 40° 10' N. latitude are not managed as an IFQ program quota. Data collection and reporting for this fishery is described in the

"Pacific Halibut Data Collection in the shore-based IFQ Fishery" (Jannot et al. 2013) and "Inseason IBQ Weight Calculations" sections by gear type (Jannot et al. 2012). The shore-based IFQ fishery includes all IFQ fishery components with the exception of Hake at-sea motherships and catcher-processors. Motherships and catcher-processors have a bycatch quota for Pacific halibut, but it is not accounted for at the permit level.

Bycatch of this species is very small in the Hake fisheries: catch (all discards) of Pacific halibut by the U.S. at-sea Hake fisheries has ranged from 0.3 to 4.0 mt annually from 2002 through 2012, averaging 1.45mt per year (Jannot et al. 2013). The U.S. shore-side Hake catch is negligible (0.03 mt during 2011-2012). Nevertheless, this species has received particular management attention through the requirement to cover all catch by the whiting trawl fisheries with IBQ, because halibut is an important commercial and recreational species.

The halibut stock is assessed on a coast-wide basis and then apportioned by area (Stewart and Martell 2014). After a peak in 2004, annual removals have decreased each year due to management actions in response to declining survey and commercial catch rates and stock assessment estimates. Observed age distributions continue to indicate a relatively stable stock, but with no evidence of strong recruitments in recent years. Individual size-at-age remains low relative to levels observed in the past several decades, although comparable to those estimated for the early portion of the 20th century. The 2013 stock assessment results indicate that the Pacific halibut stock has been declining continuously over much of the last decade, primarily as a result of recruitment strengths that are much smaller than those observed through the 1980s and 1990s, as well as decreasing size-at-age. The stock is highly likely within biological limits.

Dungeness Crab. Dungeness crab (*Metacarcinus magister* formerly *Cancer magister*) is a native species to Pacific nearshore habitat from Alaska to Mexico. It supports one of the West Coast's most valuable fisheries. Landings of Dungeness crab in the fisheries of California, Oregon, and Washington have maintained a cyclical pattern for nearly 50 seasons. Harvests have ranged from 3,600 to 25,000 mt, peaking approximately every 10 years.

The basic fisheries management has been stable over time. The Pacific Ocean fishery for Dungeness crab is administered in the State waters of California, Oregon, and Washington and in the exclusive economic zone adjacent to those States. A related tribal fishery is conducted under court order (*United States* v. *Washington*, D.C. No. CV–70 09213) in designated "usual and accustomed" (U&A) areas (Pacific States Marine Fisheries Commission 2006). Fishery management of West Coast Dungeness crab is based on the 3 "S" concept, meaning it is regulated by sex, size, and season. Harvest of female crabs is prohibited. Only males above 6 inches carapace width (CW) on Washington's coast can be taken because they are considered surplus to the reproductive needs of the population. Fisheries are scheduled to avoid periods when the majority of adult males are soft-shell to reduce mortality of fragile crabs.

There is a trigger point based on catch, which is used as the main indicator of stock status. Further management action is triggered when a decline in catch is sustained over 4 years (approximately 1 generation time) and an overall reduction in catch of greater than or equal 80% from the 20 year average (approximately 5 generations).

Several authors have explored factors that may influence the commercial fishery and have cited potential drivers (for a review see Hankin 1985) that include overfishing, variation in ocean circulation and upwelling that results in periodic pulse recruitment events (Wild *et al*. 1983; McConnaughey *et al*. 1992), and pre- and post-settlement density-dependent mortality (Eggleston and Armstrong 1995; Higgins *et al*. 1997). However, the predominate driver of crab populations is likely variation in oceanic transport that results in periodic high recruitment and settlement events.

The Oregon portion of the fishery is MSC certified; because the Washington-Oregon-California Dungeness is considered a single stock, the stock is considered as within biological limits. Because the landings of this species are so small, this bycatch is unlikely to affect the status of this stock.

Conclusion for US fisheries. Because the landings of these minor species are so small, this harvest is unlikely to affect the status of these stocks. Management strategies for these minor species include continuation of 100% observer monitoring of the low incident rates to detect any change in catches so that an assessment of impacts could occur if necessary.

Canadian Fishery

The following species (Table 11) are categorized as minor bycatch species:

Table 11. List of minor bycatch species in the Canadian Pacific Hake fishery.

Species	**Scientific name**	**Category**
Other groundfish		
Spiny Dogfish	*Squalus acanthias*	Bycatch minor
Splitnose Rockfish	*Sebastes diploproa*	Bycatch minor
Darkblotched Rockfish	*Sebastes crameri*	Bycatch minor
Yelloweye Rockfish	*Sebastes ruberrimus*	Bycatch minor
Chub Mackerel	*Scomber japonicus*	Bycatch minor
Shortraker Rockfish	*Sebastes borealis*	Bycatch minor
Non-groundfish species		
Pacific Halibut	*Hippoglossus stenolepis*	Bycatch minor
Pacific Herring	*Clupea pallasii*	Bycatch minor

Spiny Dogfish. No biomass limit points have been developed. Qualified harvest recommendations for non-assessed stocks are provided based on average catch history, trends in survey results, and expert opinion. An acceptable time series of fishing mortality is not available to provide harvest recommendations for the coastal stock of Spiny Dogfish. Wallace et al. (2009), however, examined CPUE indices from groundfish trawl research surveys conducted off the southwest of Vancouver Island and in Hecate Strait and from the International Pacific Halibut Commission longline survey conducted throughout the outside stock waters (Vancouver Island up through Hecate Strait) and concluded the outside stock is stable and fishing pressure is considered to be low relative to the estimated size of the population.

The following species are prohibited by the conditions of the groundfish trawl licence: Pacific Halibut, salmon species, Green and White Sturgeon, Pacific Herring, Basking Shark, Tope Shark, Sixgill Shark, Wolf-eels (DFO 2013b), and Eulachon (DFO 2013b). See discussion in US section above for the first three species.

Conclusion for Canadian fisheries. Because the landings of these minor bycatch species are so small, the hake harvest is unlikely to affect the status of these stocks. Management strategies for these minor species include continuation of 100% at sea and dockside monitoring of the low incident rates to detect any change in catches so that an assessment of impacts could occur if necessary.

3.4.3 ETP Species

Protected species covers those organisms for which international treaties or national legislation constrain their take (a term covering mortality and other non-lethal harmful effects).

U.S. Fishery

The principal laws are the Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), the Migratory Bird Treaty Act (MBTA) of 1918, and Executive Order (EO). NOAA's Office of Protected Resources works to conserve, protect, and recover species under the ESA and the MMPA in conjunction with its Regional Offices, Science Centers, and various partners (NMFS. 2014b). Protected species potentially affected by the proposed action include salmon, marine mammals, sea turtles, and seabirds that occur in the action area and especially those for which past interactions have been documented. Although sea turtles have been sighted off the west coast, no takes of these species have been documented in the bottom trawl fisheries (Heery *et al*. 2010a), and they will not be described here. Chinook salmon is the only ETP species for which an incidental take threshold is designated for the Hake fishery.

The endangered, threatened, and protected (ETP) species in the PFMC management area are listed in Table 12, including the salmon evolutionarily significant units (ESUs). The US Fish and Wildlife Service (USFWS) is responsible for the assessment and management of the endangered and threatened species of seabirds.

Table 12: **Endangered Species Act, Marine Mammal Protection Act, and Migratory Bird Treaty Act species/stocks off Washington, Oregon, and California that have been taken in the US. Mid-water Trawl Fishery for Pacific Hake.**

ESA Endangered (E) and Threatened (T)	MMPA	MBTA[1]
Steller sea lion (Eastern) (T)	Harbor seal	Black-footed albatross
Chinook Salmon ESUs (7T, 2E)	California sea lion and Steller sea lion	Auklet / murrelet - unidentified
Coho Salmon ESUs (3T, 1E)	Northern elephant seal	Common murre
Chum Salmon ESUs (2T)	Dall's porpoise	Northern fulmar
Sockeye Salmon ESUs (1T, 1E)	Pacific white-sided dolphin	Sooty Shearwater
Steelhead ESUs (10T,1E)		Gull, unidentified
Green Sturgeon, Southern DPS (T)		Shearwater, unident.
Eulachon, Southern DPS (T)		

[1] A few unidentified species of Auklet cormorant, gull, and petrals have also shown interaction with the bottom trawl fisheries. Sources: NMFS Office of Protected Resources 2008 website: www.nmfs.noaa.gov/pr/species/mammals/, Heery *et al* 2010, and Jannot *et al*. 2011.

ESA-listed Salmon. There are 28 ESUs of these species (except Pink Salmon) listed as threatened or endangered under the ESA (2014b.). Appendix Figure 1 presents the location of each of the listed ESUs.

Genetic analyses by the NMFS to date (Moran and Tuttle 2011) suggest that the proportion of the overall US Hake bycatch that came from listed Chinook salmon genetic stock groups differed among years. 2009 had a substantially higher proportion of fish from these groups than were observed in 2008 or 2010 (42% in 2009 compared to 27.5% in 2008 and 24.8% in 2010). This may relate to the latitude at which bycatch was encountered, with 2009 showing the most northerly distribution of the 3 years.

The highest bycatch by trawl fisheries occurs in depths shallower than 125 fm across all latitudinal strata with the highest overall bycatch occurring off the Oregon coast from Cape

Falcon to Cape Blanco, followed by the region to the south to Cape Mendocino in northern California. Groundfish fisheries' interception of salmon species other than Chinook is negligible and infrequent (NMFS 2006). Salmon are caught incidentally in both the at-sea and shore-based segments of the whiting fishery. This bycatch is closely monitored through an at-sea observer program and dockside sorting of shore deliveries. Salmon bycatch data from 2002 through 2010, by species and Hake sector (Appendix Table 3), in the Pacific whiting mid-water trawl fisheries are presented in Al-Humadhi *et al*. (2012). It includes non-tribal mothership, tribal mothership, and catcher-processor data collected by the At-Sea Hake Observer Program (A-SHOP), and shoreside tribal and shoreside exempted fishing permit (EFP) data compiled by the NOAA Fisheries Northwest Regional Office (NWR). Bycatch estimates were relatively low in 2009 compared to the annual estimates in each of the prior 8 years (2002 – 2008). Chinook had the highest 2010 bycatch estimates in the Hake sectors followed by coho and unspecified salmon. In 2010, no Pink Salmon were observed in either non-Hake or Hake sectors.

The salmon fisheries are closely managed by a collaboration of state, tribal, and federal agencies, and the U.S.-Canada Pacific Salmon Treaty. Comprehensive monitoring of the fisheries is based on field observations for biological data and required fish landing ticket procedures. The 2008 Status of the Pacific Coast Groundfish Fishery, SAFE document Volume 1, Chapter 3, briefly describes the management history, ESA consultations, and biological opinions pertaining to salmon bycatch in the west coast groundfish fishery (PFMC 2008b). The most recent Biological Opinion covering the incidental take of ESA-listed salmon in groundfish fisheries was published in 2006 (NMFS 2006). That document includes a detailed history of section 7 consultations on the groundfish fisheries.

Between 1990 and 1999, NMFS issued six Biological Opinions under the Endangered Species Act (ESA) pertaining to the effects of the Pacific Coast groundfish fisheries on several West Coast stocks of salmon. The Opinions concluded that the groundfish fishery did not pose added threats to these resources, but defined an incidental take threshold for the Hake fishery of 11,000 Chinook (NMFS 2006). Annual Chinook bycatch had averaged 7,300 over the previous 15 years, but the threshold was exceeded during the 1995, 2000, 2005 Hake fisheries (PFMC 2006, NMFS 2006). NMFS issued a Supplemental Biological Opinion in 2006 that addressed the 2005 overage, and determined that the Hake fishery did not constitute a significant threat to the recovery of the Chinook stocks (NMFS 2006). The incidental take threshold for Chinook remains in place.

Status reviews for the six Pacific northwest listed Chinook (as well as other listed salmonids) are available in Ford et al. 2010, and the three listed Chinook from California are available in Williams et al. 2010. Natural origin abundance of most ESUs/DPSs has increased since the original status reviews in the mid 1990s, but declined since the time of the last status review in 2005. Risks from harvest and hatchery production have improved considerably for many ESUs since the mid 1990s, and have remained largely stable since 2005. Overall, the information reviewed did not suggest that a change in biological risk category is likely for any of the currently listed ESU/DPSs, except for the Central Valley (California) Chinook ESU, which is at increased risk of extinction. The U.S. Hake fishery appears to have a *de minimis* impact on this latter ESU (Bellinger et al. 2009).

Green Sturgeon. Green Sturgeon (*Acipenser medirotris*) are long-lived, slow-growing fish and the most marine-oriented of the sturgeon species. Mature males range from 4.5-6.5 feet in length and do not mature until they are at least 15 years old, while mature females range from 5-7 feet long, and do not mature until they are at least 17 years old. They can weigh up to 350 pounds. Maximum ages of adult green sturgeon range from 60-70 years. Green sturgeon spend the majority of their lives in nearshore oceanic waters, bays, and estuaries. Early life-history stages reside in fresh water, with adults returning to freshwater to spawn when they are more than 15 years old and more than 4 feet long. Green Sturgeon are known to forage in estuaries and bays ranging from San Francisco Bay to British Columbia

(NOAA Fisheries 2012). The Green Sturgeon harvest is closely monitored and managed by a collaboration of state, tribal, and federal agencies.

On April 7, 2006, NOAA Fisheries listed the southern (those spawning in California rivers) distinct population segment (DPS), of North American Green Sturgeon as threatened under the ESA. The northern DPS is a Species of Concern status. On October 9, 2009, NOAA Fisheries designated final ESA critical habitat for the southern DPS of this species. Critical habitat includes: Coastal U.S. marine waters within 60 fathoms (fm) depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary, and major coastal bays (Federal Register 2009). This population is under the jurisdiction of the NOAA Fisheries Southwest Region (Federal Register 2009). On June 2, 2010, NOAA Fisheries published final Endangered Species Act protective regulations (ESA 4(d) rule) for this DPS. These regulations do address the Pacific Hake fishery, in that take is allowed if the fisheries activities are conducted under approved Fisheries Management and Evaluation Plan (FMEP). NMFS NWR SFD consulted with Protected Resources Division (PRD) pursuant to section 7(a)(2) of the ESA on the effects of the operation of the Pacific coast groundfish fishery in 2012. PRD published a Biological Opinion on February 9, 2012, documenting their findings. In the Opinion, NMFS concludes that the proposed action (operation of the Pacific coast groundfish fishery (including the Pacific Hake fishery) in 2012) is not likely to jeopardize the continued existence of green sturgeon (PFMC and NMFS 2012).

Green sturgeon bycatch in the at-sea Hake fishery is rare, as the A-SHOP recorded a total of only 3 green sturgeon in the catch from 2002 through 2010. There was one occurrence during the summer of 2005 on a tribal mothership, and two were taken by non-tribal motherships the following summer (Al-Humaidhi *et al*. 2012a). Because such catches are negligible, it is reasonable to conclude that the fishery would have no discernible impact (PFMC and NMFS 2012) on this threatened species.

Eulachon. Eulachon (*Thaleichthys pacificus*), or Columbia River smelt, are a small anadromous forage fish species that spawn in the lower portions of certain rivers draining into the northeastern Pacific Ocean ranging from northern California to the southeastern Bering Sea in Bristol Bay, Alaska. Eulachon spawn in late winter (January-February in the Columbia River) to spring (April-May off Canada). As Eulachon gather at the mouths of rivers prior to spawning runs, several marine mammal species and birds are attracted to feed on them. Adult spawners are reported to be 3–5 years old (based on reading rings on scales and otoliths) in the Columbia River, with the majority at 3 years, although some are purported to be up to 9 years old. Although they spend 95–98% of their lives at sea, little is known concerning the saltwater existence of Eulachon. They are reported to be present in the “food rich” and “echo scattering layer” of coastal waters, and “in near-benthic habitats in open marine waters” of the continental shelf between 20 and 150 m depth (Biological Review Team 2008).

Most all of the recreational and commercial harvest of Eulachon takes place in the Columbia River and its tributaries managed mainly by bag limits and seasons. When populations of eulachon declined in the 1990s, the states of Washington and Oregon developed a Washington and Oregon Eulachon Management Plan (Washington Department of Fish and Wildlife and Oregon Department of Fish and Wildlife 2001). The plan contains recommended policies concerning smelt fishery management. These policies are considered wise-use management precepts that are consistent with the need to maintain an ecosystem approach to resource decisions. These use a precautionary approach to resource management, which considers the best scientific information available and strive to improve the information base for eulachon.

The Southern DPS of Eulachon was listed as threatened under the ESA in 2010 (75 FR 13012). A status review (NMFS 2010b) describes the most likely threats to Eulachon

recovery, allowing for a qualitative assessment of the potential significance of impacts to eulachon from the US West Coast commercial groundfish fisheries.

Bycatch of Eulachon in the Hake mid-water Hake fisheries is very small. None were observed from 2002 through 2005 or in 2010. The highest Eulachon bycatch in the mid-water trawl fishery was in the summer of 2006 with 145 individuals caught by the at-sea catcher/processor sector (Al-Humaidhi *et al*. 2011). That sector took 6 the following year and 37 and 30, respectively in 2008 and 2009. In the tribal mothership sector only 32 were recorded in 2009. In the non-tribal mothership sector, 4, 6, and 6 were recorded in 2007 through 2009, respectively. In contrast the pink shrimp bottom trawl fisheries take over 200,000 up to a million annually (Al-Humaidhi *et al*. 2012a).

NMFS NWR SFD consulted with Protected Resources Division (PRD) pursuant to section 7(a)(2) of the ESA on the effects of the operation of the Pacific coast groundfish fishery in 2012. PRD published a Biological Opinion on February 9, 2012, documenting their findings. In the Opinion, NMFS concludes that the proposed action (operation of the Pacific coast groundfish fishery (including the Pacific Hake fishery) in 2012) is not likely to jeopardize the continued existence of Eulachon (PFMC and NMFS 2012).

Protected marine mammals and seabirds

The Office of Protected Resources (OPR) is a headquarters program office of NOAA's National Marine Fisheries Service (NOAA Fisheries Service, or NMFS), under the U.S. Department of Commerce, with responsibility for protecting marine mammals and endangered/threatened marine life. OPR works to conserve, protect, and recover species under the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA) in conjunction with its Regional Offices, Science Centers, and various partners. The Office of Protected Resources partners with a variety of stakeholders including state, Federal, national, and international agencies and universities, industry, zoos and aquaria, and environmental and animal welfare organizations.

Marine mammal interactions can occur by capture in active fishing equipment, entanglement in lost trawl fishing gear, and other plastics are known sources of pinnipeds and small cetacean mortality. Protected marine mammals and seabirds that interact with the Pacific Hake fishery are few in number of species and estimated number of interactions. Data are presented in Table 13:

Table 13. At-Sea Hake Observer Program (at-sea Hake sector) estimated bycatch of marine mammals and birds. Source: Jannot *et al*. 2011

Species	Number Observed	Years	Total Estimated
California sea lion	6	2003, 2004, 2008	7
Dall's porpoise	1	2002	1
Harbor seal	5	2004-2006, 2008	6
Northern elephant seal	13	2004, 2007-2008	16
Pacific white-sided dolphin	1	2002	1
Steller sea lion	11	2002-2003, 2005-2008	15
Auklet / murrelet – unidentified	5	2004, 2009	5
Black-footed albatross	8	2003, 2005-06, 2008	8
Common murre	5	2004-2005	5
Northern fulmar	108	2004-2005, 2007-2009	108
Sooty Shearwater	2	2005	2
Gull, unidentified	13	2007	13
Shearwater, unidentified	1	2007	1

The U.S. mid-water Hake fishery is listed as a Category III fishery (remote likelihood of/ no known interactions) by the NOAA Fisheries Office of Protected Resources (NMFS 2014b).

California sea lion - U.S. Stock. California sea lions *(Zalophus californianus)* have a diverse diet, feeding on northern anchovy, market squid, sardines, Pacific and jack mackerel, and rockfish (Reeves *et al*. 2002). Population estimates are made from pup counts and the proportion of pups in the population, since not all age classes of sea lions are ashore at the same time. California sea lions breed at the Channel Islands, off southern California, at islands along the northern Pacific coast of Baja California, and on the east coast of Baja California in the middle and southern Gulf of California (Reeves, *et al*. 2002). After the breeding season, large numbers, particularly males, migrate north along the Pacific coast. The U.S. stock of California sea lions' population ranges between the United States/Mexico border and extends northward into Canada. Based on a 2005 survey of pups and taking into account the mortality and growth rates, the population abundance estimate for this stock is 238,000 animals with a minimum population estimate of 141,842 (Carretta *et al*. 2007). The potential biological removal (PBR) for this stock is calculated to be 8,511 animals per year. Estimated mean annual take in commercial fisheries is 159 animals, based on 2000 to 2004 data; however, the set gillnet fishery, which has been responsible for the majority of fishery-related mortalities of California sea lion has not been observed recently. Takes have been documented between 2000 and 2004 in the California/Oregon drift gillnet fishery, the California set gillnet fishery for halibut and angel shark, the California anchovy, mackerel, and tuna purse seine fishery, the Washington/Oregon salmon net pen fishery, and the salmon pen fishery operating out of British Columbia. From 2002 through 2005, 30 animals were observed in the WCLEGT fishery (Heery et al 2010a). Other threats to this stock include shooting, entrainment in power plants, marine debris, and boat collisions. The stock is not classified as strategic under the MMPA (Carretta, *et al*., 2007).

Because the interactions with this species are so small, this bycatch is unlikely to affect the status of this stock.

Dahl's porpoise California/Oregon/Washington Stock. Dahl's porpoise (*Phocoenoides dalli*) are common in the North Pacific Ocean. These porpoises are usually found in groups averaging between 2-20 individuals, but have been occasionally seen in larger, loosely associated groups in the hundreds or even thousands of animals. For management purposes, Dall's porpoises inhabiting U.S. waters have been divided into two stocks: the Alaska Stock and the California/Oregon/Washington Stock. For both stocks, there are insufficient data available on current population trends. Dall's porpoises, however, are considered reasonably abundant. Threats include incidental catch/ bycatch in fishing gear, such as those targeting groundfish, salmon, and squid in Canadian, Russian, Japanese, Alaskan, and other U.S. waters: Japanese hunting in the western North Pacific as a source of meat for human consumption (about 18,000 are currently taken each year); and pollutants and various contaminants in the marine environment, which have been found in this species' blubber. These contaminants could present a major toxicity problem, especially to reproduction, as they accumulate and pass through the marine food chain (NMFS 2014d).

Because the interactions with this species are so small, this bycatch is unlikely to affect the status of these stocks.

Pacific harbor seal - California Stock. Harbor seals (*Phoca vitulina richardsi*) range widely in coastal areas of the North Pacific and North Atlantic. Five subspecies are recognized, based on geographic distribution. Two stocks of harbor seals are found off the U.S. west coast EEZ: the California stock and the Oregon and Washington outer coast stock. Both stocks inhabit nearshore coastal and estuarine waters. Although they do not migrate extensively, they have been documented travelling 300 to 500 km on extended foraging trips or to find suitable breeding areas. There are approximately 400 to 600 harbor seal haulout

sites in California, including both the mainland and offshore islands. Harbor seals eat a varied diet, consisting of fish, octopus, and squid (Reeves *et al.* 2002). The best estimate of abundance is 34,233 harbor seals in California based on recent harbor seal counts (May to July 2004) and a revised correction factor. Given a minimum population estimate of 31,600 animals in the California stock, the PBR for this stock is 1,896 harbor seals per year (Carretta *et al.* 2007). Estimated mean annual take in all commercial fisheries is 388 animals, based on data from 1998 to 2003. No animals were taken in the LE bottom trawl fisheries during 2002 through 2008 (Heery *et al*. 2010a). The California stock of harbor seal is not classified as strategic under the MMPA (Carretta *et al,* 2007).

Because the interactions with this species are so small, this bycatch is unlikely to affect the status of the stocks.

Northern Elephant Seal. The northern elephant seal *(Mirounga angustirostris*) are the largest "true" seal, in the Northern Hemisphere. They spend much of the year, generally about 9 months, in the ocean. They are usually underwater, diving to depths of about 1,000-2,500 ft (330-800 m) for 20-30 minute intervals with only short breaks at the surface. They are rarely seen out at sea for this reason. Though they range as far north as Alaska and as far south as Mexico, they typically breed in the Channel Islands of California or Baja California in Mexico. Once thought to be extinct from commercial sealing in the 1800s, the population began to steadily increase in the early 1900s. Though a complete population count of elephant seals is not possible because all age classes are not ashore at the same time, the most recent estimate of the California breeding stock was approximately 124,000 individuals. Threats include entanglement in marine debris, fishery interactions, and boat collisions (Stewart and DeLong 1995).

Because the interactions with this species are so small, this bycatch is unlikely to affect the status of this stock.

Pacific white-sided dolphin: Pacific white-sided dolphin (*Lagenorhyncus obliquidens*) are most often seen in the deep inshore waters of Alaska, British Columbia, and the states of Washington and Oregon during the late spring. During the winter months (November through April), they are often seen off Southern California. Pacific white-sided dolphins are opportunistic feeders, foraging on available small schooling fish, squid, and other species associated with the nightly deep scattering layer. They are often seen in groups of 10 to 50 animals, but thousands have been seen traveling together on occasion (Reeves *et al.* 2002). There appears to be a north-south seasonal migration in the eastern North Pacific. Although there is clear evidence that two forms of Pacific white-sided dolphins occur along the U.S. west coast, it is not currently possible to distinguish animals without genetic or morphometric analyses. Thus, the SAR grouped Pacific white-sided dolphins into two discrete, noncontiguous areas, waters off California/Oregon/Washington (northern and southern stocks) and Alaska waters. The 2006 SAR stated the following:

> "The most recent estimates of abundance for Pacific white-sided dolphins are based on two summer/autumn shipboard surveys conducted within 300 nm of the coasts of California, Oregon, and Washington in 2001 and 2005 (Barlow 2003) (Forney 2007). The distribution of Pacific white-sided dolphins throughout this region is highly variable, apparently in response to oceanographic changes on both seasonal and interannual time scales (Forney and Barlow 1998). As oceanographic conditions vary, Pacific white-sided dolphins may spend time outside the EEZ, and therefore a multiyear average abundance estimate including California, Oregon and Washington is the most appropriate for management within U.S. waters. The 2001-2005 geometric mean abundance estimate for California, Oregon and Washington waters based on the two most recent ship surveys is 20,719 (CV =0.22) Pacific white-sided dolphins" (Forney 2007). "

The 2001 to 2005 average abundance estimate is 17,201 for the CA/OR/WA stock, which is used as the minimum population estimate. The calculated PBR is 155 animals per year (Carretta *et al.* 2008).

The primary commercial fishery that takes Pacific white-sided dolphins is the California/Oregon thresher shark/swordfish drift gillnet fishery, although overall cetacean entanglement rates in this fishery dropped considerably in recent years due to a take reduction plan, skipper education and required gear modification (Barlow and Cameron, 2003). Low levels of mortality for Pacific white-sided dolphins have also been documented in the west coast groundfish trawl fisheries (Perez 2008; Perez and Loughlin 1991). Between 2000 and 2004, with 80 to 100 percent of the fishing effort observed, one Pacific white-sided dolphin was reported killed in the at-sea processing portion of the Pacific whiting trawl fishery. One animal was observed in the LE bottom trawl fisheries during 2002 through 2008 (Heery *et al*. 2010a). This California/Oregon/Washington stock of Pacific white-sided dolphins is not classified as strategic under the MMPA (Carretta *et al.* 2005). The total fishery mortality and serious injury for this stock is lower than 10 percent of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate.

Because the interactions with this species are so small, this bycatch is unlikely to affect the status of this stock.

Steller Sea Lion. The northern or Steller sea lion (*Eumetopias jubatus*) ranges along the North Pacific Ocean from Japan to California (Loughlin *et al.* 1984). Two stocks are designated in U.S. waters with the eastern stock extending from Cape Suckling, Alaska, to southern California (Loughlin 1997). The eastern stock of Steller sea lion has a threatened listing under the ESA, is listed as depleted under the MMPA, and is, therefore, classified as a strategic stock (Angliss and Lodge, 2002). They do not make large migrations, but disperse after the breeding season (late May to early July), feeding on rockfish, sculpin, capelin, flatfish, squid, octopus, shrimp, crabs, and northern fur seals (Fiscus and Baines 1966). Eastern stock Steller sea lions were observed taken incidentally in west coast groundfish trawls and marine set gillnet fisheries (Angliss and Lodge 2002). Two Steller sea lions and one unidentified sea lion were taken in the LE bottom trawl fisheries during 2002, but none since (Heery *et al*. 2010a). Total estimated mortalities of this stock (44) are lower than the 1,396 Steller sea lions allowed under the PBR formula (Angliss and Lodge 2002). Because the interactions with this species are so small, this bycatch is unlikely to affect the status of this stock.

Other Marine Mammals. Other mammal species protected under the ESA that occur in the area, but that have no documented interaction with the subject fisheries are blue whale (*Balaenoptera musculus*) (E), fin whale (*Balaenoptera physalus*) (E), humpback whale (*Megaptera novaeangliae*) (E), sei whale (*Balaenoptera borealis*) (E), sperm whale (*Physeter macrocephalus*) (E); and South Resident Killer whale (*Orcinus orca*) (E) (Heery *et al.* 2010a). Most ETP cetacean species are expected to have little interaction with the fishery based on their seasonal distribution, diet, or frequency of the incidental take (PFMC, 2010).

NMFS NWR Sustainable Fisheries Division (SFD) consulted with Protected Resources Division (PRD) pursuant to section 7(a)(2) of the ESA on the effects of the operation of the Pacific coast groundfish fishery in 2012. PRD published a Biological Opinion on February 9, 2012, documenting their findings. In the Opinion, NMFS concludes that the proposed action (operation of the Pacific coast groundfish fishery (including the Pacific Hake fishery) in 2012) is not likely to jeopardize the continued existence of humpback whales, Steller sea lions, and leatherback sea turtles *(Dennochelys coriacea).* NMFS also concludes that the proposed action is not likely to destroy or adversely modify designated critical habitat of green sturgeon or leatherback sea turtles.

Furthermore, NMFS concludes (PFMC and NMFS 2012) that the Pacific coast groundfish fishery may affect, but is not likely to adversely affect the following species and designated critical habitat in 2012:

Sei whales
North Pacific Right whales (*Eubalaena japonica*)
Blue whales
Fin whales
Sperm whales
Southern Resident killer whales
Guadalupe fur seals (*Arctocephalus townsendi*)
Green sea turtles (*Chelonia mydas*)

Seabirds

The U.S. Fish and Wildlife Service (USFWS) is the primary Federal agency responsible for seabird conservation and management. Three resident species in the California Current Ecosystem are listed under the ESA, and one species is a candidate for ESA listing (Xantus's murrelet (*Synthliboramphus hypoleucus)*). The listed California brown pelican (*Pelecanus occidentales*) is currently undergoing the delisting process. The California least tern (*Sterna antillarum browni*) is listed as endangered, and the marbled murrelet (*Brachyramphs marmoratus*) is listed as threatened (USFWS 2005).

Three species of albatross are known to occur within the west coast region. The black-footed albatross (*Phoebastria nigripes)* is the most abundant albatross off the west coast of Canada and the United States, ranging throughout the North Pacific between 20° N. latitude and 58° N. latitude, but more eastern in its at-sea distribution than the laysan albatross (*Phoebastria immutabilis*) (Cousins and Cooper 2008). Short-tailed albatross (*Phoebastria albatrus*), ranging from Japan to California, are also listed as endangered.

Other than the black-footed albatross listed above, none of these other seabirds have been documented to have direct negative interaction with the mid-water trawl Hake fisheries. Because only 8 black-footed albatross have been observed in the Hake at-sea sector between 2002 through 2009, it is reasonable to conclude that the fishery would have no discernible impact on this species.

The MBTA implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and Russia for the protection of migratory birds. Under the Act, taking, killing, or possessing migratory birds is unlawful. In addition to the MBTA, an EO, Responsibilities of Federal Agencies to Protect Migratory Birds (EO 13186), directs Federal agencies to negotiate Memoranda of Understanding with the USFWS that would obligate agencies to evaluate the impact on migratory birds as part of any NEPA process. The USFWS and NMFS are working on a Memorandum of Understanding concerning seabirds. Until and unless the Memorandum of Understanding describes measures for the Pacific Hake fishery necessary for migratory bird protection, none are currently required of the fishery.

More complete descriptions of those species known to have a past interaction with west coast Hake fisheries are provided below.

Common Murre. The common murre (*Uria aalge*) is the dominant member of the breeding seabird community on the west coast, fluctuate annually, in response to food supply and climatic events. Population trends remain incompletely known, pieced together from different locations in different years, and from populations exhibiting different growth patterns. Many Pacific common murre populations have declined and partially recovered; others have failed to rebound. In central California and Washington, common murre populations declined substantially through the 1980s. More recently, fishery closures and reduced oil pollution have led to partial recoveries, especially at large colonies like the Farallon Islands. Murre

populations in Oregon and northern California spared from gill nets and oil spills have been stable or increasing (National Audubon Society, Inc. 2011).

Because only 5 birds have been observed in the Hake at-sea sector between 2002 through 2009 (Jannot *et al*. 2011), it is reasonable to conclude that the fishery would have no discernible impact on this species.

Northern fulmar. The Northern Fulmar is estimated to have between 15,000,000 and 30,000,000 mature individuals, that occupy an occurrence range of 28,400,000 km^2 (11,000,000 sq mi) and their North American population is on the rise, hence it is listed with the International Union for Conservation of Nature (IUCN) as Least Concern. The range of these species increased greatly last century due to the availability of fish offal from commercial fleets, but may contract because of less food from this source and climatic change (BirdLife International 2009).

Because only 108 birds have been observed in the Hake at-sea sector between 2002 through 2009 (Jannot et al. 2011), it is reasonable to conclude that the fishery would have no discernible impact on this species.

Sooty Shearwater. Sooty shearwaters (*Puffinus griseus*) breed on small islands in the south Pacific Ocean, mainly around New Zealand. They are spectacular long-distance migrants, following a circular route, travelling north up the western side of the Pacific Ocean at the end of the nesting season in March–May, reaching sub-Arctic waters in June–July where they cross from west to east, then returning south down the eastern side of the oceans in September–October, reaching to the breeding colonies in November (McGonigal 2008). The sooty shearwater feeds on fish and squid. They can dive up to 68 m deep for food, but more commonly take surface food, in particular often following whales to catch fish disturbed by them. They will also follow fishing boats to take fish scraps thrown overboard (Shaffer *et al*. 2006). Numbers of breeding pairs are currently (2011) estimated at 22 million pairs. Its numbers have been declining in recent decades, and it is presently classified as Near Threatened by the IUCN.

Because only 2 of these birds have been observed in the Hake at-sea sector between 2002 through 2009 (Jannot *et al*. 2011), it is reasonable to conclude that the fishery would have no discernible impact on this species.

Canadian Fishery

The Species at Risk Act and Migratory Birds Convention Act include provisions to limit take of those species listed for protection. These are supported by the Fisheries Act (Section 3.5.1) and Oceans Act (Section 2.4.4), which together to conserve, protect, and recover marine species.

The Migratory Birds Convention Act gives the Minister of Environment the authority to prohibit the possession buying, selling, exchange, or giving of a migratory bird or nest, and to prohibit the deposition of substances into the environment that are harmful to migratory birds, among other things.

The Species at Risk Act (SARA) was proclaimed in June 2003, and the purposes of the Act are “to prevent wildlife species from being extirpated or becoming extinct, and to provide for the recovery of a wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened”. More information on SARA can be found at www.sararegistry.gc.ca.

In addition to the existing prohibitions under the Fisheries Act, under SARA it is illegal to kill, harm, harass, capture, take, possess, collect, buy, sell or trade any listed endangered or

threatened animal or any part or derivative of an individual. These prohibitions apply unless a person is authorized, by a permit, license or other similar document issued in accordance with SARA, to engage in an activity affecting the listed species or the residences of its individuals. Species listed as special concern are not included in these prohibitions.

The act establishes a process for conducting scientific assessments of the status of individual wildlife species and a mechanism for listing extirpated, endangered, threatened and special-concern species. SARA also includes provisions for the protection, recovery and management of listed wildlife species and their critical habitats and residences. The process includes:

- Monitoring, resulting in a report on the general status of wildlife species, every 5 years.
- Species assessment process is conducted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to assign the status of a wildlife species believed to be at some degree of risk nationally. The legislation that established SARA designated COSEWIC as an advisory committee.
- The Minister issues a response statement that reflects the jurisdictional commitment to action. There are three options for response: 1. Listing a species as recommended by COSEWIC; 2. Choosing not to list, but stating the justification for not doing so; or 3. Remanding the recommendation back for further clarification. If listing is chosen the Minister starts a national recovery process.
- A recovery strategy is outlined identification of critical habitat and what needs should be addressed.
- An action plan identifies specific actions needed to help in the species recovery.
- Evaluation programs are carried out against the goals and objectives of the recovery strategy and action plan.
- The Minister produces an annual report on the administration and implementation of the Act.

Recovery Strategies are detailed plans that outline short-term objectives and long-term goals for protecting and recovering species at risk. These strategies reflect the requirements of SARA, although previously existing recovery strategies and action plans may not (DFO 2009b).

SARA recovery strategies:

- describe the particular species and its needs;
- identify threats to survival;
- classify the species' critical habitat, where possible;
- provide examples of activities that are likely to result in destruction of the critical habitat;
- set goals, objectives and approaches for species recovery;
- identify information gaps that should be addressed; and
- state when one or more action plans relating to the strategy will be completed.

Once a species is added to the list and protected officially under SARA, a recovery strategy must be developed. For endangered species, this strategy must be developed within a year of the listing; for threatened or extirpated (extinct in Canada) species, it must be developed within two years.

Action plans summarize the projects and activities required to meet recovery strategy objectives and goals. They include information on habitat, details of protection measures, and evaluation of socio-economic costs and benefits. Action plans are the second element

of the Act's two-part recovery planning process, and are used to implement projects and activities to improve species status.

Management plans differ from recovery strategies and action plans. Management plans set goals and objectives for maintaining sustainable population levels of one or more species that are particularly sensitive to environmental factors, but which are not yet considered in danger of becoming extinct. Whenever possible, management plans are prepared for multiple species on an ecosystem or landscape level.

The Act establishes "Schedule 1" as the official list of wildlife species at risk. However, please note that while Schedule 1 lists species that are extirpated, endangered, threatened and of special concern, the prohibitions do not apply to species of special concern. Schedule 1 species related to the Canadian Pacific Hake fishery that have legal protection (Species at Risk Public Registry 2014) include:

Basking Shark, *Cetorhinus maximus*
    Pacific population: Endangered COSEWIC, Endangered SARA
Blue whale, *Balaenoptera musculus*, Endangered COSEWIC, Endangered SARA
Fin whale, *Balaenoptera physalus*, Threatened COSEWIC, Threatened SARA
Humpback whale, *Megaptera novaeangliae*, Special Concern COSEWIC, Threatened SARA
Killer whale, *Orcinus orca*
    Northeast Pacific transient: Threatened COSEWIC, Threatened SARA
    Northeast Pacific offshore: Threatened COSEWIC, Threatened SARA
    Northeast Pacific northern resident: Threatened COSEWIC, Threatened SARA
    Northeast Pacific southern resident, Endangered COSEWIC, Endangered SARA
Northern Pacific right whale, *Eubalaena japonica*, Endangered COSEWIC, Endangered SARA
Right whale, *Eubalaena glacialis*, Non-active COSEWIC, Endangered SARA
Short-tailed albatross, *Phoebastria albatrus*, Threatened COSEWIC, Threatened SARA
White sturgeon, *Acipenser transmontanus*
    Kootenay River population, Non-active COSEWIC, Endangered SARA
    Nechako River population, Non-active COSEWIC, Endangered
    Upper Columbia River population, Non-active COSEWIC, SARA Endangered SARA
    Upper Fraser River population, Non-active COSEWIC, Endangered SARA

Because the interactions with (or landings of) these species are so small, this bycatch (interaction) is unlikely to affect the status of these stocks.

The following fish species have been assessed with recommended classification by the COSEWIC, as required under national legislation, but do not yet have legal protection under SARA:

Bocaccio, *Sebastes paucispinis*, Endangered COSEWIC, decision not to list under SARA
Canary Rockfish. *Sebastes pinniger*, Threatened COSEWIC, no SARA status
Yellowmouth Rockfish, *Sebastes reedi*, Threatened COSEWIC, no SARA status
Chinook Salmon, *Oncorhynchus tshawytscha*: Threatened COSEWIC, no SARA status
Sockeye Salmon, *Oncorhynchus nerka*, Cultus population: Endangered COSEWIC, no SARA status
Eulachon, *Thaleichthys pacificus*, Endangered COSEWIC, no SARA status
    Central Pacific Coast: Endangered COSEWIC, no SARA status
    Fraser River population: Endangered COSEWIC, no SARA status
White Sturgeon, *Acipenser transmontanus*
    Upper Kootenay River population, Endangered COSEWIC, no SARA status
    Lower Fraser River population, Threatened COSEWIC, no SARA status

It should be noted that while Chinook Salmon do not have protection under SARA, Chinook, are managed for protection under Chapter 3 of Annex IV of Article XV of the *Treaty between*

the Government of Canada and the Government of the United States of America concerning Pacific Salmon, including those ESUs listed under the U.S. ESA. It has been confirmed that some Chinook caught in the Canadian hake fishery, especially small fish (1.9 kg), are U.S. listed Chinook (Luedke pers. Comm. 2014). The Assessment Team does not, at this time, categorize any salmon as ETP species for the Canadian fishery, as SARA has not listed any salmon species as ETP, and Pacific salmon are not listed in CITES Appendix I. Pacific rockfish, Eulachon, and White Sturgeon are also not listed in CITES Appendix I.

With the possible exception of Boccacio, the landings of these species are so small, this bycatch is unlikely to affect the status of these stocks. See discussion of Boccacio in section 3.4.2.1.

Leatherback turtle, *Dermochelys coriacea*, Endangered COSEWIC, no SARA status. Listed in CITES Appendix I.
Because the interactions with these species are so rare, this bycatch (interaction) is unlikely to affect the status of these stocks.

Elasmobranches. Since the 2012/2013 season, the Groundfish trawl industry, in support of Fisheries and Oceans Canada's increased conservation efforts for some elasmobranches – particularly those listed as SARA species – has supported a prohibition on the selling and retention of Pacific Basking Shark, tope (Soupfin) Shark or Bluntnose Sixgill Shark in the British Columbia groundfish trawl fishery. Additionally, cognizant of the international efforts taken to protect shark species, the groundfish trawl industry has agreed to eliminate all directed fishing for shark species, other than Pacific Spiny Dogfish, as of the 2012/2013 season. Most current encounters of these and other shark species are not targeted, and the groundfish trawl industry has worked with the Department to develop practical measures this and protocols that may minimize encounters and mortality. These protocols can be found in section 20 of the Groundfish Trawl Harvest Plan, which is Appendix 8 (DFO 2013b). No elasmobranches that interact with the Hake fishery are listed under SARA or CITES Appendix I.

No ETP species occur in the Canadian Hake fishery (e.g., Appendix 1 Table 2) to a degree that the Hake fishery could cause adverse impacts.

3.4.4 Habitat

The various bodies with management responsibility for the west coast fisheries in general, including this fishery, all show an appropriate recognition of the importance of habitat in the proper management of fisheries and essential fish habitat (EFH). For example, the PFMC have produced a series of brochures for the layman describing the importance of EFH to a variety of fish types, the latest of these was produced in 2008 (PFMC 2008b). The PFMC has recently completed the first elements of the Pacific Coast Groundfish 5-Year Review of EFH, and has published the results online (PFMC 2012a). In the context of this mid-water trawl fishery, the principal habitat of interest is the benthic habitat due to occasional contact of the sea floor with this type of trawling, but only very rarely on hard substrate bottom (PFMC 2013f).

Benthic impacts of trawling, and other gear types, have been the subject of much concern and also much scientific investigation worldwide (see DFO 2006). Scientific research has tended to focus either on general marine environmental management (e.g., in European waters: Jennings *et al.* 1999), or on EFH issues (e.g., PFMC 2005b, 2005c and 2005d), and more recently in direct response to MSC certification requirements (e.g., in South African waters: Wilkinson and Japp 2005). While there will always be local differences, there are also issues where comparison with other regions and fisheries can materially assist in understanding the '*local'* situation.

Approaches to managing benthic impacts generally have the same basic objective, to reduce the overall level of impact leading to a higher probability of sustainability for whatever activities are being conducted. Activities leading to benthic impacts include, but are not limited to fishing, and other activities may have a wider impact (e.g., pollution by flame retardants, radioactive releases and nutrients) or greater intensity of impact, such as aggregate or mineral extraction. Benthic habitats need a holistic approach to conservation management, protecting sufficient areas and selected highly vulnerable types from all activities, not just fishing. There are different approaches to the implementation of reduction in benthic habitat impacts, with two standing out as being most common. These are to (i) restrict the areas where (fishing) activity occurs, so leaving areas that are not impacted and (ii) to reduce the impact by lessening the intensity of the activity (fishing). Approaches to reducing intensity in relation to fishing include reduction in effort (number of vessels, number of days fished, etc.) and also in changing to less damaging gear types (lighter demersal trawl gear, smaller bobbins, semi-pelagic and pelagic trawls (like the subject fishery), hooks and lines, etc.). Clearly, where fishing activity has been on-going for many years, and where there are no indications of serious or irreversible harm to benthic ecosystem function, it may be possible to deduce that the level of damage is below a critical threshold but there may still be no knowledge about the potential to recover.

It is important to note that the spatial distribution of a fishery is not uniform - this includes both the distribution of effort and catches (e.g., see Jennings *et al*., 1999). Thus, any impacts will also be differentially distributed in intensity. Local studies on the distribution of bottom trawl effort and impacts support this perspective as can be seen in the studies by Hannah (2003), Bellman *et al.,* (2005), Hixon and Tissot (2007) and Hannah *et al.* (2010

United States

The recent PFMC 5-year review of EFH for the west coast groundfish fishery has included a substantive analysis of the spatial and temporal distribution of fishing effort over the whole of the west coast (PFMC 2012a). This analysis considered a fine spatial scale (3km circles centered on 0.5 km^2 grid squares) and a simple temporal pattern comparing two sequential 4.5-year time blocks (1 Jan 2002 – 11 Jun 2006 and 12 Jun 2006 – 31 Dec 2010), which fall before and after the implementation of Amendment 19 (Essential Fish Habitat) regulations PFMC 2005e, Federal Register 2006). Consideration of this analysis clearly shows a number of key issues concerning the distribution of fishing effort in space and time, which can be summarized as follows:

(i) the extent of the fishery is relatively stable over time. There were some, but not major differences in the maximal footprint of the fishery between the two time periods.

(ii) The spatial intensity of the fishery is highly variable within each time block. For example, there was a great range in effort density, changing by 2 orders of magnitude over relatively small linear distance.

(iii) The spatial intensity of the fishery is highly variable between each time block. Areas of high and low density are not in the same places in second time block as they were in the first time block (from PFMC 2012a).

The importance of these spatial and temporal aspects of the distribution of fishing intensity is that in any area that supports a fishery, some sub-areas will be heavily impacted while others will be lightly impacted, and others will remain unimpacted.

Where impacts on benthic habitats occur, there are two types of assessment and management that are typically considered. These are to (i) define the vulnerability based on the ability to recover and (ii) protect areas from some or all impacts. These are not mutually exclusive and are often used together. The first element is an assessment of the vulnerability and/or recovery potential of specific habitats usually based on both local and out-of-region studies. This approach has been developed for the US and shows a broadly similar picture to other such studies (PFMC, 2005, 2005a and 2005b). Essentially, habitats

that experience considerable natural disturbance (e.g., sand and gravels), and thus have communities that are naturally somewhat adapted to disturbance, typically exhibit less damage and faster recovery times than do habitats that experience little natural disturbance (e.g., hard substrates, but also deep-water muds). This work is based on a range of studies but there remain many gaps that are currently filled by modelling and interpolation; however, the basic approach is generally considered appropriate. From this approach, benthic habitats can be classified into different categories of vulnerability to fishing (or other activities) and the most appropriate conservation and protection methods determined, taking into account a number of other factors. The other factors that may be taken into account include the amount of the habitat type (i.e. overall area), the distribution of that area (degree of fragmentation), proximity to actual and potential sources of impact, and linkages to ETP and charismatic species.

For either total or partial protection from some or all types of fishing and other activities there are designated areas, protected areas, that have been given a number of names but can all be classed as some form of marine protected area (MPA). MPAs can be small or large, closed to all activities or just some, open at certain times or always closed.

The Pacific Council considered EFH, and developed comprehensive strategies for managing fishing impacts on EFH (PFMC 2014b). The strategy in place for managing the impact of the fishery on habitat types is to specify that only mid-water or pelagic trawl gear is required for the directed Hake fishery. Mid-water trawl gear components only make bottom contact infrequently (NMFS, 2005). The 100% observer coverage of the fishery will provide data that will be used to detect any increased risk to habitat types. If such an increased risk were detected, it would be submitted to the PFMC process for consideration.

U.S. west coast MPAs fall into four different designations, each with rather different principal goals but all generating some significant level of benthic protection from fishing in general and demersal trawling in particular. The four designation types are:

1) **Sanctuaries**: there is a network of marine sanctuaries operated under the National Marine Sanctuary Program (NMSP). Sanctuaries have very restricted permitted activities. The west coast has five sanctuaries (see Figure 3.4.1). http://sanctuaries.noaa.gov

2) **Marine protected areas (MPAs)**: there is a large network of MPAs, with many on the west coast (See Figures 9 and 10).

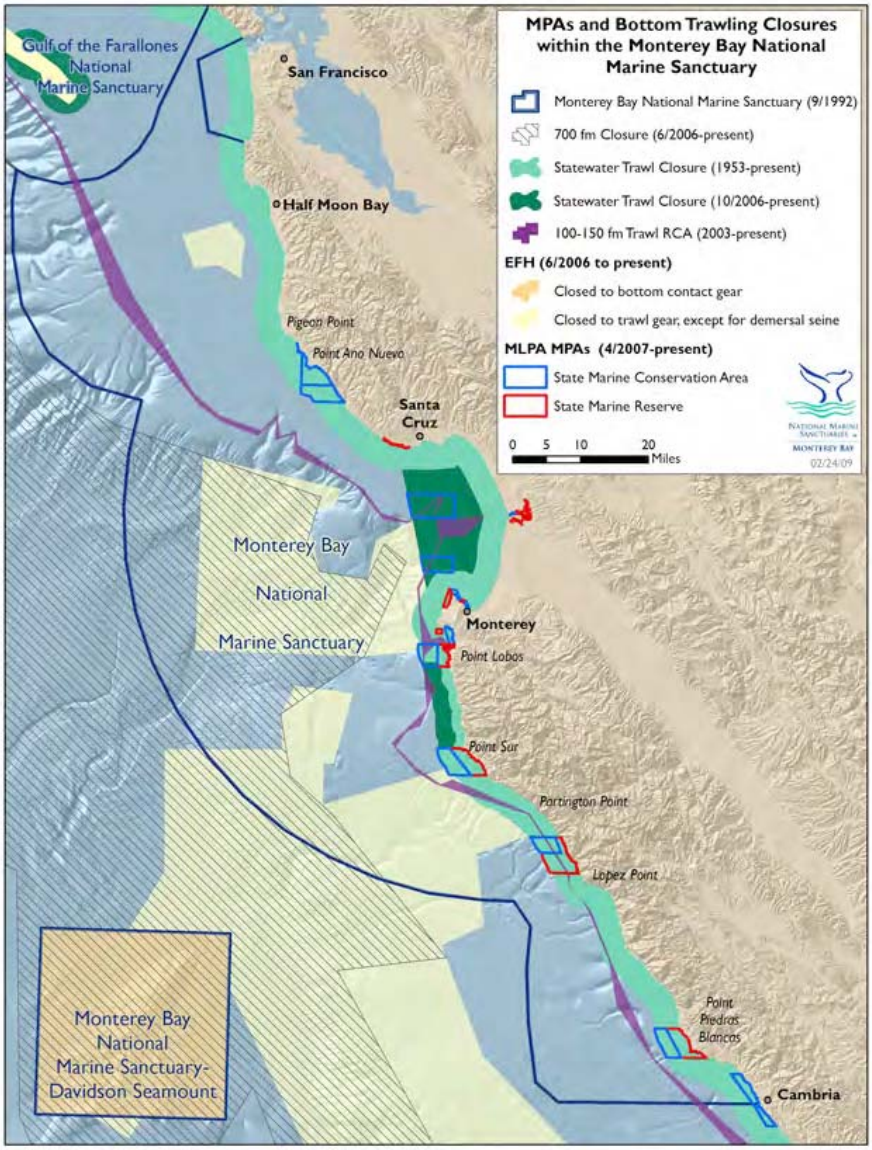


Figure 9: A map showing the location and scale of the Monterey Bay National Marine Sanctuary, and other marine protected areas. http://montereybay.noaa.gov/intro/maps.html

3) **EFH protection areas:** areas closed to bottom fishing to protect specific EFH see Figures 10 and 11).

4) **Rockfish Conservation Areas (RCAs)**: closed to bottom fishing to protect overfished rockfish from trawling. These include areas closed to protect (i) rockfish assemblages, (ii) cowcod (*Sebastes levis*), and (iii) yelloweye rockfish (*Sebastes ruberrimus*). RCAs are substantial areas and have typically been closed since the early 2000's (Figures 38, 39 and 40) PFMC (2010a).

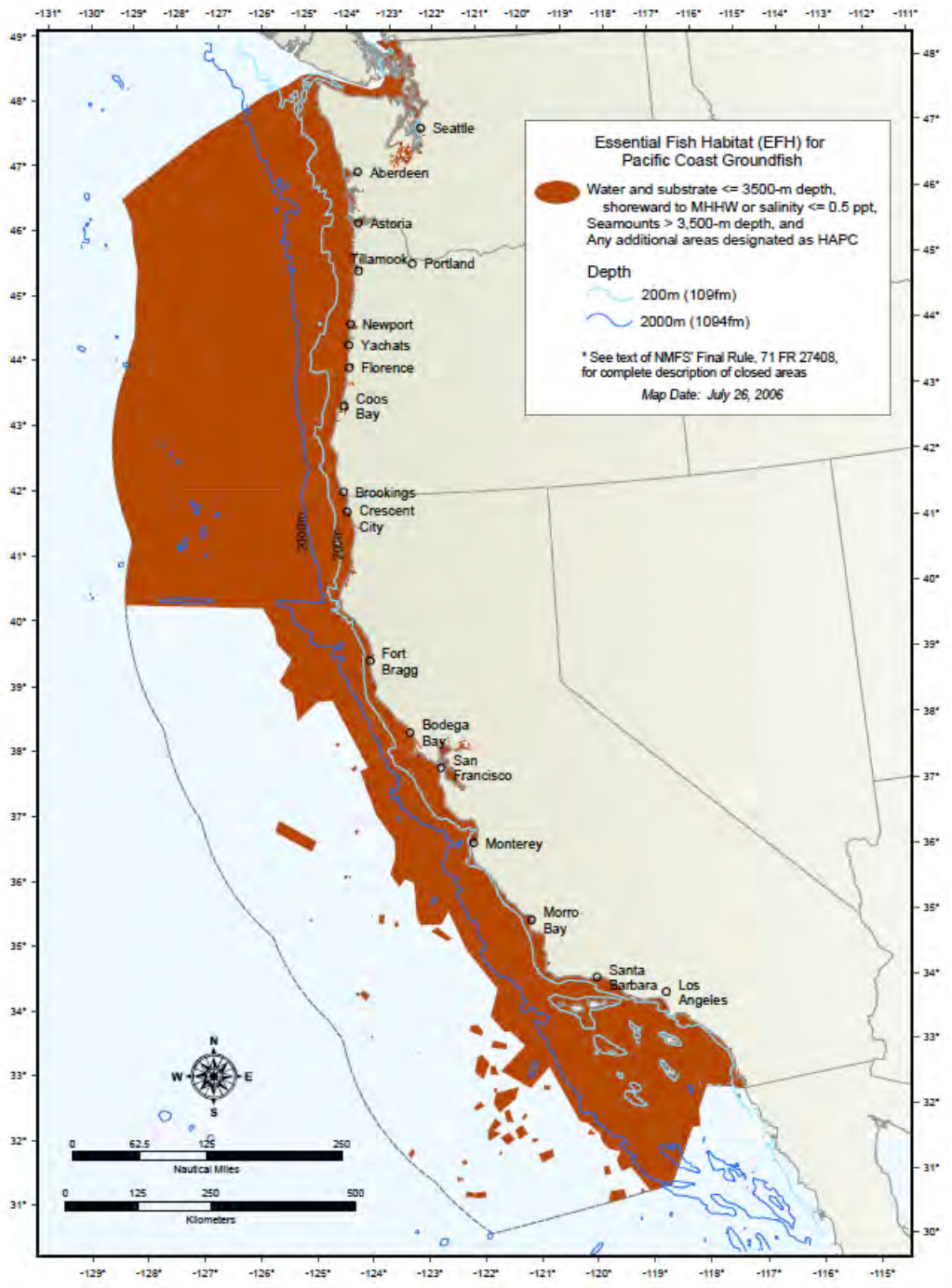


Figure 10: A map showing current designated essential fish habitat (EFH) protection areas off the west coast. (NOAA, 2006) (http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery- Management/Groundfish-Closed-Areas/Index.cfm#CP_JUMP_30292)

Figure 11: Areas providing habitat protection from different types of fishing operations for the west coast, including RCAs. (http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery- Management/Groundfish-Closed-Areas/Index.cfm#CP_JUMP_30292)

Essential Fish Habitat (EFH) for groundfish is described as *all waters from the high tide line (and parts of estuaries) to 3,500 meters (1,914 fathoms) in depth*. Habitat areas of particular concern (HAPCs) are a subset of EFH used to focus management and restoration efforts. The current HAPC types are estuaries, canopy kelp, seagrass, rocky reefs, and areas of interest (a variety of submarine features, such as banks, seamounts, and canyons, along with Washington State waters). In addition to identifying EFH and describing HAPCs, the Council also adopted mitigation measures directed at the adverse impacts of fishing on groundfish EFH. Principal among these are closed areas to protect sensitive habitats. There are three types of closed areas: bottom trawl closed areas, bottom contact closed areas, and a bottom trawl footprint closure. The bottom trawl closed areas are closed to all types of bottom trawl fishing gear. The bottom trawl footprint closure closes areas in the EEZ between 1,280 m (700 fm) and 3,500 m (1,094 fm), which is the outer extent of groundfish

EFH. The bottom contact closed areas are closed to all types of bottom contact gear intended to make contact with the bottom during fishing operations, which includes fixed-gear such as longlines and pots. It does not include the Hake mid-water fishery. A more complete description of groundfish EFH is contained in the EFH EIS (NMFS, 2005), which is incorporated herein by reference.

Canada.

The Oceans Act authorises DFO's Minister to lead and facilitate the establishment of a strategy for the integrated management of Canada's oceans through the development of integrated management plans and the establishment of marine protected areas (MPAs). The Minister has authority to establish MPAs that may restrict or prohibit fisheries within part or all of an MPA's boundaries. Integrated management plans are intended to provide a common framework of guidance for the management of all activities in Canada's oceans, including fisheries. Goals and objectives for integrated management may inform fisheries management, and also provide a forum or guidance for addressing interactions between fisheries and other user groups. The identification of ecologically and biologically significant areas and the development of integrated risk assessment tools and methods through the integrated management program have also been used to inform the development of proposed management measures to mitigate impacts of fishing on marine ecosystems; one example of this is the current work to define fishery management measures within the proposed Hecate Strait Queen - Charlotte Sound Marine Protected Area.

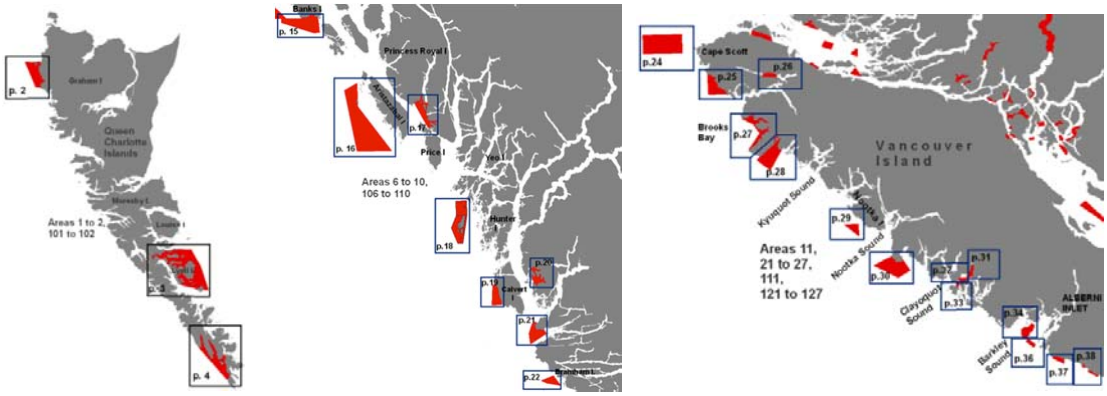
The Oceans Act mandates DFO to lead and coordinate the development and implementation of a national network of marine protected areas in Canada. More information on MPA Network Planning can be found at: http://www.dfo-mpo.gc.ca/oceans/management-gestion/marineprotection- protectionmarine/index-eng.htm#network. Under this authority, DFO has designated two MPAs in the Pacific Region. The Endeavour Hydrothermal Vents, designated in 2003, lie in waters 2,250m deep 250 km southeast of Vancouver Island. The Saan Kinghlas-Bowie Seamount Marine Protected Area (SK-B MPA), designated in 2008, is 180 km west of Haida Gwaii (formerly known as the Queen Charlotte Islands). MPA regulations and management plans articulate any restrictions on activities taking place within the MPA, where applicable. At this time, all fisheries are restricted within the Endeavour and SK-B MPAs. The Canada National Marine Conservation Areas Act provides for the establishment of National Marine Conservation Areas (NMCAs). Parks Canada, DFO and the Council of the Haida Nation are working together on the management of the Gwaii Haanas NMCA through the exchange of information on marine resources, fisheries and cultural data and coordinated consultations. Measures respecting the management of the Gwaii Haanas NMCA will be articulated in future IFMPs (DFO 2013b).

DFO's Pacific Region Cold-Water Coral and Sponge Conservation Strategy encompasses short and long-term goals and aims to promote the conservation, health and integrity of Canada's Pacific Ocean cold-water coral and sponge species. The Strategy also takes into consideration the need to balance the protection of marine ecosystems with the maintenance of a prosperous economy. It was created with input from stakeholders throughout the Pacific Region and will help regional partners and stakeholders to understand how DFO's existing programs and activities tie into cold-water coral and sponge conservation. The Department, with the full support of the groundfish trawl industry, implemented measures to preserve four unique sponge reefs located in waters off central and northern British Columbia. These areas were last amended at the start of the 2007/2008 season (DFO 2013b). Section 18 of the IFMP presents habitat conservations measures and protocols for Coral and Sponge Habitat off the west coast of Canada to ensure that the British Columbia groundfish bottom trawl fishery does not disproportionately affect any one particular benthic habitat type. It does not apply to Hake mid-water trawl because contact with the bottom is infrequent (DFO 2013b, Appendix 8).

To avoid serious or irreversible harm to sensitive benthic habitat, species and communities and otherwise address impacts to benthic habitat, communities and species, the policy for Managing the Impacts of Fishing on Sensitive Benthic Areas (SBA) follows a five (5) step process. Ongoing fishing activities in historically fished areas will be managed to address impacts of fishing on sensitive benthic areas through existing processes, including the advisory processes in place for the given fishery, following these steps. The management of proposed new fishing activities in frontier areas will be addressed through a separate procedure, also using these steps. For more information on the SBA Policy see: http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/benthi-eng.htm (DFO 2013b).

In 2009, the SFU/DFO/Industry team assembled information on fishing effort, bottom habitat, and biological communities in BC's offshore fishing areas and, in 2010, collaborated on a joint research cruise of Hecate Strait, B.C, collecting a combination of ROV video and still photo data, oceanographic data, benthic grab samples and acoustic multi-beam bathymetry and backscatter data. Gathering information on gear impacts from commercial groundfish fisheries continues to be an area of priority for both the Department and its stakeholders. This project is working towards improving data and developing management strategies to address the concerns (DFO 2013b).

Base on the results of the above activities, DFO has established 164 coast-wide RCAs have been closed to the groundfish fishery in the Canadian EEZ off the coast of British Columbia. These areas are to protect rockfish and other sensitive hard bottom habitats (DFO 2013c). The areas shown below (Figure 12) are those that may intersect with the Canadian Pacific Hake fishery.



Areas 1-2 Areas 6-10 Areas 11, 21-27

Figure 12. Coastwide Rockfish Conservation Areas that may have intersection with the Pacific Hake Fishery.

3.4.5 Ecosystem Structure and Function

The California Current ecosystem, like other eastern boundary current ecosystems, is a relatively open marine system characterized by tremendous fluctuations in physical conditions and productivity over multiple time scales (Mann and Lazier 1996; Parrish *et al.,* 1981). Food webs tend to be structured around coastal pelagic species that exhibit boom-bust cycles over decadal time scales (Bakun, 1996; Schwartzlose, *et al.* 1999). Baleen whales, fur seals, albacore tuna, salmon, and sooty shearwaters dominate the top trophic levels of such ecosystems, whose dynamics may be partially or wholly driven by processes in entirely different ecosystems, even different hemispheres.

The California Current is basically the eastern limb of the Central Pacific Gyre. It begins where the west wind drift (or the North Pacific Current) reaches the North American

continent. This occurs near the northern end of Vancouver Island, between 45° and 50° N. latitude and 130° to 150° W longitude (Ware and McFarlane 1989). The west wind drift splits into two broad coastal currents, caused by a divergence in the prevailing wind patterns, resulting in the California Current to the south and the Alaska Current to the north. This region is referred to as the California Current system because there are several dominant currents in the region, all of which vary in geographical location, intensity and direction, depending on the seasons (Hickey, 1979).

A year-round feature, the California Current consists of a massive southward flow of the cool waters of the west wind drift. The current is characterized as a shallow, wide, and slow-moving body of water, ranging from the shelf break to 1,000 km offshore, with the strongest flows at the sea surface, and in the summertime (Dodimead, *et al.* 1963; Hickey 1979; Lynn and Simpson 1987). This surface current is matched in the summer by the California Undercurrent, which moves water northward from the south in a deep yet narrow band of subtropical water typically found just off of the shelf break at depths of 100 to 300 m. The undercurrent flows from Baja California to Vancouver Island, transporting warmer, saltier southern water north along the coast (Hickey 1979). On average, the California Current flow volume reaches a maximum in spring and summer, when the flow moves inshore, closer to the shelf break. The California Undercurrent develops in late spring through early summer and persists into the fall. Later in the year (typically November) when winter storms bring occasional strong southerly winds, there is a surfacing of the California Undercurrent, also known as the Davidson Current (Brink and Cowles 1991).

Biogeographic patterns of the California Current ecosystem are distinct zoogeographic provinces extending north and south of Point Conception, California, known as the Oregonian and San Diego Provinces. The Oregonian Province extends from the Strait of Juan de Fuca in the north to Point Conception in the south. The San Diego Province begins at Point Conception and runs south past the terminus of the EEZ (NMFS 2004).

There are strong seasonal inshore and offshore migrations for many species, and some evidence for ontogenetic movement in some species by both/either depth and latitude. Pacific whiting are the only confirmed highly migratory groundfish species in the FMP, with a clear seasonal migration from southern spawning grounds off northern Mexico and Southern California to northern foraging habitat off the coasts of Oregon, Washington, and British Columbia (Bailey, *et al.* 1982). There is an ontogenetic component to this migration, as juveniles tend to be found off central and northern California, with larger, older fish dominating in the northern range of this species. Similarly, the distribution of Pacific whiting tends to be more northerly in warm years (Dorn 1995; Swartman and Hickey 2003), reflecting inter-annual shifts in marine habitat (environmental) conditions.

While the physical and bathymetric features associated with these general biogeographic boundaries are fixed in space, the physical characteristics of water masses and associated plankton communities are clearly highly dynamic in space and time. Fulton and LeBrasseur (1985) described a transport-driven shifting subarctic domain in the northern reaches of the California Current System, the margin of which was characterized by abrupt declines in zooplankton biomass south of the subarctic boundary. Although the physical dynamics are thought to be more complex than their model, it is clear that climate-driven changes in transport and ocean conditions dramatically alter both the species composition and productivity of zooplankton throughout the California Current to a considerably greater extent than static boundaries based on geography (Mackas *et al.* 2005; McGowan *et al.* 1998; Peterson *et al.,* 2002; Peterson and Schwing 2003).

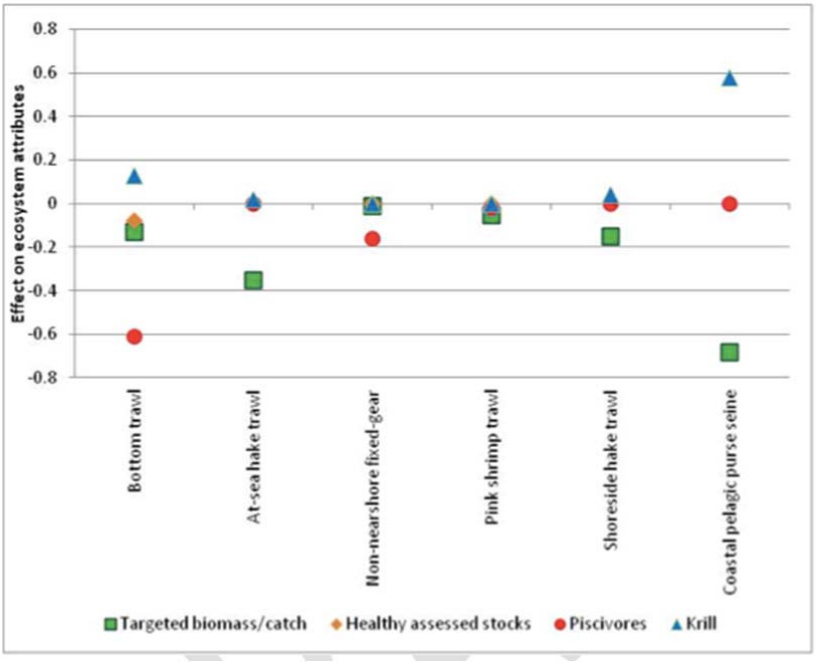
The California Current Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) continues to make significant progress (NOAA Fisheries 2014b). Specific to Pacific Hake, the 2012 CCE IEA report discusses several ecosystem-related issues that could affect Pacific Hake:

. Evaluates the potential for climate change to cause northern shifts to the range of Hake.

. Examines potential changes in groundfish Mean Trophic Level and how the change might relate to declines in abundance of Hake and spiny dogfish (*Squalus acanthias*) because these species consume large amounts of forage fish and krill; their lower abundance may mean an increase in food resources for other species that utilize these prey.
. Reviews the status of several CCE species and notes that Pacific Hake biomass is very dynamic and is currently above the target relative biomass reference point with a recent increasing biomass trend.
. Discusses overlap of marine mammals (i.e., predicted mean annual density of 12 cetacean species) and observed groundfish fishery sectors (fixed gear, bottom trawl, and Hake).
• Evaluates the vulnerability of several groundfish fisheries to non-fisheries risks and notes that groundfish appear to be at highest risk from systemic threats such as ocean acidification and change in average sea surface temperature.

Several technical papers were recently published as part of the second phase of the CCE IEA project. Of specific interest to the Pacific Hake MSC certification is Kaplan et al. (2012). It examines effects of fishing fleets, and their interactions, using a spatially explicit Atlantis simulation model of the food web and fisheries in the California Current. Results suggest Hake mid-water trawl primarily has direct impacts on its target and bycatch species. Few indirect effects from the fleet extended through predator–prey links to other parts of the food web, but the few include increases krill, small plantivores, large piscivorous flatfish, Dover sole, shortbelly rockfish, and shrimp.

Kaplan et al. (2012) also evaluated impacts in terms of nine ecosystem attributes based on those used for the CCE Integrated Ecosystem Assessment project (Levin and Schwing 2011a) and the IndiSeas project (Shin, et al. 2010). Figure 13 (taken from Figure 3-1 Pacific Fishery Management Council (2013x) as derived from Kaplan, et al. (2012)), shows the effect of six fleets on selected ecosystem attributes (chosen because they varied by ≥5% from status quo). As noted above, all fleets show negative impacts as measured by the targeted biomass/catch indicator.



. Figure 13: Effect of six individual fleets on four ecosystem attributes.

The effects of fleet interactions were also evaluated in Kaplan et al. (2012). First, the effect of combinations of four major fleets (bottom trawl, fixed gear, Hake fleets, and CPS purse

seine) on change in the biomass of 60 functional species groups defined in the Atlantis CCE model was evaluated. Second, the effect of these fleet combinations on the ecosystem attributes discussed above was evaluated. Combined effects were largely additive (equal to the sum of the individual fleet effects); 93% of interactions in the case of changes in the biomass of functional groups. Only 2% of the interactions were negative (biomass lower than the sum of biomasses resulting from modelling the individual fleets). For the ecosystem attributes there were no negative interactions and only two attributes involved in positive interactions.

These efforts will inform fishery science and management decisions by the PFMC, NMFS, and the JMC. These efforts also corroborate previous research about the potential effects of the Hake fishery on the ecosystem and the effects of the ecosystem on the Hake stock and fishery.

At its April 2013 meeting, the PFMC adopted the Fishery Ecosystem Plan (FEP), the Ecosystem Initiatives Appendix, and a schedule for implementation (PFMC 2013c). The purpose of the FEP is to enhance the PFMC's species-specific management programs with more ecosystem science, broader ecosystem considerations and management policies that coordinate PFMC management across its Fishery Management Plans and the California Current Ecosystem. Current list of Council FEP Initiatives:

- Protection for Unfished Forage Fish
- Potential Long-Term Effects of Council Harvest Policies on Age- and Size-Distribution in Managed Stocks
- Bio-Geographic Region Identification and Assessment
- Cross-FMP Bycatch and Catch Monitoring Policy
- Cross-FMP Essential Fish Habitat
- Cross-FMP Safety
- Human Recruitment to the Fisheries
- Cross-FMP Socio-Economic Effects of Fisheries Management
- Cross-FMP Effects of Climate Shift
- Indicators for Analyses of Council Actions

In support of its ecosystem-based management processes, the PFMC has requested that NMFS, in coordination with its Integrated Ecosystem Assessment Program and interested agencies, provide an annual state-of-the-ecosystem report at each of its March meetings. The first annual report was presented at the November 2012 PFMC meeting (PFMC 2012b).

Canada

The California Current ecosystem extends far enough into Canada that the Canadian fishery occurs in the region analysed by the US (see above), so basic ecosystem information applies to fisheries of both countries. Up to 90% of the Canadian fishery is harvested within the CCE.

In order to complement the CCE studies for the small portion of Pacific hake range in this transition zone north of the CCE (where up to 10 % of the Canadian Hake fishery may occur), Crawford and Irvine (2010, 2011) report on the marine ecosystem of the Pacific North Coast Integrated Management Area (PNCIMA), which encompasses approximately 102,000 km^2 from the edge of the continental shelf east to the British Columbia mainland, and from the British Columbia-Alaska border south to Bute Inlet on the mainland, across to Campbell River on the east side of Vancouver Island and the Brooks Peninsula (50 mi south of Cape Scott) on the west side of Vancouver Island. Several 2010 highlights were specific to the waters of central and northern British Columbia (PNCIMA): this region warmed later in the year than the Oregon, Washington and southern British Columbia coasts. Zooplankton species here also continued the dominance of cool-water groups. There are three stocks of herring in PNCIMA, and the biomass of adults of all three stocks is relatively low. Their

biomass might increase if hake numbers remain low. Groundfish catches constituted about half of the total groundfish catches within BC with Pacific hake the single largest species catch both coast-wide and within PNCIMA. Gadoid (Pacific cod, walleye pollock, Pacific hake) stocks are generally stable or increasing, flatfish, lingcod, sablefish and elasmobranch stocks are stable, while many rockfish species are at low levels of abundance with some being threatened or special concern.

Canada applies integrated oceans management as a modern approach to managing Canada's ocean resources through the Oceans Action Plan (DFO 2005a). It is a collaborative way of making decisions on how Canada's marine resources can best be developed and protected. Integrated oceans management gives decision makers responsible for ocean-based activities a basis for managing these activities in a manner that will sustain a healthy marine environment and provide due consideration of other ocean users.

The aim of integrated management is to improve decision making to ensure that decisions:

- are more effective in the long term;
- are not conflicting;
- are built upon a common knowledge base; and
- take into consideration the needs of the ecosystem as well as the needs of humankind.

Implementing an integrated-management approach is intended to ensure that the management system will:

- maintain the health of the marine ecosystems;
- address user conflicts;
- limit the cumulative effects of human activities within a defined ocean space; and
- maximize and diversify sustainable use of our oceans.

Within the Ocean Action Plan, Canada considers ecosystem-based management as an integrated or holistic approach to making decisions about ocean-based development and conservation activities. It means considering the environmental impact of an activity on the whole ecosystem, not simply the specific resource targeted. It also means taking into account the cumulative impact of all human activities on the ecosystem within that area. This is different from past management approaches that focused on a single species or single economic activity.

Ecosystem-based management sets objectives for various aspects of marine ecosystem structures and functions, such as productivity, key species and sensitive habitats. These objectives describe the desired physical, chemical or biological condition of the ecosystem, or one of its constituents, to ensure a healthy ecosystem. As such, these ecosystem objectives are extremely important to the overall management of a specific marine area.

Implementation of Canada's approach to integrated management and the development of integrated-management plans is built around these objectives as a means to ensure sustainability of the resources and their habitats. This means that management decisions about ocean resources and coastal uses must be made with full consideration of ecosystem impact.

Conservation measures to maintain a healthy ecosystem include work to prevent and mitigate the introduction of aquatic invasive species, fisheries closures to protect valuable ecosystems, supporting the recovery of species at risk, and strengthening Canada's response to ship-source marine pollution.

Canada applies these concepts for the Hake fishery through the Integrated Fishery Management Plan and the Pacific Hake addendum to the plan (DFO 2013a, b).

In relation to the ecosystem effect of Hake fisheries in Canadian waters, studies of the California Current Ecosystem (NOAA Fisheries 2014b) and Kaplan et al. (2012) suggest Hake mid-water trawl primarily has direct impacts on its target and bycatch species. Few indirect effects from the fleet extended through predator–prey links to other parts of the food web, but these include increases krill, small plantivores, large piscivorous flatfish, Dover Sole, Shortbelly Rockfish, and shrimp. Such evidence summarizes the status of empirical indicators of the principle prey and predator species of Pacific Hake, and of other ecosystem components that are affected by the US. Hake fishery, which can reasonably be applied to the Canadian fishery. Since these indicators are measured throughout the Hake range, this demonstrates there are likely negligible fishery impacts on ecosystem structure and function within key fishing areas.

3.5 Principle Three: Management System Background

3.5.1 Area of operation of the fishery and under which jurisdiction it falls

The Pacific west coast mid-water trawl Pacific Hake (*Merlucius productus*) fishery is conducted in the U.S. and Canadian Pacific EEZ waters west of California, Oregon, Washington and British Columbia. Historically, with implementation of the Magnuson-Stevens Fishery Conservation and Management Act in the U.S. and the declaration of a 200 mile fishery conservation zone in both countries in the late 1970s, annual Hake quotas (or catch targets) had been used to limit the catch of Pacific Hake in both zones by foreign and domestic fisheries. During the 1990s, however, disagreement between the U.S. and Canada on the division of the total catch led to quota overruns.

The countries resolved the disagreements through a Joint US-Canada Agreement for Pacific Hake (called “the Agreement”) that went through final ratification in both counties in 2010. Under the Agreement, Pacific Hake stock assessments are to be prepared by a Joint Technical Committee (JTC) comprised of both U.S. and Canadian scientists, and reviewed by a Scientific Review Group (SRG), with national representatives to both groups appointed by their respective governments. Additionally, the Agreement calls for both of these bodies to include industry- nominated scientists, who are selected and appointed jointly by both nations. This process sets the total coast-wide Total Allowable Catch (TAC) or quota to be allocated to each country. The countries then allocate the country quota to each fishery sector within their respective country. The Agreement assigns 73.88% of the TAC to the United States and 26.12% to Canada for an initial period of nine years, and thereafter unless the Parties agree to change it.

Canada

The Fisheries Act is the primary piece of federal legislation relating to the management of fisheries in Canada. The Act applies to shellfish, finfish, marine plants, and marine mammals, and provides tools to constrain take or disturbance of these species and their habitats for reasons of conservation or other valid objectives. Among other things, the Act grants authority to the Minister of Fisheries and Oceans Canada (“the Minister”) to issue and repeal fishing licences and to make regulations. The Minister may make regulations regarding: the control of fisheries effort and catch, conservation of fish, protection of fish habitat, prevention of pollution, issuance and conditions of licences, vessels, fishing gear, means of enforcement, fish culture, and monitoring and reporting, among other things. These provide the basis for DFO’s work to manage and control fisheries and conserve species from year to year. For example, the Fisheries Act was the legislative basis for the rebuilding actions DFO has implemented for Bocaccio and the development of the Rockfish

Conservation Strategy (including the establishment of 164 Rockfish Conservation Areas) to rebuild inshore rockfish.

Fisheries and Oceans Canada (DFO) is responsible for managing the Canadian Hake fishery off the west coast of British Columbia. Groundfish off Canada are under the jurisdiction of the Fisheries Act and the regulations made thereunder, and also the Oceans Act and the Species at Risk Act. Pacific Hake are managed under the Integrated Fisheries Management Plan (IFMP) Groundfish and the Hake Addendum (DFO 2013a, DFO 2013b). The IFMP supports the Species At Risk Act and the Oceans Act by adopting an ecosystem-based approach to management and data collection.

Under Canada's Ocean's Act (1996) and the subsequent Ocean Strategy (2002), fisheries management is required to move toward the overarching objective of ecosystem-based management. Management strategies for groundfish fisheries are now directed at reducing bycatch of vulnerable species and minimizing the adverse effect of fishing on sensitive benthic habitats through area closures (particularly for the trawl fishery in Eastern Queen Charlotte Sound and Hecate Strait) and via the creation of Rockfish Conservation Areas in coastal British Columbia.

United States

The principle legislative instrument for fisheries management in the US is the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA contains ten National Standards (NSs) which fishery managers must consider when preparing a Fishery Management Plan (FMP) or Amendment. These NSs are:

1. Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the U.S. fishing industry;
2. Conservation and management measures shall be based upon the best scientific information available;
3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination;
4. Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonable calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of privileges;
5. Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose;
6. Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches;
7. Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication;
8. Conservation and management measures shall, consistent with the conservation requirements of the Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities;
9. Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch; and,

10. Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The National Standard Guidelines (NSGs) on how NMFS follows the NSs are published in the US Federal Register at 50 CFR Part 600 subpart D. National Standard 1 has been interpreted as being being consistent with international agreements and criteria for precautionary approaches. Proposed guidelines for implementing the legislation have been translated into scientific and technical guidance for developing limit and target control rules, with some suggestions for defaults (Restrepo et al 1998). The control rules specify management actions (fishing mortality rate), based upon current stock status (Restrepo and Powers 1999).

In coastal waters off the United States, Pacific Hake catch is under the jurisdiction of the Pacific Whiting Act of 2006, the Pacific Coast Groundfish Fishery Management Plan (PCGFMP), and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). The geographical extent of the FMP management area is the U.S. EEZ of the northeast Pacific Ocean that lies between the U.S.-Canada border (as specified in *Federal Register*, Volume 42, Number 44, March 7, 1977, page 12938) and the U.S.-Mexico border. The Pacific Fishery Management Council management area is divided into subareas based on International North Pacific Fisheries Commission (INPFC) statistical areas, with slight modifications.

- Conception - Southern boundary of EEZ to 36000' N latitude
- Monterey - 36000' N latitude to 40030' N latitude
- Eureka - 40030' N latitude to 43000' N latitude
- Columbia - 43000' N latitude to 47030' N latitude
- Vancouver - 47030' N latitude to northern boundary of the EEZ

Implementation comes under federal law CFR › Title 50 › Chapter VI › Part 660 › Subpart D › Section 660.131. Under this jurisdiction, the Pacific Fishery Management Council recommends management and enforcement measures to NMFS, the agency charged with implementation. In addition, Washington coastal tribes have treaty rights that are taken into account in the management of the fishery, coordinated by NMFS.

3.5.2 **Recognized groups with interests in the fishery**

This species is harvested primarily by commercial mid-water pelagic trawls operated by catcher vessels delivering to shore, catcher vessels delivering to motherships that process the catch, or at-sea catcher/processor vessels, and in the case of Canada, joint ventures are allowed under certain circumstances.

Canada

An Option A commercial groundfish trawl licence and appropriate holdings of Individual Vessel Quota (IVQ) is required to commercially harvest groundfish trawl species (including Pacific Hake) using trawl gear. Groundfish trawl vessel owners and harvesters are reminded to carefully review and familiarize themselves with the groundfish trawl licence and attached conditions.

Prior to commencing to harvest under the authority of a groundfish trawl licence, a Request for a 2013/2014 Groundfish Trawl Licence Amendment Form must be completed and submitted to DFO's Groundfish Management Unit (GMU). The owner of a groundfish trawl licensed vessel or the party authorised to request amendments must complete the amendment request form. It is a requirement that any Option A vessel must be in possession of a valid amendment to the vessels 2013/2014 groundfish trawl licence prior to fishing.

Pacific Hake quota licence fees are assessed based on the permanent IVQ holdings of the licence and the initial notional TAC and in-season allocation(s) of the Pacific Hake TAC as either Shore-side and/or JV delivery quota. Licence fees for Pacific Hake are $4.00 per mt quota, which equates to $0.0016 per pound. DFO, upon payment of applicable quota fees, will amend the individual groundfish trawl licence to reflect the increased available quota for the licence (DFO 2013b).

The in-season management advisory process has many stakeholders:
Hake license holders, fishers, processors, the British Columbia Provincial Government, fishermen's organizations (Association of Pacific Hake Fisherman and the Deep Sea Trawlers Association), the Groundfish Development Authority, the Canadian Groundfish Research & Conservation Society, and the United Fishermen and Allied Worker's Union, and the Coastal Communities Network (mayors of BC coastal towns). First Nations, and environmental groups are also stakeholders.

United States

The U.S. allocates a portion of the U.S. quota to Washington state tribes (Makah, Quileute, and Quinault) that have Treaty fishing rights. The tribal fisheries are managed by the tribes and are managed in accordance with the harvest control rules established by the NMFS. Both the Makah and Quileute tribes have fishing plans that address operations, bycatch management, and catch reporting. As a treaty fishery, all harvest vessels must be owned and crewed by enrolled tribal members.

For non-tribal harvest of Pacific Hake, it is covered under the Pacific Groundfish Trawl Rationalization implemented in January 2011 by Amendment 20 (and subsequent trailing amendments) to the Groundfish Management Plan.

To qualify to receive a quota share (QS) permit, a person or entity must be the current owner of a Pacific Coast Groundfish trawl-endorsed limited entry permit with landing history; or must be a Hake shore-side processor that received deliveries of ≥1 metric ton of Hake from whiting trips in each of any two years from 1998-2004. QS permits consider landings history and bycatch ratios for overfished species. At-sea whiting harvest cooperatives: must have a Mothership (MS) permit, an MS/Catcher Vessel (CV)-endorsed limited entry trawl permit, or a Catcher-processor (C/P)-endorsed limited entry trawl permit. To qualify for initial issuance of an MS permit, a person must own, or operate under a bareboat charter, a vessel on which at least 1,000 mt of Pacific Hake was processed in the mothership sector in each year for at least two years between 1997-2003.

Similar to Canada, the Hake management process has many stakeholders:
Hake license holders, fishers, processors, the states of Washington, Oregon, and California, fishermen's organizations, Treaty Nations, and several environmental groups.

3.5.3 Consultations leading to the formulation of the management plan

Canada

Several advisory committees and subcommittees have been established to provide advice to the DFO on the formulation of management the plan. Terms of reference, membership and meeting minutes for the Groundfish Trawl Advisory Committee (GTAC), the Commercial Industry Caucus (CIC), and the Groundfish Integrated Advisory Board (GIAB) can be found on the Internet at: http://www.pac.dfo-mpo.gc.ca/consultation/fisheries-peche/ground-fond/index-eng.htm.

DFO engages in a variety of consultation, engagement and collaborative harvest planning processes with First Nations. These exchanges and involvement may include bilateral consultations, advisory processes, management boards, technical groups and other

roundtable forums. Consulting is an important part of good governance, sound policy development and decision-making. In addition to good governance objectives, Canada has statutory, contractual and common-law obligations to consult with Aboriginal groups.

Stock assessment and research programs involving groundfish are conducted by the DFO and through cooperative research programs carried out in conjunction with industry associations. Science personnel, in association with DFO fishery managers and groundfish user group representatives, establish assessment priorities and timing schedules for assessments. These programs are intended to support ongoing evaluation of management measures. Opportunities for stakeholder involvement and co-operative ventures in research and assessment activities are pursued.

Science is the basis for sound decision-making and DFO Science Sector provides information on the consequences of management and policy options, and the likelihood of achieving policy objectives under alternative management strategies and tactics. The Canadian Science Advisory Secretariat (CSAS) oversees the provision of all scientific advice required by operational client sectors within DFO (Fisheries and Aquaculture Management, Oceans and Habitat Management, and Policy). In the Pacific Region, science advisory processes are managed by the Centre for Science Advice Pacific (CSAP). Further details can be found in the 2013/1014 Integrated Fisheries Management Plan for Groundfish (DFO 2103b).

United States

The process used by the PFMC to manage groundfish is described in the Council Operating Procedures (PFMC 2010a). Since the 2002 implementation of Amendment 17 to the groundfish FMP, groundfish, including Pacific Hake, has been managed as a biennial process. Management measures are implemented for a two-year period with harvest specifications (ABCs and OYs) identified for each year in the biennium. This cycle provides stability and increases the time available to work on other groundfish issues and receive public comment. At least a three-meeting process is used to decide biennial harvest specifications and management measures:

- November: the Council decides on a preliminary range of harvest levels and management measures
- March: additional analysis can be considered
- April: the Council decides final harvest levels, and decides a range of management measures for detailed analysis
- June: the Council decides final management measures The Council reviews new stock assessments, management performance and socioeconomic impacts relative to management objectives during the two-year management period with a consideration of modifying harvest specifications and management measures in the next management cycle. The exception to the biennial management process is Pacific whiting, which is managed annually with harvest levels set each year under the terms of the U.S.- Canada Pacific Whiting treaty (PFMC, 2010b). Proposals for management measures may come from the public, state and federal agencies, advisory groups, or Council members. For those proposals the Council chooses to pursue it directs the Groundfish Management Team (GMT), the National Marine Fisheries Service (NMFS), and/or Council staff to prepare an analysis considering a range of alternatives. The Council reviews the analysis and selects a range of alternatives within which a preliminary preferred alternative may be identified. The analysis is then made available for public review, and the Council makes a final decision at the next meeting the item is scheduled (PFMC 2010a). After considering Council recommendations and public comments, NMFS publishes the adopted regulations. For non-routine and annual management decisions, NMFS publishes a *Federal Register* notice and provides a public comment period before finalizing the recommendations (PFMC 2010a).

The Pacific Fishery Management Council is advised by a number of standing, advisory and ad hoc committees.

Standing Committees
The PFMC has two Standing Committees composed of Council members: the Budget Committee and Legislative Committee (PFMC 2011g). The Budget Committee reviews the Council's budget and grant proposals. The Legislative Committee monitors federal legislation affecting Council operations and West Coast fisheries and drafts Council positions and potential actions (PFMC 2011f).

Advisory Committees

The Scientific and Statistical Committee
The MSA requires that each council maintain a scientific and statistical committee (SSC) to provide ongoing scientific advice for fishery management decisions. This includes recommendations for acceptable biological catch, preventing overfishing, maximum sustainable yield, and achieving rebuilding targets, and reports on stock status and health, bycatch, habitat status, social and economic impacts of management measures, and sustainability of fishing practices. Members appointed by councils to the SSC's are required to have strong scientific or technical credentials and experience (MSA 2007).

The Council appoints the PFMC SSC. At-large members serve three-year terms, while management agency representatives serve indefinite terms. In 2011 the SSC has 17 members, including scientists from NOAA Fisheries (8), state agencies (4), the Northwest Indian Fisheries Commission (1), academic institutions (3), and a private consultant (1). The SSC has six subcommittees: salmon, groundfish, highly migratory species, coastal pelagic species, ecosystem management, and economics (PFMC 2011g).

The SSC identifies scientific resources required for the development of FMPs and amendments; provides a multidisciplinary review of FMPs and FMP amendments and advises the Council on their scientific content, helps the Council evaluate statistical, biological, economic, social, and other scientific information and analyses, and makes recommendations on the composition of plan development, technical, and management teams (PFMC 2011a).

Advisory Panels
Advisory subpanels represent the commercial and recreational fishing industry, tribes, the public, and conservation interests. They advise the Council on fishery management measures and provide input into fishery management planning. Members are selected by a Council vote and serve three-year terms.

The Council has five advisory subpanels: Groundfish (GAP), Coastal Pelagic Species (CPSAS), Highly Migratory Species (HMSAS), Salmon (SAS) and Ecosystems (EAS). Subpanels most directly relevant to West Coast limited entry groundfish trawl are the GAP and EAS.

The GAP includes representatives of the trawl, fixed gear and open access commercial harvesters, at-sea and shore- side processors, tribal, charter boat, sport, and conservation sectors (PFMC, 2011g).

The EAS includes three representatives each from California, Idaho, Oregon, and Washington; and one tribal representative (PFMC 2011g).

Groundfish Management Team
Technical and management teams are working groups of biologists and economists with specified representation of state, federal and tribal agencies. Members serve indefinite terms and are selected by a vote of the Council. Technical and Management Teams monitor

fisheries and prepare stock assessments and fishery impact analyses. They may monitor catch rates and management impacts, analyze or recommend harvest limits, develop rebuilding plans, or conduct other tasks assigned by the Council. The Council has five technical and management teams: Groundfish Management Team (GMT), Salmon Technical Team (STT), Coastal Pelagic Species Management Team (CPSMT), Salmon Model Evaluation Workgroup (SMEW), and Highly Migratory Species Management Team (HMSMT). Of these, the team most directly relevant to West Coast limited entry groundfish trawl is the GMT.

The 2011 GMT has 10 members representing the California Dept. of Fish and Game (2), Oregon Dept. of Fish and Wildlife (2), Washington Dept. of Fish and Wildlife (1), Northwest Indian Fisheries Commission (1), NMFS Southwest Fisheries Science Center (1), NMFS Northwest Fisheries Science Center (1), NMFS Northwest Region (2). (PFMC 2011)

Ecosystem Plan Development Team
Plan Development Teams (PDTs) develop fishery management plans. Plan development includes appraising Council fisheries and resources, working with other teams to draft FMP and amendment text, presenting alternative management objectives to the Council, analyzing the short- and long-term trade-offs of management measures, helping Council and NMFS staff prepare related documents, attending public hearings, advising the Council on biological and socioeconomic impacts of fisheries management, providing information to advisory subpanels, and presenting stock assessments and analyses to the SSC for review.

The Council presently one has a single PDT charged with developing an Ecosystem Plan. The 2011 Ecosystem Plan Development Team (EPDT) has 11 members and two vacant positions (California Department of Fish and Game and tribal). Members represent the Oregon Dept. of Fish and Wildlife (1), Washington Dept. of Fish and Wildlife (1), Idaho Dept. of Fish and Game (1), NMFS Southwest Fisheries Science Center (3), NMFS Northwest Fisheries Science Center (2), NMFS Southwest Region (1) NMFS Northwest Region (1), and NOAA National Marine Sanctuaries (1) (PFMC 2011g).

Habitat Committee
The Habitat Committee (HC) works with other teams and panels on habitat issues that affect Council fisheries. The group helps develop ways to resolve habitat problems and avoid future habitat conflicts, and it makes recommendations for actions that will help achieve the Council's habitat objectives (PFMC 2007).

HC membership includes one member each from the U.S. Fish and Wildlife Service, the Pacific States Marine Fisheries Commission, and the National Marine Sanctuary program; one NMFS region representative and one NMFS science center representative; one at-large member; one conservation representative; four members from the four state fishery agencies; two tribal representatives; and two fishing industry members. The Council chair requests nominees from these agencies and organizations. HC members representing NMFS, U.S. Fish and Wildlife Service, National Marine Sanctuaries, Pacific States Marine Fisheries Commission, and state agencies serve indefinite terms. Other HC members serve three-year terms.

Groundfish Allocation Committee
The Groundfish Allocation Committee (GAC) is charged with developing options for allocating certain groundfish species among the commercial and recreational sectors as well as among gear groups within the commercial sector. The purpose of the GAC is to distribute the harvestable surplus among competing interests to resolve short-term and long-term allocation issues (PFMC, 2007; 2011l).

The GAC is composed of voting and non-voting members. The six voting members of the 2011 GAC include two sitting Council members (presently representing the Washington Department of Fish and Wildlife and a Washington charter boat association), one

representative each from the California, Oregon and Washington management agencies, the NMFS Northwest Region, and the Pacific States Marine Fisheries Commission (PFMC 2011g).

Six non-voting advisor members of the 2011 GAC represent shore-side and at-sea processing sectors, non-whiting trawl, whiting trawl, fixed gear, open access, and recreational sectors. A designated conservation seat is presently vacant (PFMC 2011g).

Enforcement Consultants

Enforcement Consultants are representatives from state police agencies, state fish and wildlife agencies, NMFS regions, and the Coast Guard. They advise the Council about the enforceability of proposed management actions and their potential impact on safety at sea. The seven Enforcement Consultants serve indefinite terms (PFMC 2011g). The 2011 Enforcement Consultants membership includes representation of the Oregon State Police, Fish and Wildlife California Dept. of Fish and Game, Washington Dept. of Fish and Wildlife, NOAA Office of Law Enforcement Southwest Region, NOAA Office of Law Enforcement Northwest Region, U.S. Coast Guard 11th District, U.S. Coast Guard 13th District (PFMC, 2011l).

Ad-Hoc Committees

Ad-hoc committees are created to serve special needs. Ad-hoc committees directly or indirectly related to the groundfish trawl sector include:

- Full Retention Committee
- Groundfish Catch Share Program Cost Recovery Committee
- Groundfish Fishery Management Plan Environmental Impact Statement Oversight Committee
- Groundfish Habitat Technical Review Committee
- Groundfish Essential Fish Habitat Review Committee
- Groundfish Multi-Year Management Committee
- Groundfish Trawl Individual Quota Committee
- Marine Protected Area Committee
- Shore-based Whiting Amendment Workgroup
- Trawl Individual Quota Analytical Team
- Trawl Individual Quota Enforcement Group
- Trawl Individual Quota Independent Experts Panel
- Observer Program Implementation Committee
- Vessel Monitoring System Committee
- Groundfish Strategic Plan Implementation Oversight Committee
- Groundfish Strategic Plan Implementation Oversight Committee Open Access Conversion Subcommittee
- Groundfish Process Improvement Committee. The Groundfish Process Improvement Committee (PIC), created November 2010, is the most recently formed ad- hoc committee addressing groundfish issues. It is charged with generating recommendations for a workable detailed process and schedule for the 2013-14 cycle. Four PIC subcommittees – Science, Management Measures, NEPA/EIS Structure, and FMP Amendments – are tasked with reviewing the Council staff white paper and advisory body statements related to the problems surrounding the previous biennial cycles and making recommendations in three areas: (1) improving the science-related processes and inputs, (2) the development of management measures, and (3) the National Marine Fisheries Service (NMFS) approval review and regulation implementation process. At the April 2011 Council meeting, the Council is scheduled to adopt a preliminary preferred detailed process and schedule for the 2013-14 biennial management cycle with the objective of achieving a 2013 fishery start date under a more orderly and predictable workload environment than has occurred in recent years. After a period of public review, final Council action is scheduled for the June 2011 meeting (PFMC, 2011m).

3.5.4 Arrangements for on-going consultations with interest groups

See Section 3.5.3 above.

3.5.5 Non-fishery users or activities, which could affect the fishery, and arrangements for liaison and co-ordination

Canada

Laws that apply to non-users and users that are directly relevant to the management of marine fisheries includes:

- Oceans Act: Established marine zones on Canada and jurisdictions, and set the framework for integrated coastal and ocean management.
- Species at Risk Act: An Act respecting the protection of wildlife species at risk in Canada; providing legal protection for species at risk will complement existing legislation and will, in part, meet Canada's commitments under the United Nations Convention on the Conservation of Biological Diversity.
- Department of the Environment Act: The powers, duties and functions of the Minister extend to and include all matters over which Parliament has jurisdiction, not by law assigned to any other department, board or agency of the Government of Canada, relating to (*a*) the preservation and enhancement of the quality of the natural environment, including water, air and soil quality; (*b*) renewable resources, including migratory birds and other non-domestic flora and fauna; (*c*) water; (*d*) meteorology.
- Navigable Waters Protection Act: An Act respecting the protection of navigable waters.
- Migratory Bird Treaty Act (MBTA): a shared agreement between the United States, Canada, Japan, Mexico, and Russia to protect migratory birds, prohibiting their taking, killing, or possession. The directed take of seabirds is prohibited.

United States

Should any entity want to dredge or fill in areas that could affect the fisheries, they would be subject to the Clean Water Act, Section 404, and the proponent would be required to prepare and Environmental Assessment (EA) or environmental impact statement (EIS) to be considered for a permit.

Other applicable law applies to non-users and users alike that is directly relevant to the management of marine fisheries includes (Buck 1995; PFMC 2011g):

- National Environmental Policy Act (NEPA): requires an EIS for actions with a federal nexus and compliance with other laws and executive orders.
- Endangered Species Act (ESA): prohibits actions that are expected to jeopardize the continued existence of any endangered or threatened species under NMFS' jurisdiction or result in harmful effects on critical habitat. Consultations, including a Biological Assessment are required.
- Marine Mammal Protection Act (MMPA): requires protection of marine mammals. NMFS is responsible for whales, dolphins, porpoise, seals, sea lions and fur seals. The U.S. Fish and Wildlife Service (USFWS) is responsible for walrus, sea otters, and the West Indian manatee (PFMC 2011g).
- Migratory Bird Treaty Act (MBTA): a shared agreement between the United States, Canada, Japan, Mexico, and Russia to protect migratory birds, prohibiting their taking, killing, or possession. The directed take of seabirds is prohibited.
- Coastal Zone Management Act (CZMA): requires all federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable
- Administrative Procedures Act (APA): provides for public participation in the rulemaking process

- Paperwork Reduction Act (PRA): regulates the collection of information from the public
- Regulatory Flexibility Act (RFA): requires assessment of the regulatory impact on small entities through a regulatory flexibility analysis. The analysis is combined with the regulatory impact review (RIR) and NEPA analyses.
- EO 12866 (Regulatory Planning and Review): establishes guidelines for promulgating new regulations and reviewing existing regulations and requires agencies to assess the costs and benefits of all regulatory action alternatives.
- EO 12898 (Environmental Justice): requires federal agencies to identify and address "disproportionately high adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States" as part of an environmental impact analysis associated with an action.
- EO 13175 (Consultation and Coordination with Indian Tribal Governments): requires regular and meaningful consultation and collaboration with tribal officials in the development of federal policies that have tribal implications and the avoidance of unfunded mandates imposed on tribes.
- EO 13132 (Federalism): requires federal agencies to consider the implications of policies that may limit the scope of or pre-empt states' legal authority. Such actions require a consultation process with the states and may not create unfunded mandates for the states.
- EO 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds): supplements the MBTA by requiring Federal agencies to work with the U.S. Fish and Wildlife Service (USFWS) to develop memoranda of agreement to conserve migratory birds and to evaluate the effects of their actions on migratory birds in NEPA documents.

3.5.6 Details of the decision-making process or processes, including the recognized participants

After the annual allocations are provided through the Hake Agreement process, each country executes its respective process for managing the fisheries.

Canada

Each year, details of the annual (2013 is the latest) management of Hake are published in the Pacific Hake Harvest Plan, addendum to the 2013/1014 Integrated Fisheries Management Plan for Groundfish (DFO 2013a).

The following in-season processes have been established to ensure onshore processors receive priority access and consistent supply of Hake catch during the season, and provide advice to DFO on the in-season management of the annual Pacific Hake TAC:

- In-season Hake Advisory Committee (IHAC): The IHAC is expected to meet bi-weekly (in person or by conference call), or more often if needed, to review the Hake fishery and ensure priority access for vessels delivering onshore is being provided, make recommendations to DFO with respect to in-season release of quota held in reserve and other management actions for the onshore and JV fisheries which may arise. All IHAC meetings/conference calls begin at 9:30 am.

The IHAC consists of representatives for:

- onshore harvesters (one from each active shore-side processor (i.e. a member of each OPC),
- JV harvesters (two representatives),
- active shore-side processors (one from each active shore-side processor (i.e. a member of each OPC),
- the Hake Association (one representative)
- the Hake Consortium of BC (one representative).

- Coastal Community Representative (one representative).
- The Province of BC Ministry of Environment is an ex-officio member.
- DFO chairs the IHAC.

. Onshore Plant Committees (OPCs): All vessel operators/owners actively fishing for onshore processors are expected to meet weekly (by conference call or in person) with plant representatives to discuss delivery schedules and quantity issues.

. The OPCs and IHAC will only deal with in-season management of the fishery. The terms of reference for these two groups are presented in DFO (2013a).

. The Groundfish Trawl Advisory Hake Subcommittee in conjunction with IHAC participate in the in-season review process and provide general overarching advice to DFO on management of Pacific Hake fishery.

. Regional Director General for the Pacific Region approves the annual plan.

United States

The Pacific Fishery Management Council (PFMC) is the regional council responsible for managing Pacific Ocean fisheries in the 317,690 mi^2 Federal EEZ off the coasts of California, Oregon and Washington. The Pacific fisheries comprise about 119 species of salmon, groundfish (including Pacific Hake), coastal pelagic species, and highly migratory species (PFMC 2011b).

The Council has fourteen voting members, consisting of four state fishery agency directors, the regional administrator of NMFS (NW or SW Region, depending on the issue under consideration), 4 state obligatory appointments, four at-large appointments, and one tribal appointment representing Federally recognized fishing rights from California, Oregon, Washington, or Idaho (PFMC 2011f). The state obligatory and at-large appointments are made by the Secretary of Commerce based on nominations from the governors of the four member states for terms of three years, with a maximum of three terms. The tribal appointment is made by the Secretary of Commerce in consultation with the Secretary of the Interior and tribal governments based on a list of nominees submitted by the tribal governments, with representation to be rotated among the treaty tribes (MSA 2007).

Under MSA, each council must reflect the expertise and interests of its constituent States, with membership that is knowledgeable about conservation, management, commercial or recreational harvest, of the fishery resources within the council area. The Secretary of Commerce is charged with ensuring each council has membership that fairly represents the commercial and recreational fisheries under that Council's jurisdiction. Each year the Secretary submits a report on council membership to the Senate Committee on Commerce, Science, and Transportation that list the fisheries under the jurisdiction of each Council and their characteristics, assesses council membership in terms of the apportionment of the active participants in each council's fisheries, and states a plan and schedule for actions to achieve a fair and balanced apportionment on each council (MSA 2007).

The Council meets five times a year. Most Council meetings take six days, with individual advisory body meetings occurring during the course of the week. All meetings are open to the public, except for a short closed Council session in which the Council deals with personnel, administrative, or litigation issues. Meeting locations rotate among member state cities (PFMC 2011g). Advisory bodies also meet at various times between Council meetings.

The PFMC has prepared and implemented four FMPs for these fisheries. Each FMP contains a suite of management tools that together characterize the fishery management regime. These management tools are defined in the FMP or its implementing regulations

and require a formal plan or regulatory amendment to change. Species included in the trawl rationalization program are managed under the Pacific Coast Groundfish FMP.

Management measures developed by the Council are recommended to the Secretary of Commerce through the National Marine Fisheries Service (NMFS). Management measures are implemented by NMFS Northwest and Southwest Regional offices and enforced by the NOAA Office of Law Enforcement, the U.S. Coast Guard 11th District, and local enforcement agencies (PFMC 2011b).

The Council staff works at the direction of the Council to coordinate and expedite routine Council activities. As of April 2011, there were 16 members of the Council staff (PFMC 2011k), consisting of an Executive Director Deputy Director, support staff, and Staff Officers. Staff Officers oversee each fishery management plan (groundfish, coastal pelagic species, highly migratory species, and salmon), and also focus on economics, social science, habitat, and outreach and education (PFMC 2011a).

3.5.7 Objectives for the fishery

Canada

DFO's Groundfish Management Unit (GMU) has identified key issues facing the groundfish fisheries overall, as informed by consultations with interested parties. Groundfish management issues can be categorized under one of the following themes: science, catch monitoring, access and allocation, marine planning and governance. These key management issues informed the fisheries management goals and objectives that follow.

The resource management goal for groundfish, including Pacific Hake, is to ensure the sustainable use of the groundfish resource. Each of the objectives described below, in some form, help to achieve this goal in the long term (DFO 2013b).

The management issues identified above formed the basis for the development of the following long-term objectives (DFO 2013b). The long-term objectives were developed for the 2011-2013 Groundfish IFMP and remain relevant for the current IFMP. These longer-term objectives are supported by short-term objectives that are described in the next section. Objectives must be specific, measurable, attainable, relevant and time-bound (SMART). The long-term objectives are as follows:

- By 2017, identify and begin to acquire the necessary data required to provide science advice for all groundfish species identified in the DFO groundfish stock assessment strategic plan.
- By 2017, pursue accountability for total groundfish mortality (retained and released catch) for all user groups supported by scientifically defensible (accurate and precise) catch monitoring programs.
- By 2017, have an agreed upon process to aid in the development of allocation arrangements between user groups for groundfish species in the future.
- By 2017, develop the infrastructure to collect and analyze data to determine economic viability and social impacts of the various groundfish fisheries.

Short-term objectives were developed for the 2011 – 2013 IFMP (DFO 2013b). Following a review of those objectives with input from GIAB, they have been updated; those that were complete have been removed from this list and those with work underway have been updated or maintained on the list below. Several new short-term objectives have been added that build upon the work done to date and reflect priorities for 2013-2015. This does not preclude additional short-term objectives to be included in subsequent iterations of the IFMP. Current short-term objectives relevant to the Pacific whiting fisheries are as follows:

1. By the spring of 2014, work with groundfish users to identify and pursue funding mechanisms that support groundfish science and fisheries management (e.g., joint project agreements consistent with the emerging use-of-fish policy, user fee amendments).
2. By the outset of 2015, evaluate different approaches to assessing data limited species and assess the applicability of these approaches to the BC groundfish context.
3. By the dates below, develop and formalize catch monitoring standards that are consistent with DFO's strategic catch monitoring framework for each of the groundfish fisheries:

- By the outset of the 2013 fishing season, implement new delivery models for existing catch monitoring standards for commercial groundfish fisheries;
- By spring 2014, develop a pilot catch monitoring risk assessment for a FSC groundfish fishery that can inform catch monitoring standards for FSC fisheries.

4. By the summer of 2014, use the GIAB to develop the appropriate consultative approach that would support achieving the long-term objective stated in 4th point of the long-term objectives above.
5. By the outset of 2015, identify information sources that can be used to define and describe the cultural importance of the groundfish fisheries.
6. By the outset of 2015, identify and initiate implementation of improvements to catch monitoring and reporting of groundfish species in recreational and First Nations fisheries.

In addition, the groundfish trawl industry by consensus agreed to the following objectives for the 2013 Hake fishery (DFO 2013a):

- To support the operations of the shore-side fishery in a manner consistent with DFO's stated Ministerial policy that shows priority for shore-side utilization.
- To maximize the overall value of the combined (shore-side and JV) Hake fishery - this includes the value to vessel owners, crew, shore-side plants, workers, and coastal communities.

United States

The MSA contains ten national standards with which all fishery management plans (FMPs) must conform (MSA 2007). The national standards provide the primary guidance for the management of US fisheries. Conservation and management measures require:

1. Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the U.S. fishing industry;
2. Conservation and management measures shall be based upon the best scientific information available;
3. To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination;
4. Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various U.S. fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonable calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of privileges;
5. Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose;
6. Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches;
7. Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication;
8. Conservation and management measures shall, consistent with the conservation requirements of the Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such

communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities;
9. Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch; and,
10. Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The Pacific Coast Groundfish Fishery Management Plan (FMP) is structured around three goals in order of priority, to be considered in conjunction with the national standards of the Magnuson-Stevens Act (PFMC 2010b):

1. Conservation: Prevent overfishing and rebuild overfished stocks by managing for appropriate harvest levels and prevent, to the extent practicable, any net loss of the habitat of living marine resources.

2. Economics: Maximize the value of the groundfish resource as a whole.

3. Utilization: Within the constraints of overfished species rebuilding requirements, achieve the maximum biological yield of the overall groundfish fishery, promote year-round availability of quality seafood to the consumer, and promote recreational fishing opportunities.

The FMP has 17 objectives designed to meet the three management goals. The Plan states that these objectives “will be considered and followed as closely as practicable.” The objectives are presented in summary form below:

1. Maintain an information flow on the status of the fishery and the fishery resource to inform management decisions as the fishery occurs.
2. Adopt harvest specifications and management measures for each groundfish species or species group. Achieve capacity level appropriate for a sustainable harvest and low discard rates, and a diverse, stable, and profitable fishery.
3. Develop rebuilding plan to rebuild overfished stocks as soon as possible, taking into account their status, biology and ecosystem interactions, the needs of fishing communities, and recommendations by international organizations in which the United States participates.
4. Control the impacts of groundfish fishing on non-groundfish species with identified conservation problems through actions designed to minimize bycatch, avoiding disruption of the groundfish fishery and not precluding achievement of a quota, harvest guideline, or allocation of groundfish, unless such action is required by other applicable law.
5. Describe and identify essential fish habitat (EFH), adverse impacts, and actions to conserve and enhance it, and adopt management measures that minimize impacts from fishing on EFH.
6. Within the constraints of the conservation goals and objectives of the FMP, attempt to achieve the greatest possible net economic benefit to the nation from the managed fisheries.
7. For sectors of the groundfish fishery, which benefit from year-round marketing opportunities extend fishing and marketing opportunities as long as practicable during the fishing year.
8. Use gear restrictions to minimize the necessity for other management measures whenever practicable. Use experimental fishing permits (EFPs) to promote gear research directed at reducing discards.
9. Develop management measures that encourage full utilization (harvesting and processing) of groundfish resources by domestic fisheries.
10. Recognize the multispecies nature of the fishery and establish a concept of managing by species and gear or by groups of interrelated species.

11. Develop management programs that minimize bycatch and its mortality and reduce discard to the extent practicable. Improve estimates of total fishing-related mortality and bycatch and other information necessary to determine the extent to which bycatch and bycatch mortality may be reduced.
12. When conservation actions are necessary to protect a stock or stock assemblage, attempt to develop management measures that will affect users equitably.
13. Minimize gear conflicts among resource users.
14. Choose the management measure that best accomplishes a desired change with the least disruption of current domestic fishing practices, marketing procedures, and the environment.
15. Avoid unnecessary adverse impacts on small entities.
16. Consider the importance of groundfish resources to fishing communities, provide for their sustained participation and minimize adverse economic impacts on them.
17. Promote the safety of human life at sea.

3.5.8 Outline the fleet types or fishing categories participating in the fishery

Canada

The Canadian Hake fleet has but one sector. The vessels must have a DFO issued T (Trawl) license to harvest hake. Of this fleet there are some vessels that are freezer trawlers and have the ability to HGT and freeze at sea. They are not a separate fleet however and have access to the exact same quota as the majority of the Trawl licensed vessels who deliver wet product.

In 2007, 38 out of a possible 141 trawlers landed hake (Nelson Bros Fisheries Ltd. 2009). The active hake fleet in 2012 was 35 and in 2013 was 36 out of 142 eligible. The average length of the wet (shore-based) vessels is 81 ft (range 60 ft to 110 ft). Recently there are four freezer trawlers operating that take about one third of the catch. These range in length from rom 128 to 188 ft, averaging 148 ft (Ackerman, pers. comm. 2014).

In British Columbia under the one fishing sector, there are ultimately two allocations of the Pacific Hake Offshore TAC, the shore-based allocation and the joint venture (JV) allocation. All T licensed vessels are able to receive both allocations. A JV allocation can be delivered either to shore or to a JV partner; a shoreside allocation must be delivered to shore. The freezer trawlers may have allocations of both shoreside and JV quota and can deliver to either onshore processors or the JV.

Since 1979, the JV program has provided benefits to the groundfish industry and aided in the development of the Canadian shoreside hake industry. Annually an assessment of the need for a JV program is completed with fishery stakeholders and takes into account stock status, current industry. The JV program entails Canadian groundfish trawl vessels delivering, via codend transfer, Pacific Hake to foreign fishing vessels that are licensed to operate in Canadian waters. A key operating principle is to ensure operations do not disrupt or interfere with the supply of groundfish and hake to Canadian processing plants. To this end the British Columbia Hake Consortium, as it has since 1979, has again been tasked with co-ordinating the JV program and fishing fleet on behalf of the groundfish industry. This includes securing available JV Hake IVQ, negotiating sales agreements with foreign partners, coordinating the day to day JV operations and ensuring that issues involving the JV program which may or are perceived to compromise the needs of the shorebased processing industry are addressed (DFO 2013a). There were no JV fisheries in 2012 or 2013.

United States

There are four sectors comprising the U.S. Hake fishery:

1. The catcher/processor sector, or C/P Coop Program, is composed of catcher/processors registered to a limited entry permit with a C/P endorsement. Only 6 or 7 of the 10 eligible vessels operate each year (Pacific Whiting conservation Cooperative (PWCC) 2014). Vessels range from 268 to 341 ft in length. The catcher/processor cooperative program is composed of three companies owning catcher/processors, which are vessels that both harvest and process Pacific whiting. Under this cooperative program, the catcher/processor sector will continue to operate under a single voluntary cooperative. It consists of members of the cooperative (all catcher/processor endorsed limited entry trawl permit owners) and the vessels registered to member permits (NMFS 2014c).

2. The mothership (MS) sector, or MS Coop Program, is composed of motherships and catcher vessels that harvest Pacific whiting for delivery to motherships. Motherships are vessels registered to an MS permit, and catcher vessels are vessels registered to a limited entry permit with an MS/CV endorsement or vessels registered to a limited entry permit without an MS/CV endorsement if the vessel is authorized to harvest the coop's allocation. There are currently 6 eligible motherships serviced by 39 catcher vessels, ranging in length from 60 to 147 ft in length, averaging 80 to 100 ft (NMFS 2014c).

3. The Pacific whiting IFQ fishery is composed of vessels that harvest Pacific whiting for delivery shoreside to IFQ first receivers during the primary season (NMFS 2014c). Currently, the shorebased IFQ Program is composed of 138 QS permits/accounts, 142 vessel accounts, and 50 first receivers (Federal Register 2013a). These vessels are similar in size to the MS catcher vessels.

4. The Tribal fisheries. There are four tribes that can participate (by law) in the tribal whiting fishery: Makah, Quileute, Quinault, Hoh. The current tribal fleet is composed of 5 trawlers (Makah) that either deliver to a shoreside plant or to a contracted mothership (Federal Register 2013a).

3.5.9 Individuals or groups granted rights of access to the fishery, and the nature of those rights

See section 3.5.2 above.

3.5.10 Description of the measures agreed upon for the regulation of fishing in order to meet the objectives within a specified period

In addition to the measures outlined above related to the Joint US-Canada Agreement for Pacific Hake, the following measures for each country are summarized:

Canada

All measures for regulation of the Canadian Pacific Hake fisheries can be found in the 2013 Pacific Hake Harvest Plan, addendum (DFO 2013a) to the 2013/1014 Integrated Fisheries Management Plan for Groundfish (DFO 2013b). Subsequent years measures are available on the on DFO's Groundfish Internet site at the following link: http://www.pac.dfo-mpo.gc.ca/fm-gp/commercial/ground-fond/index-eng.html. Specific types of measures include:

Total Allowable Catch
Fishery Season and Open Times
Joint Venture fishery
Waters in Which Fishing Is Permitted
Species and Area Closures
Licensing Requirements
Licensing Quota Fees

Initial allocations of Pacific Hake to sectors
In-season allocation of reserve TAC
In-season Management
Groundfish Development Authority
Landing requirements
Quota Overage/Underage Rules: Fishing Restrictions for Quota Overage; Quota Overage/Underage and Quota Carryover
Gear Restrictions
Trawl Net Size
Trawl Net Escape Panel
Fish Released at Sea
Catch Monitoring and Validation:

- At Sea Monitoring
- Mandatory Retention of Catch
- Hail-Out Requirements Prior to Fishing for Pacific Hake
- Hail-In Requirement When Fishing for Pacific Hake
- Catch Reporting
- Port Monitoring
- Bycatch Allowances for Electronically Monitored Trips
- Bycatch Allowances for Observed Trips
- Use of Packers

United States

The U.S measures for regulating the Pacific Hake fisheries are found in 50 CFR 660.131 - Pacific whiting fishery management measures:

(a) *Sectors—*

(1) The catcher/processor sector, or C/P Coop Program, is composed of catcher/processors registered to a limited entry permit with a C/P endorsement.
(2) The mothership sector, or MS Coop Program, is composed of motherships and catcher vessels that harvest Pacific whiting for delivery to motherships. Motherships are vessels registered to an MS permit, and catcher vessels are vessels registered to a limited entry permit with an MS/CV endorsement or vessels registered to a limited entry permit without an MS/CV endorsement if the vessel is authorized to harvest the coop's allocation.
(3) The Pacific whiting IFQ fishery is composed of vessels that harvest Pacific whiting for delivery shore-side to IFQ first receivers during the primary season.

(b) *Pacific Whiting seasons—*

(1) *Primary seasons.* The primary seasons for the Pacific whiting fishery are:
(i) For the Shore-based IFQ Program, Pacific Whiting IFQ fishery, the period(s) of the large-scale target fishery is conducted after the season start date;
(ii) For catcher/processors, the period(s) when catching and at-sea processing is allowed for the catcher/processor sector (after the season closes at-sea processing of any fish already on board the processing vessel is allowed to continue); and
(iii) For vessels delivering to motherships, the period(s) when catching and at-sea processing is allowed for the mothership sector (after the season closes at-sea processing of any fish already on board the processing vessel is allowed to continue).
(2) *Different primary season start dates.* North of 40°30′ N. lat., different starting dates may be established for the catcher/processor sector, the mothership sector, and in the Pacific whiting IFQ fishery for vessels delivering to IFQ first receivers north of 42° N. lat. and vessels delivering to IFQ first receivers between 42° through 40°30′ N. lat.
(i) *Procedures.* The primary seasons for the whiting fishery north of 40°3′ N. lat. generally will be established according to the procedures of the PCGFMP for developing and

implementing harvest specifications and apportionments. The season opening dates remain in effect unless changed, generally with the harvest specifications and management measures.

(ii) *Criteria.* The start of a primary season may be changed based on a recommendation from the Council and consideration of the following factors, if applicable: Size of the harvest guidelines for whiting and bycatch species; age/size structure of the whiting population; expected harvest of bycatch and prohibited species; availability and stock status of prohibited species; expected participation by catchers and processors; the period between when catcher vessels make annual processor obligations and the start of the fishery; environmental conditions; timing of alternate or competing fisheries; industry agreement; fishing or processing rates; and other relevant information.

(iii) *Primary whiting season start dates and duration.* After the start of a primary season for a sector of the Whiting fishery, the season remains open for that sector until the sector allocation of whiting or non-whiting groundfish (with allocations) is reached or projected to be reached and the fishery season for that sector is closed by NMFS. The starting dates for the primary seasons for the Whiting fishery are as follows:

(A) Catcher/processor sector—May 15.

(B) Mothership sector—May 15.

(C) Shore-based IFQ Program, Pacific Whiting IFQ fishery.

(*1*) North of 42° N. lat.—June 15;

(*2*) Between 42°-40°30′ N. lat.—April 1; and

(*3*) South of 40°30′ N. lat.—April 15.

(3) *Trip limits in the whiting fishery.* The “per trip” limit for Whiting before the regular (primary) season for the shore-based sector is announced in Table 1 of this subpart, and is a routine management measure under § 660.60(c). This trip limit includes any whiting caught shoreward of 100-fm (183-m) in the Eureka, CA area. The “per trip” limit for other groundfish species for the shore-based sector are announced in Table 1 (North) and Table 1 (South) of this subpart and apply as follows:

(i) During the groundfish cumulative limit periods both before and after the primary whiting season, vessels may use either small and/or large footrope gear, but are subject to the more restrictive trip limits for those entire cumulative periods.

(ii) If, during a primary whiting season, a whiting vessel harvests a groundfish species other than whiting for which there is a mid-water trip limit, then that vessel may also harvest up to another footrope-specific limit for that species during any cumulative limit period that overlaps the start or close of the primary whiting season.

(c) *Closed areas.*

Vessels fishing in the Pacific Whiting primary seasons for the Shore-based IFQ Program, MS Coop Program, or C/P Coop Program shall not target Pacific whiting with mid-water trawl gear in the following portions of the fishery management area:

(1) *Klamath River salmon conservation zone.* The ocean area surrounding the Klamath River mouth bounded on the north by 41°38.80′ N. lat. (approximately 6 nm north of the Klamath River mouth), on the west by 124°23′ W. long. (approximately 12 nm from shore), and on the south by 41°26.80′ N. lat. (approximately 6 nm south of the Klamath River mouth).

(2) *Columbia River salmon conservation zone.* The ocean area surrounding the Columbia River mouth bounded by a line extending for 6 nm due west from North Head along 46°18′ N. lat. to 124°13.30′ W. long., then southerly along a line of 167 True to 46°11.10′ N. lat. and 124°11′ W. long. (Columbia River Buoy), then northeast along Red Buoy Line to the tip of the south jetty.

(3) *Ocean salmon conservation zone.* All waters shoreward of a boundary line approximating the 100 fm (183 m) depth contour. Latitude and longitude coordinates defining the boundary line approximating the 100 fm (183 m) depth contour are provided at § 660.73, subpart C. This closure will be implemented through automatic action, defined at § 660.60(d), subpart C, when NMFS projects the Pacific whiting fishery may take in excess of 11,000 Chinook within a calendar year.

(4) Pacific Whiting bycatch reduction areas (BRAs). Vessels using limited entry mid-water trawl gear during the primary whiting season may be prohibited from fishing shoreward of a boundary line approximating the 75-fm (137-m), 100-fm (183-m) or 150-fm (274-m) depth contours. Latitude and longitude coordinates for the boundary lines approximating the depth contours are provided at §§ 660.72 and 660.73. Closures may be implemented in-season for a sector(s) through automatic action, defined at § 660.60(d), when NMFS projects that a sector will exceed an allocation for a non-whiting groundfish species specified for that sector before the sector's whiting allocation is projected to be reached.

(d) *Eureka area trip limits.*

Trip landing or frequency limits may be established, modified, or removed under § 660.60 or this paragraph, specifying the amount of Pacific Whiting that may be taken and retained, possessed, or landed by a vessel that, at any time during a fishing trip, fished in the fishery management area shoreward of the 100 fathom (183 m) contour (as shown on NOAA Charts 18580, 18600, and 18620) in the Eureka area (from 43° 00′ to 40° 30′ N. lat.). Unless otherwise specified, no more than 10,000-lb (4,536 kg) of Whiting may be taken and retained, possessed, or landed by a vessel that, at any time during a fishing trip, fished in the fishery management area shoreward of the 100 fm (183 m) contour (as shown on NOAA Charts 18580, 18600, and 18620) in the Eureka management area (defined at § 660.11).

(e) *At-sea processing.*

Whiting may not be processed at sea south of 42°00′ N. lat. (Oregon-California border), unless by a waste-processing vessel as authorized under paragraph (g) of this section.

(f) *Time of day.*

Vessels fishing in the Pacific Whiting primary seasons for the Shore-based IFQ Program, MS Coop Program or C/P Coop Program shall not target Pacific whiting with mid-water trawl gear in the fishery management area south of 42°00′ N. lat. between 0001 hours to one-half hour after official sunrise (local time). During this time south of 42°00′N. lat., trawl doors must be on board any vessel used to fish for whiting and the trawl must be attached to the trawl doors. Official sunrise is determined, to the nearest 5° lat., in The Nautical Almanac issued annually by the Nautical Almanac Office, U.S. Naval Observatory, and available from the U.S. Government Printing Office.

(g) *Processing fish waste at sea.*

A vessel that processes only fish waste (a “waste-processing vessel”) is not considered a whiting processor and therefore is not subject to the allocations, seasons, or restrictions for catcher/processors or motherships while it operates as a waste-processing vessel. However, no vessel may operate as a waste-processing vessel 48 hours immediately before and after a primary season for whiting in which the vessel operates as a catcher/processor or mothership. A vessel must meet the following conditions to qualify as a waste-processing vessel:
(1) The vessel makes meal (ground dried fish), oil, or minced (ground flesh) product, but does not make, and does not have on board, surimi (fish paste with additives), fillets (meat from the side of the fish, behind the head and in front of the tail), or headed and gutted fish (head and viscera removed).
(2) The amount of whole whiting on board does not exceed the trip limit (if any) allowed under § 660.60(c), subpart C, or Tables 1 (North) or 1 (South) in subpart D.
(3) Any trawl net and doors on board are stowed in a secured and covered manner, and detached from all towing lines, so as to be rendered unusable for fishing.
(4) The vessel does not receive codends containing fish.
(5) The vessel's operations are consistent with applicable state and Federal law, including those governing disposal of fish waste at sea.

(h) *Reapportionment of Pacific whiting.*

(1) By September 15 of the fishing year, the Regional Administrator will, based on discussions with representatives of the tribes participating in the Pacific whiting fishery for that fishing year, consider the tribal harvests to date and catch projections for the remainder of the year relative to the tribal allocation as specified at § 660.50 of Pacific whiting. That portion of the tribal allocation that the Regional Administrator determines will not be used by the end of the fishing year may be reapportioned to the other sectors of the trawl fishery in proportion to their initial allocations, on September 15 or as soon as practicable thereafter. Subsequent reapportionments may be made based on subsequent determinations by the Regional Administrator based on the factors described above in order to ensure full utilization of the resource. No reapportionments will occur after December 1 of the fishing year.
(2) The reapportionment of surplus Whiting will be made effective immediately by actual notice under the automatic action authority provided at § 660.60(d)(1).
(3) Estimates of the portion of the tribal allocation that will not be used by the end of the fishing year will be based on the best information available to the Regional Administrator.
(http://www.law.cornell.edu/cfr/text/50/660.131)

3.5.11 Arrangements and responsibilities for monitoring, control and surveillance and enforcement

Canada

Observers perform a key role in observing, documenting and reporting to DFO fishing related occurrences. Occurrence reporting procedures are reviewed with the objective of ensuring that fishery officers coast-wide are able to provide prompt response to significant enforcement issues. Observers perform duties best described as “Observe, Record and Report.” Duties are related to monitoring of fishing activities, examination and measurement of fishing gear, collection of biological samples, recording scientific data, monitoring the landing of fish occurrences and verification of the weight and species of fish caught and retained. Observers, while performing a vital role contributing to regulatory compliance, are not enforcement officers. Observers must carry proof of their designation by DFO as an Observer (laminated card). Dockside Observers monitor and document weigh-out inspections at all approved landing locations. Observers interview the fisher, assigning catch to the appropriate stock area, spot-check harvest logs for consistency with verbal reports and notify the Department of any occurrences observed during the interview, logbook review and offload process.

DFO’s Conservation and Protection (C&P) program has a large role in facilitating compliance with the acts and regulations associated with Canada’s aquatic resources. Through modern community policing practices, C&P uses education, partnering, enforcement and problem solving to assist in the conservation and protection of the fishery resources.

There are approximately 155 fishery officers stationed in the Pacific Region, which encompasses the province of British Columbia and Yukon Territory. They are designated as “fishery officers” under Section 5 of the *Fisheries Act* and have full enforcement powers and responsibilities outlined in the *Fisheries Act, Coastal Fisheries Protection Act, Oceans Act, Species at Risk Act,* the *Criminal Code* of Canada and the *Constitution Act.* Fishery officers are tasked with the responsibility of responding coast-wide to calls from the general public, other agencies, observers and other industry users reporting all types of occurrences including commercial groundfish landings. Fishery officers inspect and investigate groundfish vessels for compliance with terms and Conditions of Licences, Fisheries Act and related Regulations and Variation Orders.

Fishery officers conduct inspections both dockside and at sea to verify compliance with Licence Conditions. Due to the complexity of transferable Individual Transferable Quota (ITQ) and the related licence amendment system, tracking of catch quantities under the ITQ system is primarily performed administratively under the dockside-monitoring program. Surveillance of the fishery is also conducted by vessel and aircraft (DFO 2013b).

United States

Observers. The mission of the Federal At-Sea Hake Observer Program is to collect data on fishing effort, total catch by species, and biological data; characterize marine mammal and sea bird interactions during the Pelagic mid-water trawl fishery for Pacific Hake.

The Magnuson-Stevens Fishery Conservation and Management Act and the Marine Mammal Protection Act authorize NMFS to place observers on Pacific Hake vessels. The action is mandatory. All vessels carry two observers at all times (31 observers deployed in 2010). NMFS is responsible for funding and overall administration of the program including observer training, debriefing and data management. The fishing industry is responsible for making arrangements with contracting companies that meet the North Pacific Observer Program NMFS-certification requirements for placement of NMFS-trained observers aboard their vessels and paying contractors for direct observer costs. The observer contractors are responsible for observer recruiting, deployment, logistics, and insurance/benefits.

Observer coverage responsibilities are shared among, the fishing industry and four independent observer contractors (who are certified by NMFS). The contractors hire and deploy observers. The NMFS also provides other observer support services (sampling gear and training documents) and is responsible for maintaining information systems for scientific and operational data, and administrative support.

Compliance. At-sea and shore-side enforcement is carried out by the state fish and wildlife agencies or California, Oregon and Washington, NMFS Office of Law Enforcement (OLE), and the US Coast Guard (USCG). State and federal fisheries enforcement officers make use of USCG vessels to assist in surveillance and enforcement.
At-sea enforcement includes:

- Monitoring of commercial fishing activities to ensure compliance with fishery laws and regulations;
- Actions to close commercial fisheries once catch limits have been reached;
- Educating participants in the fishery on the laws and regulations;
- Penalizing violators. NMFS Management, NMFS OLE, and the USCG all conduct extensive outreach and education programs that seek not only to explain the regulations, but also to help the fishing industry understand the rationale for those regulations. Outreach on the trawl ITQ program was conducted throughout the process of program development and implementation (D. Mathews, Pers. Comm. 2011). NMFS agents and officers can assess civil penalties directly to the violator in the form of a summary settlement or can refer the case to NOAA's Office of General Counsel for Enforcement and Litigation who can impose a sanction on the vessels permit or further refer the case to the U.S. Attorney's Office for criminal proceedings. Penalties may range from severe monetary fines, boat seizure and/or imprisonment (NMFS 2011c).

The USCG operates within an "Ocean Guardian" strategic plan within which their objectives are to prevent encroachment of the U.S. EEZ, ensure compliance with domestic fisheries regulations, and ensure compliance with international agreements. The USCG makes an annual report to the PFMC on resources applied to fishery enforcement in the previous year, including numbers of boardings. It also details numbers of violations by year, lives lost at sea, safety issues, and any changes in regulations (cf. PFMC 2011t).

The NMFS Northwest Regional Office has issued two compliance guides to assist the industry with the new groundfish trawl ITQ program processes and regulations. The 81-page program compliance guide is intended as a plain-language summary of how small businesses can comply with regulations implementing the Pacific Coast groundfish trawl rationalization program, and covers a range of subjects including: observer program, catch monitor program for IFQ, catch weighing requirements, first receiver site licenses, quota share accounts, vessel accounts, gear switching, coop permits/coop agreements, economic data collection program, and further tracking and monitoring requirements (NMFS 2011b.) NMFS published a second 36-page compliance guide covering the program application process (NMFS 2010b).

As noted in Section 6.2.2.1.7 above, the PFMC maintains a standing Enforcement Consultants committee comprising state and federal enforcement officials that provides ongoing interaction with enforcement personnel at each Council meeting.

3.5.12 Details of any planned education and training for interest groups

Canada

DFO provides a range of opportunities for stakeholder education and input into management consistent with its 2004 Consultation Framework policy document. The Consultation Framework sets out 9 principles that guide DFO's engagement with other interests, which support their education and training:

1. Commitment: Effective consultations require leadership and a shared commitment so that the results from consultations will be considered in the decision-making
2. Evaluation: Consultations will be evaluated periodically throughout the process and at their conclusion based on objectives set out in an established consultation plan.
3. Timing: Consultations will be organized with appropriate timeframes and deadlines so that participants are provided reasonable time to prepare and provide their input.
4. Inclusiveness: Consultations will involve the appropriate range of groups or individuals that may have an interest in, be affected by or can make a meaningful contribution to a government decision.
5. Accessibility: Reasonable steps will be taken to determine how clients, stakeholders, and others wish to be consulted and to provide them with relevant, understandable information.
6. Clarity: Participants need to know the objective of consultations and be able to understand the information and documentation they receive.
7. Accountability: Roles and responsibilities in consultations will be clearly communicated.
8. Transparency: Consultations will be documented and results disseminated in a timely manner.
9. Coordination: Viewpoints, perspectives and comments on consultations, including the process and the product will be shared within the department and take into account impacts on and feedback from other initiatives.

Based on these principles, interest groups are provided opportunities to participate in scientific and management advisory processes to ensure they are informed and to provide opportunities for feedback:

- Through the Canadian Science Advisory Secretariat process, DFO Scientific assessments and advice respecting the assessment and management of fisheries is peer reviewed annually in Regional Peer Review meetings. Government and non-government individuals with knowledge and technical expertise pertaining to each peer review meeting are invited to contribute to the peer review and development of advice.

- DFO has established a number of groundfish fishery advisory processes to support and inform departmental decision making on fisheries management issues. These include advisory processes for individual groundfish fisheries and integrated advisory processes that address cross-cutting issues relevant to multiple groundfish fisheries and bring together all interest groups (commercial fisheries, recreational fisheries, coastal communities, environmental groups, First Nations, labour, etc). The full list of groundfish advisory processes and the roles and responsibilities of each advisory body can be found online: http://www.pac.dfo-mpo.gc.ca/consultation/ground-fond/index-eng.html.
- These bodies meet regularly and are open to the public, and supporting documents and DFO minutes are available from the respective DFO species co-ordinators.

DFO continually engages with and seeks advice from these advisory bodies, which play a key role in proposing alternative management approaches for issues that DFO is planning to address. DFO may also engage with interest groups through other processes (e.g., bilateral consultations with First Nations).

United States

The Council provides a range of opportunities for stakeholder education and input into management required by federal statute and implemented through its standard operating procedures (Statement of Organization, Practices and Procedures (SOPPs) (PFMC 2004). Descriptions of stakeholder consultation procedures available on the NPFMC website identify several elements of PFMC procedures that enable the distribution of information to stakeholders and the provision of public comment to management (www.pcouncil.org):

- Consultation among federal agencies, state agencies, universities and stakeholders in the provision of scientific information;
- Review of data and analysis through interdisciplinary Groundfish Management Team meetings which are publicly announced and at which public comment is accepted;
- Scientific review and comment on all scientific matters on the Council's agenda by the interdisciplinary SSC, at meetings open to the public;
- Advice to PFMC provided by a the Groundfish Advisory SubPanel, the Ecosystem Advisory Subpanel and several ad hoc advisory committees representing major segments of the fishing industry and other stakeholders; catching and processing, subsistence and commercial fishermen, observers, consumers, environmental/conservation, and sport fishermen. All proposed actions are discussed at open meetings at which public comment is taken.
- Published timely notice of all meetings and meeting agendas according to requirements of the MSA, with meeting dates and locations scheduled three years in advance, posted on PFMC website;
- Regular dissemination of the Council newsletter, blogpost and twitter feed on the PFMC website;
- Rotating meeting locations to facilitate public involvement;
- Identification of committee membership, affiliation and contact information of council committees;
- A guide to the Council process posted on the PFMC website;
- Instructions for submitting written or oral public comment, posted on PFMC website;
- Public comment on all action items at PFMC meetings;
- Publication of FMP amendments, and the proposed rules implementing such measures, in the *Federal Register* to allow for public comment. All comments to final rules receive a written response. A Record of Decision explains the rationale for NMFS action;
- Judicial review of regulations promulgated under the Act is provided by Section 305(f) of the MSFCMA, enabling stakeholders to legally challenge a Secretarial action;

3.5.13 Date of next review and audit of the management plan

Canada

The Groundfish IFMP is reviewed each year through several advisory processes, including GIAB, CIC, and GTAC, among others. The IFMP is also posted for public comment every two years to provide an opportunity for others to review the document and send feedback. In addition to coordinating input from advisory bodies and the public, the DFO Groundfish Management Unit coordinates internal review of the IFMP with other relevant branches, including enforcement, Policy, Oceans, Species at Risk, Aquaculture, and Treaty and Aboriginal programs, among others. Internal and external review of the plan The DFO Regional Director General for the Pacific Region approves the Groundfish IFMP before it is implemented in February of each year.

The offshore Pacific Hake management plan is reviewed every year following consultation on the draft plan through GTAC and IHAC each spring. The final plan is an addendum to the IFMP, and becomes effective in mid June each year. The IHAC and GTAC also meet regularly in season to review in-season management changes needed.

United States

The biennial management cycle and activities related to groundfish including Pacific Hake, management contain extensive points of review detailed in the Council Operating Procedures (PFMC 2010a). These involve month-specific review actions taken by the Scientific and Statistical Committee, Groundfish Management Team and Groundfish Advisory Subpanel
Management measures are implemented for a two-year period with harvest specifications (ABCs and OYs) identified for each year in the biennium.

The trawl rationalization program under Amendment 20 contains review provisions in addition to those specified for the FMP. These include annual renewal requirements and regular program reviews to ensure program goals are being met, a provision for NMFS to review, track, and monitor program implementation and needs, and the mandatory five-year performance review (PFMC 2010b) described in Section 6.3.6.1.11 (75 CFR 2010).

3.5.14 Description of fishery's research plan

Under the Hake Agreement, the latest available SRG Research Recommendations include (SRG 2013):

Highest- priority recommendations

1. Increase frequency of acoustic survey to annual. The acoustic survey provides the most important data series for estimating biomass dynamics in the stock. However, the survey's impact on the assessment is delayed by being conducted only in odd years. That limitation is especially pertinent because the stock and fishery rely on intermittent high recruitment, and such recruitment is detected by the acoustic survey when fish reach age 2 or 3, (up to three years after recruitment), by which time they are part of the fishery. The SRG recommends that the survey be conducted annually, which would improve management's ability to react to both strong and weak recruitments. It would also reduce the period of uncertainty following survey values (e.g., 2009) that when modelled does not appear compatible with other information.

- The SRG recognizes that initiating an annual survey immediately (i.e., adding an additional full survey in 2012) would provide immediate improvements in the

precision of the assessment, which would in turn improve the information available for management decisions in the next few years. Given that fishery data alone has proved unsuccessful at informing the scale of current abundance in the past, a 2012 survey point could be the only way to resolve the magnitude of the 2008 year class prior to decision-making in 2013.

- In response to this recommendation, the acoustics team expressed concerns that implementing a full-scale survey in 2012 would come at the expense of other work planned by the survey team in 2012. In particular, the survey team plans to conduct additional work on target strength in 2012, which will help improve the accuracy of future surveys, and to conduct work designed to provide for a joint survey of Hake and sardine, which will provide a more cost-effective means of achieving an annual survey on an ongoing basis. The SRG believes that an attempt to do a limited Hake survey plus the long-term work is not advisable because a limited Hake survey (e.g. fewer transects) would produce results that are even more uncertain than those from a full survey. The SRG agreed with the acoustics team that conducting a survey in 2012 would only be beneficial if resources were available for a full-scale survey in both Canadian and US waters.

- The SRG concluded that while a 2012 survey would help better inform management in 2013, research into increased survey efficiency / precision could help better inform management in the long-term. In the absence of increased resource allocation to the 2012 survey, a trade-off between these short-term and long-term benefits will be necessary, especially due to the limited number of experienced personnel available.

- Management strategy evaluation (MSE). The SRG recommends that a management strategy evaluation framework be developed for this fishery. Such a framework would allow the JTC to provide better guidance to the JMC on how different forms of management (i.e., the combination of data collection, stock assessment, and harvest decision rules) affect trade-offs between potential management objectives, among them magnitude and stability of yield. In addition, an MSE can elucidate which management strategies are more or less robust to unavoidable biological and assessment uncertainties, which are considerable in a fishery that relies on periodic large recruitments. Conducting an MSE will require a significant commitment of resources by the JTC, and the SRG considers it a high priority.

- In simulating the acoustic survey in an MSE, we recommend that observation errors be drawn from a mixture distribution, rather from a single statistical distribution. The mixture would have a minority of observations drawn from a distribution with considerably wider tails (larger variance) than the majority. This recommendation stems from the observation that in this assessment (and in others the panel is familiar with), the majority of survey biomass index values were fit quite well, and a minority fit quite poorly.

<u>Other recommendations</u>

- Inter-vessel calibrations. The SRG notes that calibration of acoustics gear is performed regularly on vessels conducting the survey; however, potential differences among vessels have not yet been quantified fully. We recommend periodic inter-vessel calibrations. Based on comments from experts, the SRG believes that about 10% of the survey budget might be needed for such work. This is an important aspect of quality control in this assessment.
- Age-1 or -0 index development. Because the current acoustic survey does not develop an index of fish below age 2, a large recruitment (when it occurs) cannot be confirmed for several years, especially given surveys only in odd years. An index of abundance of young (age-0 and/or age-1) Hake could speed reaction of stock assessments to high recruitment events. Preliminary research has been done on the

potential of obtaining an index from the acoustic survey. The SRG recommends that research be carried forward.

- Life-history data improvements. Present information on maturity at age is from a single study in the 1990s. A new study of maturity at age is in progress, which the SRG strongly supports. The SRG recommends regular collection and analysis of life-history data such as growth, fecundity, and maturity at age, rather than relying on static values from the literature.
- Survey extent. Based on comments from an industry participant, the SRG recommends that the survey team explore the seaward extent of Hake distribution, particularly at the northern end of the range, and that some portion of the survey be extended seaward if warranted. The commenter stated that substantial Hake catches have been made over the last 5 years seaward of acoustic transects in Canadian waters. The SRG was unable to evaluate this situation, because data are protected by privacy regulations.
- Survey variance. The SRG recommends that research be continued on more complete estimation of variance in the acoustic survey. We refer to estimation from survey characteristics, independent of the stock-assessment model. Current variance estimates are a product of the kriging procedure and thus reflect only statistical sampling error, but the SRG believes (and assessment results confirm) that other physical and biological processes contribute the majority of variance. It was noted that AFSC scientists have been working on a similar problem, and that discussions and collaboration would be useful.

    - In connection with the preceding recommendations, the SRG acknowledges that additional data collection and analysis will require significant additional resources from both nations, a commitment that seems to be warranted, given the importance of this stock to both nations.

    - The SRG also notes that statistical and simulation studies could be useful, in many cases, in choosing or refining the most fruitful approaches to data improvement.

- The SRG recommends that use of commercial vessels in acoustic or biological sampling be explored as one way to expand sampling. This might include scientific analysis of echo data collected by commercial vessels in the course of fishing.
- Target characterization and verification. The SRG recommends that, as part of statistical studies to evaluate improved sampling options, that an increasing the number of target-verification tows and conducting target-strength research be considered. This could reduce uncertainty in assigning species and demographic characteristics to acoustic signals. Potentially, this could be done in collaboration with industry.
- Exploration of separability assumption in the assessment model; i.e., the assumption that selectivity is constant over time. The SRG recommends that, as a sensitivity analysis, the JTC examine the effects of relaxing the separability assumption in the assessment model. This could be done by fitting a simple tuned catch-age model (e.g., ADAPT) to the catch-at-age data and survey index. Observing that such a model could not improve the survey fit would further confirm that the 2009 and 2011 survey estimates are incompatible with each other.

4 Evaluation Procedure

4.1 Harmonised Fishery Assessment

The fishery does not overlap with other fisheries. No harmonization required.

4.2 Previous assessments

This assessment report is part of the determination whether to re-certify the fishery; therefore, the fishery has undergone an initial assessment and four annual surveillance audits. As of the third annual surveillance, the fishery had closed out all conditions. No conditions from the original assessment remained for consideration prior to the PCDR of this re-assessment.

4.3 Assessment Methodologies

This assessment used the MSC Certification Requirements V 1.3 and the MSC Full Assessment Reporting Template V 1.3. The default assessment tree was used without modifications.

4.4 Evaluation Processes and Techniques

4.5 Site Visits and consultation

The surveillance team of Robert Trumble, Max Stocker, and Mark Pedersen met with the staff of: the West Coast Regional Office and Northwest Fisheries Science Center of the US National Marine Fisheries Service (NMFS), the Makah tribe, Washington Department of Fish and Wildlife, the Pacific Fishery Management Council, the science and management of Fisheries and Oceans Canada (DFO); the Province of British Columbia, representatives of the Canadian industry, the Environmental Defense Fund, and the David Suzuki Foundation. The client close-out meeting was held from 1:00 – 3:00pm, November 28th. The team met in person in Seattle with those organizations and individuals that requested a meeting, and by teleconference with others. Mr. Colin Brannen, auditor for Accreditation Services International, attended the meetings on the 20-22 November. The table below summarizes the participation, location, and topics of the meetings. The site visit occurred in person in Seattle from 20-23 November, 2014, and by teleconference on 25 and 26 November 2014.

Date 2013	Location	Name/Affiliation	Topic
20 Nov	Seattle	Kevin Duffy, Becky Renko – NMFS, WCRO; Robert Trumble, Mark Pedersen, Max Stocker – Team; Colin Brannen - ASI	• Progress of Agreement implementation • Changes to the fishery management framework • Changes to management tools • Upcoming changes • Progress on Conditions
20 Nov	Conf call	Steve Joner – Makah Tribe; Robert Trumble, Mark Pedersen, Max Stocker – Team; Colin Brannen - ASI	• Progress of Agreement implementation • Changes to the fishery management framework • Review of Makah participation • Makah fishery observers
20 Nov	Conf call	Dayna Mathews – NOAA OLE; Robert Trumble, Mark Pedersen, Max Stocker – Team; Colin Brannen - ASI	• Changes to Enforcement framework • Summary of compliance, enforcement issues • Implications of Agreement implementation
20 Nov	Conf call	Shems Jud – EDF; Robert Trumble, Mark Pedersen, Max Stocker – Team;	• Environmental issues: abundance variability; rougheye rockfish bycatch; ecosystem impact

Date 2013	Location	Name/Affiliation	Topic
		Colin Brannen - ASI	
21 Nov	Conf call	Michelle Culver, Corey Niles – WDFW; Robert Trumble, Mark Pedersen, Max Stocker – Team; Colin Brannen - ASI	• Co-management with tribes • WDFW enforcement • Salmon bycatch
21 Nov	Conf call	Chuck Tracy, John DeVore, Kelly Ames, Mike Burner – PFMC; Robert Trumble, Mark Pedersen, Max Stocker – Team; Colin Brannen – ASI	• EPDT progress, next steps • Changes to the fishery management • framework • Ecosystem management tools • Upcoming changes • Implications of Agreement implementation • Progress on conditions
21 Nov	Seattle	Michele McClure, Jim Hastie, Allan Hickes, Vanessa Tuttle, Isaac Kaplan – NMFS, NWFSC; Nathan Taylor – DFO Science; Robert Trumble, Mark Pedersen, Max Stocker – Team; Colin Brannen - ASI	• Changes to stock assessment process; 2013 stock assessment; • Ongoing and new research • Ecosystems • Observers, IFQ
22 Nov	Seattle	Dan Waldeck, Jan Jacobs, Pacific Whiting Conservation Cooperative; Brad Pettinger, Oregon Trawl Commission; Shannon Mann, Association of Pacific Hake Fishermen; Robert Trumble, Mark Pedersen, Max Stocker – Team; Colin Brannen - ASI	• Changes to the fishery • Implications of Agreement implementation • Progress on conditions • General findings
25 Nov	Conf Call	Barron Carswell, Dennis Chalmers – BC Province; Robert Trumble, Mark Pedersen, Max Stocker – Team	• Implications of Agreement implementation • Provincial role in management • Shoreside processing
25 Nov	Conf Call	Greg Workman, Chris Grandin, DFO Science; Robert Trumble, Mark Pedersen, Max Stocker – Team	• Changes to DFO personnel • Participation in Annual Stock Assessment • Changes to assessment process • Current / new research • 2013 stock assessment
26 Nov	Conf Call	Paul Ryall, Murray Gilchrest, Barry Ackerman, DFO Management; Robert Trumble, Mark Pedersen, Max Stocker – Team	• Implications of Agreement implementation • Management system changes • Progress on Conditions
26 Nov	Conf Call	Scott Wallace - David Suzuki Foundation; Robert Trumble, Mark Pedersen,	• Fishery effects on environment; rockfish and salmon bycatch

Date 2013	Location	Name/Affiliation	Topic
		Max Stocker – Team	
26 Nov	Conf Call	Bruce Turris, Shannon Mann - Canada Industry; Robert Trumble, Mark Pedersen, Max Stocker – Team	• Changes to the fishery • Progress of Agreement implementation • Progress on conditions • General findings

4.5.1 Evaluation Techniques

MRAG published an announcement of the re-assessment of the fishery on IntraFish.com, and the MSC posted the announcement on its re-assessment downloads page. Together, these media presented the announcement to a wide audience representing industry, agencies, and stakeholders.

The assessment team and the clients set up meetings with US and Canadian science, management, and enforcement personnel, and the team set up a meeting with all other stakeholders who requested one.

Scoring followed a consensus process in which the assessment team discussed the information available for evaluating performance indicators to develop a broad opinion of performance of the fishery against each performance indicator. Review of sections 3.2, 3.3, 3.4 and 3.5 by all team members assured that the assessment team was aware of the issues for each performance indicator. Subsequently, the assessment team member responsible for each principle filled in the scoring table and provided a provisional score. The assessment team members reviewed the rationales and scores, and recommended modifications as necessary, including possible changes in scores. The team members agreed on the final scores. This process followed the MSC CR V1.3 section 27.10. The MSC has 31 ‘performance indicators’, seven in Principle 1, 15 in Principle 2, and nine in Principle 3. The performance indicators are grouped in each principle by ‘component.’ Principle 1 has two components, Principle 2 has five, and Principle 3 has two. Each performance indicator consists of one or more ‘scoring issues;’ a scoring issue is a specific topic for evaluation. ‘Scoring guideposts’ define the requirements for meeting each scoring issue at the 60 (conditional pass), 80 (full pass), and 100 (state of the art) levels.

Note that some scoring issue may not have a scoring guidepost at each of the 60, 80, and 100 levels; in the case of the example above, scoring issue (b) does not have a scoring issue at the SG60 level. The scoring issues and scoring guideposts are cumulative; this means that a performance indicator is scored first at the SG60 levels. If not all of the SG scoring issues meet the 60 requirements, the fishery fails and no further scoring occurs. If all of the SG60 scoring issues are met, the fishery meets the 60 level, and the scoring moves to SG80 scoring issues. If no scoring issues meet the requirements at the SG80 level, the fishery receives a score of 60. As the fishery meets increasing numbers of SG80 scoring issues, the score increases above 60 in proportion to the number of scoring issues met; performance indicator scoring occurs at 5-point intervals. If the fishery meets half the scoring issues at the 80 level, the performance indicator would score 70; if it meets a quarter, then it would score 65; and it would score 75 by meeting three-quarters of the scoring issues. If the fishery meets all of the SG80 scoring issues, the scoring moves to the SG100 level. Scoring at the SG100 level follows the same pattern as for SG80.

Principle scores result from averaging the scores within each component, and then from averaging the component scores within each Principle. If a Principle averages less than 80, the fishery fails.

Scoring elements

Component	Scoring elements	Main/not main	Data-deficient or not
Target	Pacific Hake	Target	N
Retained	Yellowtail Rockfish	Main US, Canada	N
	Widow Rockfish	Main US	N
	ShortrakerRockfish	Main US	N
	Rougheye Rockfish	Main US	N
	Spiny Dogfish	Main US	N
	Redstripe Rockfish	Main Canada	N
	Bocaccio	Main Canada	N
	Walleye Pollock	Main Canada	N
	Minor retained see Tables 8 and 9		
Bycatch	Rougheye Rockfish	Main Canada	N
	Minor retained see Tables 10 and 11		
ETP	ESA salmon	Main US	N
Habitat	Pelagic habitat	Main US, Canada	N
Ecosystem	California Current	Main Us, Canada	N

5 Traceability

5.1 Eligibility Date

As the fishery is currently certified, the actual eligibility date is the date of certification, 25 November 2014.

5.2 Traceability within the Fishery

The offshore Pacific Hake fisheries in the US and Canada operate under catch share programs that have rigorous reporting requirements. In both cases, the fisheries have 100% at sea monitoring, either via on-board monitoring or electronic monitoring, and 100% dockside monitoring. All landings are recorded on fish receiving tickets. There are two much smaller stocks with much smaller ranges potentially overlapping the Pacific Hake unit of certification: a Puget Sound stock and a Gulf of Georgia stock. These separate, and much smaller, populations are not included in this analysis. US vessels permitted for the offshore hake fishery do not have permits to fish in the waters of Puget Sound or Gulf of Georgia. Canadian vessels in the Gulf of Georgia may not mix catch with certified offshore hake: offshore and most Gulf of Georgia hake vessels must have 100% observer coverage, and all landings have 100% dockside monitoring to confirm area of landing. The section below describes the rigorous monitoring and traceability of the Pacific Hake landings.

The client group for the US includes all fishermen and companies authorized to fish for and sell Pacific Hake, with the exception of US fishermen with authorization to fish with demersal trawls. The demersal trawl fishermen may take Pacific Hake incidentally, and may sell them. However, they are not part of the client group and may not use the MSC certificate. The US does not specify landing sites, but rather requires a ‘first receiver site license’ for each onshore buying station that authorizes the holder to receive, purchase, or take custody, control, or possession of an IFQ landing at a specific physical site onshore directly from a vessel. Each buyer of groundfish from a vessel making an IFQ landing must have a first receiver site license for each physical location where the IFQ landing is offloaded. Catcher vessels may land on shore or deliver codends to processing vessels. Onshore landings must go to a site with a first receiver site license. Vessels with mothership and catcher vessel permits may participate in the mothership fishery with at-sea deliveries to vessels designated in section 5.3. Motherships must meet reporting requirements, have observers as specified, and weigh all catch in its round form on a NMFS-approved scale. All

motherships 125 ft (38.1 m) LOA or longer must carry two NMFS-certified observers, and all vessels shorter than 125 ft (38.1 m) LOA registered to an Mothership permit must carry one NMFS-certified observer while receiving fish. Any vessel delivering catch to any mothership must carry one NMFS-certified observer while fishing. Landings records identify vessels and gear, so that little likelihood exists that Hake from demersal trawls could enter the MSC supply chain.

The Canadian certificate is opened to all T Licensed hake vessels annually upon agreement to an annual cost share agreement. Without the agreement, the Canadian client group restricts the certificate to member vessels only. To date, there has always been a cost share agreement reached and therefore the certificate has been open. Landings records identify vessels and gear, so that little likelihood exists that Hake from these vessels outside the cost sharing agreement could enter the MSC supply. Only catches from the Gulf of Georgia could potentially mix with the certified Canadian fishery. The 2014-2015 Conditions of Licence specify the statistical areas of the offshore (certified) area and the Gulf of Georgia area. The Conditions of Licence require records of location of catch, which is monitored by on-board observers or electronic monitoring and by on-shore monitors. All Pacific Hake caught in the offshore Area shall be landed at

- a fish buying station licenced under the *Fisheries Act* (Province of British Columbia) at the following locations:
  - Ucluelet;
  - Port Alberni;
  - Port Hardy;
  - Coal Harbour;
  - Victoria;
  - Metro Vancouver;
  - Port Simpson; or
- in the United States (Washington State) at Westport; or
- transhipped to a foreign fishing vessel licensed under the *Coastal Fisheries Protection Regulations*.

No fish shall be landed unless an observer is present and authorizes the commencement of weight verification. The weight and species of all fish landed from the vessel shall be verified by an observer. Therefore, little risk exists for contamination of certified Pacific Hake by non-certified product.

Pacific hake is a white fish, similar in characteristics to many other white fish. It could be difficult to distinguish Hake from other fish once processed. However, motherships and catcher-processors must have CoC prior to processing, so substitution with uncertified fish is unlikely. Shoreside landings require 100% monitoring, so all non-hake would be sorted out upon landing. Hake represents on the order of 99% of the volume of catch, so very little uncertified fish occur in the Hake fisheries. Therefore, it is unlikely that substitutions could occur.

5.3 Eligibility to Enter Further Chains of Custody

This fishery certification has evaluated the Chain of Custody to the point of first landing at shoreside or transfer at sea, for both the US and Canada. Chain of custody certifications will be required for the motherships, Joint Venture motherships (Canada), catcher/ processor vessels (US), and shoreside processing operations. Catcher vessels (including Makah Tribal catcher vessels) providing raw product to either the mothership sector or shoreside will not require chain of custody certification. Canadian catcher vessels (including vessels that produce headed, gutted, and tailed frozen hake) of the client group providing Pacific hake product to either the JV motherships or shoreside processors will not require chain of custody certification. Transhipment of Canadian hake is authorized to foreign fishing vessels.

US Pacific Hake Client Companies Authorized to Sell MSC Certified Pacific Hake

U.S. Catcher-Processor Owning Companies (if in possession of a valid chain of custody certification):

- American Seafoods Company
- Glacier Fish Company
- Trident Seafoods

U.S. Mothership Catcher Vessels: All legally permitted catcher vessels participating in the Mothership hake fishery, inclusive of vessels in Washington, Oregon and California

U.S. Mothership Owning Companies (if in possession of a valid chain of custody certification):

- American Seafoods company
- Arctic Storm Management Group
- Golden Alaska Seafoods
- Phoenix Processor Limited Partnership
- Premier Pacific Seafoods

U.S. Shoreside Vessels: All legally permitted catcher vessels participating in the Shoreside hake fishery, inclusive of vessels in Washington, Oregon and California

U.S. Shoreside Vessels, Processing Companies and Locations: All Pacific hake processing companies in Oregon if in possession of a valid chain of custody certification and processing Pacific hake legally landed in Oregon and; The following client group Pacific hake processing companies, if in the possession of a valid chain of custody certification and processing legally landed Pacific hake from vessels certified in the MSC Pacific Hake mid-water trawl fisheries:

- Trident Seafoods (processing facilities in Washington and Oregon)
- Ocean Gold Seafoods, Inc. (processing facilities in Westport, WA)
- Washington Crab Producers (processing facilities in Westport, WA)
- Bandon Pacific Seafoods (processing Facilities in Charlestown, OR)
- Pacific Coast Seafoods (processing facilities in Warrenton, OR)
- Pacific Shrimp Co. (Processing facilities in Newport, OR)
- Pacific Choice Seafood (Processing facilities in Eureka, CA)
- Jessie's Ilwaco Fish Co (processing facilities in Ilwaco, WA)

Canadian Pacific Hake Client Vessels Authorized to Sell MSC Certified Pacific Hake

These vessels are always authorized to sell MSC Certified Pacific Hake: Sea Crest, Northern Osprey, Northern Alliance, Knight Dragon, Sun Maiden, Gulf Spirit, Osprey No 1, Snow Drift, Free Enterprise #1, RAW Spirit, Ocean King, Blue Waters, Ante B, North Isle, Island Sun, Carmana, Nemesis, Canadian No 1.

Upon annual agreement on the cost sharing of the certificate, the entire Trawl licensed sector is then authorized to sell MSC certified Pacific Hake. The agreement covers the fishery from February 21st to the following February 20th, one year each.

5. 4 Eligibility of Inseparable or Practically Inseparable (IPI) stock(s) to Enter Further Chains of Custody

The fishery does not contain any IPI stocks.

6 Evaluation Results

6.1 Principle Level Scores

Table 2 Final Principle Scores

Final Principle Scores		
Principle	**Score US**	**Score Canada**
Principle 1 – Target Species	88.9	
Principle 2 – Ecosystem	97.7	91.3
Principle 3 – Management System	100	100

6.2 Summary of Scores

Fishery Assessment Scoring Worksheet - US Pacific Hake

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in Princ			Score	Contribution to Principle Score	
						Either		Or			Either	Or
One	1	Outcome	0.5	1.1.1	Stock status	0.5	0.25	0.333	0.1667	90	22.50	15.00
				1.1.2	Reference points	0.5	0.25	0.333	0.1667	90	22.50	15.00
				1.1.3	Stock rebuilding			0.333	0.1667			0.00
		Management	0.5	1.2.1	Harvest strategy	0.25	0.125			85	10.63	10.63
				1.2.2	Harvest control rules & tools	0.25	0.125			80	10.00	10.00
				1.2.3	Information & monitoring	0.25	0.125			90	11.25	11.25
				1.2.4	Assessment of stock status	0.25	0.125			95	11.88	11.88
Two	1	Retained species	0.2	2.1.1	Outcome	0.333	0.0667			90	6.00	
				2.1.2	Management	0.333	0.0667			95	6.33	
				2.1.3	Information	0.333	0.0667			100	6.67	
		Bycatch species	0.2	2.2.1	Outcome	0.333	0.0667			85	5.67	
				2.2.2	Management	0.333	0.0667			100	6.67	
				2.2.3	Information	0.333	0.0667			95	6.33	
		ETP species	0.2	2.3.1	Outcome	0.333	0.0667			100	6.67	
				2.3.2	Management	0.333	0.0667			100	6.67	
				2.3.3	Information	0.333	0.0667			100	6.67	
		Habitats	0.2	2.4.1	Outcome	0.333	0.0667			100	6.67	
				2.4.2	Management	0.333	0.0667			100	6.67	
				2.4.3	Information	0.333	0.0667			100	6.67	
		Ecosystem	0.2	2.5.1	Outcome	0.333	0.0667			100	6.67	
				2.5.2	Management	0.333	0.0667			100	6.67	
				2.5.3	Information	0.333	0.0667			100	6.67	
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.25	0.125			100	12.50	
				3.1.2	Consultation, roles & responsibilities	0.25	0.125			100	12.50	
				3.1.3	Long term objectives	0.25	0.125			100	12.50	
				3.1.4	Incentives for sustainable fishing	0.25	0.125			100	12.50	
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2	0.1			100	10.00	
				3.2.2	Decision making processes	0.2	0.1			100	10.00	
				3.2.3	Compliance & enforcement	0.2	0.1			100	10.00	
				3.2.4	Research plan	0.2	0.1			100	10.00	
				3.2.5	Management performance evaluation	0.2	0.1			100	10.00	

Overall weighted Principle-level scores		Either	Or
Principle 1 - Target species	Stock rebuilding PI not scored	88.8	
	Stock rebuilding PI scored		
Principle 2 - Ecosystem		97.7	
Principle 3 - Management		100.0	

Fishery Assessment Scoring Worksheet Canada Pacific Hake

Prin-ciple	Wt (L1)	Component	Wt (L2)	PI No.	Performance Indicator (PI)	Wt (L3)	Weight in Princ			Score	Contribution to Principle Score	
						Either		Or			Either	Or
One	1	Outcome	0.5	1.1.1	Stock status	0.5	0.25	0.333	0.1667	90	22.50	15.00
				1.1.2	Reference points	0.5	0.25	0.333	0.1667	90	22.50	15.00
				1.1.3	Stock rebuilding			0.333	0.1667			0.00
		Management	0.5	1.2.1	Harvest strategy	0.25	0.125			85	10.63	10.63
				1.2.2	Harvest control rules & tools	0.25	0.125			80	10.00	10.00
				1.2.3	Information & monitoring	0.25	0.125			90	11.25	11.25
				1.2.4	Assessment of stock status	0.25	0.125			95	11.88	11.88
Two	1	Retained species	0.2	2.1.1	Outcome	0.333	0.0667			80	5.33	5.33
				2.1.2	Management	0.333	0.0667			95	6.33	6.33
				2.1.3	Information	0.333	0.0667			75	5.00	5.00
		Bycatch species	0.2	2.2.1	Outcome	0.333	0.0667			80	5.33	5.33
				2.2.2	Management	0.333	0.0667			100	6.67	6.67
				2.2.3	Information	0.333	0.0667			70	4.67	4.67
		ETP species	0.2	2.3.1	Outcome	0.333	0.0667			100	6.67	6.67
				2.3.2	Management	0.333	0.0667			90	6.00	6.00
				2.3.3	Information	0.333	0.0667			100	6.67	6.67
		Habitats	0.2	2.4.1	Outcome	0.333	0.0667			100	6.67	6.67
				2.4.2	Management	0.333	0.0667			100	6.67	6.67
				2.4.3	Information	0.333	0.0667			100	6.67	6.67
		Ecosystem	0.2	2.5.1	Outcome	0.333	0.0667			90	6.00	6.00
				2.5.2	Management	0.333	0.0667			100	6.67	6.67
				2.5.3	Information	0.333	0.0667			90	6.00	6.00
Three	1	Governance and policy	0.5	3.1.1	Legal & customary framework	0.25	0.125			100	12.50	
				3.1.2	Consultation, roles & responsibilities	0.25	0.125			100	12.50	
				3.1.3	Long term objectives	0.25	0.125			100	12.50	
				3.1.4	Incentives for sustainable fishing	0.25	0.125			100	12.50	
		Fishery specific management system	0.5	3.2.1	Fishery specific objectives	0.2	0.1			100	10.00	
				3.2.2	Decision making processes	0.2	0.1			100	10.00	
				3.2.3	Compliance & enforcement	0.2	0.1			100	10.00	
				3.2.4	Research plan	0.2	0.1			100	10.00	
				3.2.5	Management performance evaluation	0.2	0.1			100	10.00	

Overall weighted Principle-level scores		Either	Or
Principle 1 - Target species	Stock rebuilding PI not scored	88.8	
	Stock rebuilding PI scored		
Principle 2 - Ecosystem		91.3	
Principle 3 - Management		100.0	

6.3 Summary of Conditions

Summary of Conditions

Canada

Condition number	Condition	Performance Indicator	Related to previously raised condition? (Y/N/N/A)
1	**Retained species information - Canada**	**2.1.3**	**N**
2	**Bycatch information - Canada**	**2.2.3**	**N**

6.4 Determination, Formal Conclusion and Agreement

The fishery attained a score of 80 or more against each of the MSC Principles. The MRAG Americas Assessment Team, therefore, recommends that the US and Canada Mid-Water Trawl Pacific Hake Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries. Conditions have been identified that the Canadian fishery must satisfy in order to maintain this Certification. Details are provided in Appendix 2.2.

Following this Recommendation of the assessment team, and review by stakeholders and peer-reviewers, a determination is hereby made by the MRAG Americas Certification Committee (MACC) to certify the US and Canada Mid-Water Trawl Pacific Hake Fishery.

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Appendices

Appendix 1 Catch composition tables

Appendix 2 Scoring and Rationales

Appendix 2.1 Performance Indicator Scores and Rationale

Appendix 2.2 Conditions and Client Action Plan

Appendix 3. Peer Review Reports

Appendix 4. Stakeholder submissions

Appendix 5. Surveillance Frequency

Appendix 6. Client Agreement

Appendix 6.1 Objections Process

APPENDIX 1 CATCH COMPOSITION TABLES

Appendix 1 Table 1. U.S. Hake IFQ/Coop sectors. Retained catch/landings (mt), discard (mt), and fishing mortality estimates (mt) of groundfish species from hake IFQ/Coop sectors in 2012. In shoreside hake, discard ratios were multiplied by expansion factors to generate estimated discard,sampled discard was expanded to the haul level and summed by sector, and landings were summarized from PacFIN. At-sea hake Coop Program data was summarized from the A-SHOP (Bellman et al. 2013).

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	IFQ- Shoreside Hake			At-Sea Catcher/Processor Hake			At-Sea Mothership Hake			Total Non tribal					Species catch/ ACL
Species	**Discard**	**Landed**	**Estimate**	**Discard**	**Landed**	**Estimate**	**Discard**	**Landed**	**Estimate**	**Discard**	**Landed**	**Estimate**	**% of total catch**	**2012 ACL**	
Pacific Hake	128	65,288	65,416	146	55,549	55,695	155	38,060	38,215	429	158,897	159,326	99.19%		
Rebuilding Species															
Bocaccio Rockfish (S)												No catch		274	
Canary Rockfish	0	2.14	2.14	0.14	0.13	0.27	0.13	0.02	0.15	0.27	2.29	2.56	trace	107	2.4%
Cowcod (S)												No catch		3	
Darkblotched Rockfish	0.03	4.3	4.33	0.43	1.01	1.44	0.7	0.56	1.26	1.16	5.87	7.03	trace	296	2.4%
Pacific Ocean Perch (N)	0.03	12.33	12.36	1.85	1.3	3.15	0.34	1.03	1.37	2.22	14.66	16.88	0.01%	183	9.2%
Petrale Sole		0	0			0			0	0	0	trace	trace	1,160	0.0%
Yelloweye Rockfish												No catch		17	
Non-rebuilding species															
Arrowtooth Flounder		24.82	24.82	1.06	1.49	2.55	0.89	1.19	2.08	1.95	27.5	29.45	0.02%	12,049	0.2%
Dover Sole		0.6	0.6	0.09	0.2	0.29	0.02	0.01	0.03	0.11	0.81	0.92	trace	25,000	0.0%
English Sole		0.02	0.02	0	0.01	0.01	0		0	0	0.03	0.03	trace	10,150	0.0%
Lingcod (N)		3.74	3.74		0.01	0.01	0.07	0.1	0.17	0.07	3.85	3.92	0.00%	2,151	0.2%
Longnose Skate		0.24	0.24	0.03		0.03	0.03		0.03	0.06	0.24	0.3	trace	1,349	0.0%
Longspine Thornyhead (N)		0.05	0.05	0		0			0	0	0.05	0.05	trace	2,064	0.0%
Pacific Cod		0.04	0.04	0.01	0	0.02	0.01		0.01	0.02	0.04	0.06	trace	1,600	0.0%
Sablefish (N)		**47.21**	**47.21**	**0.12**	**4.11**	**4.23**	**0.61**	**0.27**	**0.88**	**0.73**	**51.59**	**52.32**	**0.03%**	**5,347**	1.0%
Shortbelly Rockfish		0.08	0.08	0	0.02	0.02	0.17	0.1	0.27	0.17	0.2	0.37	trace	50	0.7%
Shortspine Thornyhead (N)		8.32	8.32	0.87	0.36	1.23	0.35	0.16	0.51	1.22	8.84	10.06	**0.01%**	1,556	0.6%
Spiny Dogfish	**0.44**	**159.64**	**160.08**	**110.2**	**38.19**	**148.34**	**22.56**	**6.9**	**29.46**	**133.2**	**204.73**	**337.88**	**0.21%**	**2,044**	16.5%
Widow Rockfish	**0.05**	**107.36**	**107.41**	**15.05**	**26.94**	**42**	**26.2**	**11.14**	**37.34**	**41.3**	**145.44**	**186.74**	**0.12%**	**600**	31.1%
Yellowtail Rockfish	**0.03**	**388.21**	**388.24**	**25.35**	**6.65**	**32**	**6.25**	**4.75**	**11**	**31.63**	**399.61**	**431.24**	**0.27%**	**4,371**	9.9%

Species	IFQ- Shoreside Hake			At-Sea Catcher/Processor Hake			At-Sea Mothership Hake			Total Non tribal			% of total catch	2012 ACL	catch/ ACL
	Discard	Landed	Estimate	Discard	Landed	Estimate	Discard	Landed	Estimate	Discard	Landed	Estimate			
Minor shelf rockfish (N)												**1.7**		**4,441**	0.0%
Bocaccio Rockfish		0.13	0.13	0.03	0.04	0.08	0.03	0.01	0.04	0.06	0.18	0.24	trace	268	0.1%
Chilipepper Rockfish		0.01	0.01		0.01	0.01	0	0	0.01	0	0.02	0.02	trace	141	0.0%
Greenspotted Rockfish		0	0			0			0	0	0	trace	trace	216	0.0%
Greenstriped Rockfish		0.05	0.05			0			0	0	0.05	0.05	trace	1,480	0.0%
Harlequin Rockfish			0			0		0	0	0	0	trace	trace	0	0.0%
Redstripe Rockfish		0.04	0.04	0	0.03	0.03	0.02	0.01	0.03	0.02	0.08	0.1	trace	289	0.0%
Rosethorn Rockfish			0			0		0	0	0	0	trace	trace	18	0.0%
Silvergray Rockfish		0.57	0.57	0.23	0.43	0.66			0	0.23	1	1.23	trace	181	0.7%
Stripetail Rockfish			0			0			0	0	0	trace	trace	56	0.0%
Shelf Rockfish Unid		0.01	0.01		0.05	0.07		0	0	0	0.06	0.06	trace		
Minor slope rockfish (N)												**198.1**		**2,410**	8.2%
Aurora Rockfish		**0.46**	**0.46**	**0**	**0**	**0.01**	**0.01**		**0.01**	**0.01**	**0.46**	**0.47**	trace	46	1.0%
Bank Rockfish			0	0	0.01	0.01		0.01	0.01	0	0.02	0.02	trace	595	0.0%
Blackgill Rockfish		0.23	0.23	0.01	0.01	0.03		0	0	0.01	0.24	0.25	trace	280	0.1%
Redbanded Rockfish		0.83	0.83	0	0	0	0		0	0	0.83	0.83	trace	64	1.3%
Rougheye Rockfish	**0.01**	**47.07**	**47.08**	**22.85**	**19.59**	**42.44**	**1.3**	**10.29**	**11.59**	**24.16**	**76.95**	**101.11**	**0.06%**	**79**	**128.8%**
Sharpchin Rockfish		0.66	0.66			0	0	0	0	0	0.66	0.66	trace	243	0.3%
Shortraker Rockfish		**56.3**	**56.3**	**0.07**	**0.6**	**0.67**		**0.01**	**0.01**	**0.07**	**56.91**	**56.98**	**0.04%**	**22**	**257.8%**
Splitnose Rockfish	0.23	16.21	16.44	0.47	9.23	9.7	2.85	7.93	10.78	3.55	33.37	36.92	**0.02%**	897	4.1%
Yellowmouth Rockfish		0.52	0.52	0.2	0.01	0.21		0.04	0.04	0.2	0.57	0.77	trace	185	0.4%
Slope Rockfish Unidified		0.09	0.09	0		0			0	0	0.09	0.09	trace		
Other flatfish												**7.31**			
Rex Sole		4.39	4.39	0.59	2.03	2.62	0.15	0.14	0.29	0.74	6.56	7.3	trace		
Rock Sole			0			0			0	0	0	trace	trace		
Flatfish Unidentified		0	0		0	0	0	0	0.01	0	0	0.01	trace		
Other groundfish												**1.89**			
Big Skate			0	0.09		0.09	0.01		0.01	0.1	0	0.1	trace		
Grenadier Unidentified		0.01	0.01		0	0	0.01		0.01	0.01	0.01	0.02	trace		
Groundfish Unidentified		1.36	1.36			0			0	0	1.36	1.36	trace		
Pacific Electric Ray			0	0.03		0.03	0.03		0.03	0.06	0	0.06	trace		
Roundfish Unidentified			0	0.05	0	0.05	0		0	0.05	0	0.05	trace		

Species	IFQ- Shoreside Hake Discard	Landed	Estimate	At-Sea Catcher/Processor Hake Discard	Landed	Estimate	At-Sea Mothership Hake Discard	Landed	Estimate	Total Non tribal Discard	Landed	Estimate	% of total catch	2012 ACL	catch/ ACL
Skate Unidentified		0.07	0.07	0		0			0	0	0.07	0.07	trace		
Soupfin Shark	0.13	0.01	0.14		0.02	0.02	0.07		0.07	0.2	0.03	0.23	trace		
Spotted Ratfish		0	0			0			0	0	0	trace	trace		
Non-groundfish species															
Dungeness Crab	0	0	0			0			0	0	0	trace	trace		
Non-FMP flatfish															
Pacific halibut	0	0	0	0.6	0	0	0	0	0	0.6	0	0.6	trace		
Slender Sole			0		0	0	0	0.02	0.02	0	0.02	0.02	trace		
Totals of non hake species	0.95	888.12	889.07	180.4	112.48	292.32	62.81	44.69	107.52	244	1,045	1,299	0.81%		
Total non tribal fishery catc	129	66,176	66,305	326	55,661	55,987	218	38,105	38,323	673	159,942	160,624			
WA Tribal Hake			**613**			**0**			**21**			**634**			

Note: Because spiny dogfish was managed as part of the "Other fish complex" in 2012, the 2013 ABC is used here.

Note: Pacific halibut bycatch data from Jannot et al. 2013.

Species	Category	Comment
Pacific Hake	U of C	
Rebuilding Species		
Bocaccio Rockfish (S)	None	
Canary Rockfish	Retained minor	
Cowcod (S)	None	
Darkblotched Rockfish	Retained minor	
Pacific Ocean Perch (N)	Retained minor	
Petrale Sole	Retained minor	
Yelloweye Rockfish	None	
Non-rebuilding species		
Arrowtooth Flounder	Retained minor	
Dover Sole	Retained minor	
English Sole	Retained minor	
Lingcod (N)	Retained minor	
Longnose Skate	Retained minor	
Longspine Thornyhead (N)	Retained minor	
Pacific Cod	Retained minor	
Sablefish (N)	Retained minor	**high val**
Shortbelly Rockfish	Retained minor	
Shortspine Thornyhead (N)	Retained minor	
Spiny Dogfish	Retained minor	
Widow Rockfish	**Retained main**	
Yellowtail Rockfish	Retained minor	

Species	Category	Comment
Minor shelf rockfish (N)	Bycatch minor	
Bocaccio Rockfish	Bycatch minor	
Chilipepper Rockfish	Bycatch minor	
Greenspotted Rockfish	Bycatch minor	
Greenstriped Rockfish	Bycatch minor	
Harlequin Rockfish	Bycatch minor	
Redstripe Rockfish	Bycatch minor	
Rosethorn Rockfish	Bycatch minor	
Silvergray Rockfish	Bycatch minor	
Stripetail Rockfish	Bycatch minor	
Shelf Rockfish Unid	Bycatch minor	
Minor slope rockfish (N)		
Aurora Rockfish	Retained minor	**V > 2.2**
Bank Rockfish	Retained minor	
Blackgill Rockfish	Retained minor	
Redbanded Rockfish	Retained minor	
Rougheye Rockfish	**Retained main**	**V > 2.2**
Sharpchin Rockfish	Retained minor	
Shortraker Rockfish	**Retained main**	**V > 2.2**
Splitnose Rockfish	Retained minor	
Yellowmouth Rockfish	Retained minor	
Slope Rockfish Unidified	Retained minor	
Other flatfish		
Rex Sole	Retained minor	
Rock Sole	Retained minor	
Flatfish Unidentified	Retained minor	
Other groundfish		
Big Skate	Bycatch minor	
Grenadier Unidentified	Retained minor	
Groundfish Unidentified	Retained minor	
Pacific Electric Ray	Bycatch minor	
Roundfish Unidentified	Bycatch minor	

Species	Category	Comment
Skate Unidentified	Bycatch minor	
Soupfin Shark	Bycatch minor	
Spotted Ratfish	Retained minor	
Non-groundfish species		
Dungeness Crab	Bycatch minor	
Non-FMP flatfish		
Pacific halibut	Prohibited	
Slender Sole	Retained minor	

Appendix 1 Table 3. Estimated bycatch of salmon (no. of fish) in all U.S. west coast fisheries observed by the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (* = A-SHOP) from 2002-2010, as well as salmon bycatch in shoreside Pacific hake sectors (= numbers from annual NWR reports). (Source: Al-Humadhi et al. 2012.)**

Species/Sector	2002	2003	2044	2005	2006	2007	2008	2009	2010	Average
Chinook salmon										
Tribal Shoreside**	0	9	50	76	1,271	1,690	539	1,321	28	554
Tribal Mothership*	1,010	3,436	3,701	3,909	669	714	158	826	650	1,675
Shoreside - EFP**	1,062	425	4,206	4,018	839	2,462	1,962	279	2,997	2,028
At-Sea Mothership*	713	2,060	388	2,207	1,095	585	226	297	457	892
At-Sea Catcher Processor*	959	576	369	1,756	114	736	496	22	257	587
Species Total	**3,744**	**6,506**	**8,714**	**11,966**	**3,988**	**6,187**	**3,381**	**2,745**	**4,389**	**5,736**
Coho salmon										
Tribal Shoreside**	0	0	0	0	0	98	21	49	0	19
Tribal Mothership*	23	193	207	344	3	9	0	8	5	88
Shoreside - EFP**	0	0	0	0	0	141	10	37	47	26
At-Sea Mothership*	77	3	0	82	26	139	18	12	30	43
At-SeaCatcher Processor*	69	0	1	4	2	88	3	0	0	19
Species Total	**169**	**196**	**208**	**430**	**31**	**475**	**52**	**106**	**82**	**194**
Chum salmon										
Tribal Shoreside**	0	0	0	0	0	8	11	0	0	2
Tribal Mothership*	51	9	11	2	24	0	0	11	1	12
Shoreside - EFP**	0	0	0	0	0	113	8	2	8	15
At-Sea Mothership*	10	3	28	12	80	97	17	41	6	33
At-SeaCatcher Processor*	14	8	24	8	8	73	43	0	4	20
Species Total	**75**	**20**	**63**	**22**	**112**	**291**	**79**	**54**	**19**	**82**

Appendix1 Table 3. Estimated bycatch of salmon (no. of fish) in all U.S. west coast fisheries observed by the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake Observer Program (* = A-SHOP) from 2002-2010, as well as salmon bycatch in shoreside Pacific hake sectors (= numbers from annual NWR reports). (Source: Al-Humadhi et al. 2012.)**

Pink salmon										
Tribal Shoreside**	0	0	0	0	0	513	9	129	0	72
Tribal Mothership*	0	3766	0	0	0	0	0	0	0	418
Shoreside - EFP**	0	0	0	0	0	47	7	26	0	9
At-Sea Mothership*	0	4	0	0	0	15	0	2	0	2
At-SeaCatcher Processor*	0	13	0	48	0	19	0	0	0	9
Species Total	**0**	**3783**	**0**	**48**	**0**	**594**	**16**	**157**	**0**	**511**
Sockeye salmon										
Tribal Shoreside**	0	0	0	0	0	0	0	0	0	0
Tribal Mothership*	0	0	0	0	0	0	0	0	0	0
Shoreside - EFP**	0	0	0	0	0	0	0	0	0	0
At-Sea Mothership*	0	0	0	0	0	0	0	0	0	0
At-SeaCatcher Processor*	0	0	0	0	0	0	2	0	2	0.4
Species Total	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**2**	**0.4**
Unspecified salmon										
Tribal Shoreside**	0	0	0	0	0	0	0	0	0	0
Tribal Mothership*	1	0	9	8	0	0	0	0	0	2
Shoreside - EFP**	0	0	0	0	0	0	13	107	2	14
At-Sea Mothership*	3	188	0	0	0	0	0	0	2	21
At-SeaCatcher Processor*	0	0	0	0	0	0	18	0	0	2
Species Total	**4**	**188**	**9**	**8**	**0**	**0**	**31**	**107**	**4**	**39**
Totals for all species/sectors	**3,992**	**10,693**	**8,994**	**12,474**	**4,131**	**7,547**	**3,561**	**3,169**	**4,496**	**6,562**

Source: Al-Humadhi et al. 2012

Appendix1 Table 2. 2012 Offshore Canadian Pacific Hake Fishery Landed and Release Weights

Species (landed)	Landed Wt (mt)*	% of Total landed wt	Released Wt (mt)**	% of Total Released wt	Total Landed and Released	% of Total Released wt	% of Total Hake wt	2014 ACL	Category	Comment
PACIFIC HAKE	46,358.31	96.52%	425.91	50.71%	46,784.23	95.73%	100.00%			
YELLOWTAIL ROCKFISH	**510.62**	**1.06%**	**115.15**	**13.71%**	**625.77**	**1.28%**	**1.34%**	**4,421**	**Retained main**	
WALLEYE POLLOCK	**318.98**	**0.66%**	**22.82**	**2.72%**	**341.80**	**0.70%**	**0.73%**	**3,110**	**Retained main**	
PACIFIC OCEAN PERCH	231.04	0.48%	68.20	8.12%	299.24	0.61%	0.64%	3,588	Retained minor	
WIDOW ROCKFISH	160.29	0.33%	25.13	2.99%	185.42	0.38%	0.40%	2,315	Retained minor	
REDSTRIPE ROCKFISH	**143.44**	**0.30%**	**7.30**	**0.87%**	**150.74**	**0.31%**	**0.32%**	**1,186**	**Retained main**	
SILVERGRAY ROCKFISH	67.26	0.14%	8.98	1.07%	76.23	0.16%	0.16%	1,163	Retained minor	
YELLOWMOUTH ROCKFISH	46.25	0.10%	9.09	1.08%	55.33	0.11%	0.12%	1,675	Retained minor	
ROUGHEYE ROCKFISH	**33.69**	**0.07%**	**72.69**	**8.65%**	**106.37**	**0.22%**	**0.23%**	**620**	**Bycatch main**	**V > 2.2**
ARROWTOOTH FLOUNDER	24.41	0.05%	6.05	0.72%	30.47	0.06%	0.07%	14,995	Retained minor	
SPINY DOGFISH	20.41	0.04%	42.03	5.00%	62.43	0.13%	0.13%	4,480	Bycatch minor	
BOCACCIO	**18.68**	**0.04%**	**10.04**	**1.19%**	**28.71**	**0.06%**	**0.06%**	**150**	**Retained main**	**Rebuilding**
CANARY ROCKFISH	13.94	0.03%	4.35	0.52%	18.29	0.04%	0.04%	710	Retained minor	
LINGCOD	12.77	0.03%	1.15	0.14%	13.93	0.03%	0.03%	2,682	Retained minor	
DOVER SOLE	11.91	0.02%	0.04	0.01%	11.96	0.02%	0.03%	3,072	Retained minor	
SPLITNOSE ROCKFISH	10.78	0.02%	14.28	1.70%	25.06	0.05%	0.05%	N/A	Bycatch minor	
PACIFIC COD	9.95	0.02%	0.13	0.02%	10.09	0.02%	0.02%	2,290	Retained minor	
PETRALE SOLE	6.59	0.01%	0.00	0.00%	6.59	0.01%	0.01%	900	Retained minor	
REX SOLE	4.11	0.01%	0.00	0.00%	4.11	0.01%	0.01%	N/A	Retained minor	
REDBANDED ROCKFISH	2.95	0.01%	0.01	0.00%	2.96	0.01%	0.01%	294	Retained minor	
SABLEFISH	2.53	0.01%	0.46	0.05%	2.99	0.01%	0.01%	175	Retained minor	
LONGNOSE SKATE	1.45	0.00%	0.02	0.00%	1.47	0.00%	0.00%	47	Retained minor	
SHORTSPINE THORNYHEAD	1.13	0.00%	0.06	0.01%	1.19	0.00%	0.00%	731	Retained minor	
SHARPCHIN ROCKFISH	1.12	0.00%	0.03	0.00%	1.15	0.00%	0.00%	N/A	Retained minor	
DARKBLOTCHED ROCKFISH	0.96	0.00%	3.05	0.36%	4.01	0.01%	0.01%	N/A	Bycatch minor	
FLATHEAD SOLE	0.48	0.00%	0.00	0.00%	0.48	0.00%	0.00%	N/A	Retained minor	
ENGLISH SOLE	0.46	0.00%	0.03	0.00%	0.48	0.00%	0.00%	882	Retained minor	
BIG SKATE	0.43	0.00%	0.02	0.00%	0.45	0.00%	0.00%	567	Retained minor	
SPOTTED RATFISH	0.42	0.00%	0.00	0.00%	0.42	0.00%	0.00%	N/A	Retained minor	
SOUTHERN ROCK SOLE	0.33	0.00%	0.00	0.00%	0.33	0.00%	0.00%	752	Retained minor	
SHORTRAKER ROCKFISH	**0.23**	**0.00%**	**1.45**	**0.17%**	**1.67**	**0.00%**	**0.00%**	**125**	**Bycatch main**	**V > 2.2**
GREENSTRIPED ROCKFISH	0.13	0.00%	0.00	0.00%	0.13	0.00%	0.00%	N/A	Retained minor	
GRENADIERS	0.11	0.00%	0.00	0.00%	0.11	0.00%	0.00%	N/A	Retained minor	
BLUE SHARK	0.03	0.00%	0.00	0.00%	0.03	0.00%	0.00%	N/A	Retained minor	
YELLOWEYE ROCKFISH	0.02	0.00%	0.04	0.00%	0.06	0.00%	0.00%	7	Bycatch minor	
PACIFIC ELECTRIC RAY	0.01	0.00%	0.00	0.00%	0.01	0.00%	0.00%	N/A	Retained minor	
CHILIPEPPER	0.01	0.00%	0.00	0.00%	0.01	0.00%	0.00%	N/A	Retained minor	
Other Fish & Invertebrates										
AMERICAN SHAD	2.52	0.01%	0.00	0.00%	2.52	0.01%	0.01%	N/A	Retained minor	
CANIFORMIA	0.02	0.00%	0.00	0.00%	0.02	0.00%	0.00%		Prohibited	
CHUB MACKEREL	0.00	0.00%	0.07	0.01%	0.07	0.00%	0.00%	N/A	Bycatch minor	
JACK MACKEREL	1.58	0.00%	0.00	0.00%	1.58	0.00%	0.00%	N/A	Retained minor	
OCTOPUS	0.01	0.00%	0.00	0.00%	0.01	0.00%	0.00%	N/A	Retained minor	
PACIFIC HALIBUT	0.17	0.00%	0.03	0.00%	0.21	0.00%	0.00%		Prohibited	
PACIFIC HERRING	1.15	0.00%	0.00	0.00%	1.15	0.00%	0.00%		Prohibited	
RAGFISH	0.18	0.00%	0.00	0.00%	0.18	0.00%	0.00%	N/A	Retained minor	
ROBUST CLUBHOOK SQUID	0.05	0.00%	0.00	0.00%	0.05	0.00%	0.00%	N/A	Retained minor	
SCHOOLMASTER GONATE SQUID	0.14	0.00%	0.00	0.00%	0.14	0.00%	0.00%	N/A	Retained minor	
SQUIDS	1.22	0.00%	0.00	0.00%	1.22	0.00%	0.00%	N/A	Retained minor	
Salmon										
Chinook	7.35	0.02%	1.31	0.16%	8.66	0.02%	0.02%		Prohibited	
Chum	0.31	0.00%	0.00	0.00%	0.31	0.00%	0.00%		Prohibited	
Coho	0.33	0.00%	0.00	0.00%	0.33	0.00%	0.00%		Prohibited	
Grand Total	48,031.28	100.00%	839.95	100.00%	48,871.22	100.00%				

Source: Barry Ackerman, DFO, March 25, 2014

Notes

* Landed Weights verfied by 100% DMP

** Released Weights verified by ASOP

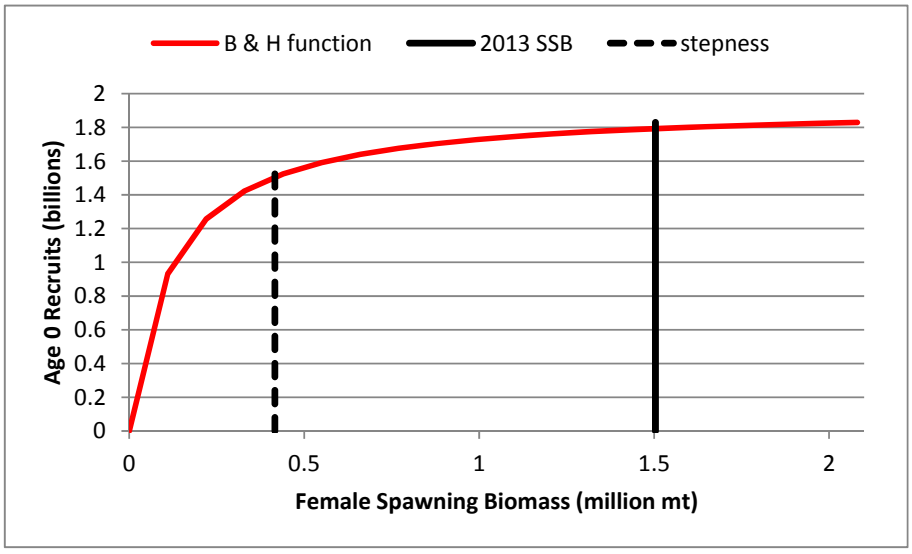
- **Vessels using Electronic Monitoring are subject to 100% retention**
- **Landed and Released weights reflect catch from only fishing events which were targeting Pacific Hake**
- **Total number of hake fishing trips - 506**

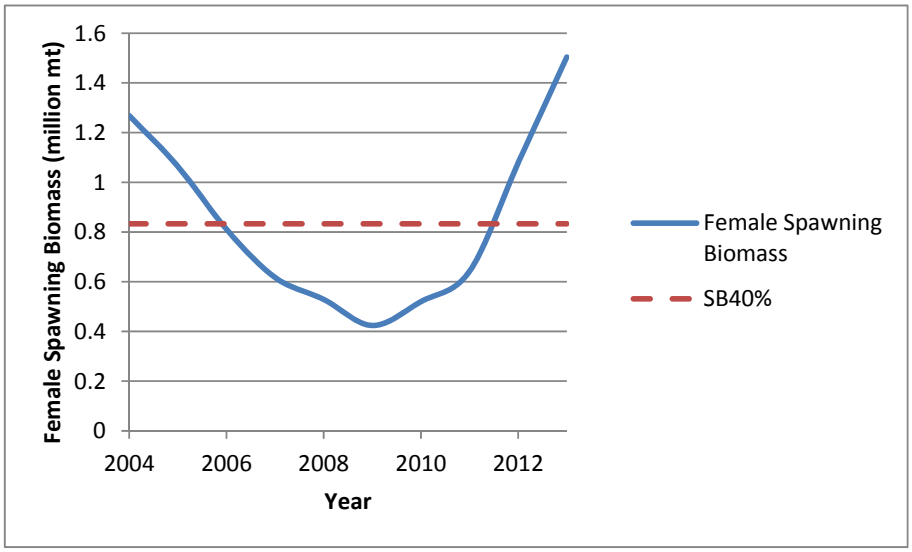
APPENDIX 2 SCORING AND RATIONALES

APPENDIX 2.1 PERFORMANCE INDICATOR SCORES AND RATIONALE

Principle 1

Evaluation Table: PI 1.1.1

PI 1.1.1		The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	It is likely that the stock is above the point where recruitment would be impaired.	It is highly likely that the stock is above the point where recruitment would be impaired.	There is a high degree of certainty that the stock is above the point where recruitment would be impaired.
	Met?	Yes	Yes	Yes
	Justification	SG60 – See SG100 SG80 – See SG100 SG100 The 2013 median posterior female spawning biomass was estimated to be 72.3% of the estimated unfished equilibrium (SB_0) with 95% posterior credibility intervals ranging from 34.7% to 159.7%. The lower estimate (34.7% of SB_0) is well above the default limit reference point of 20% of B_0. The 2013 stock assessment provides stock-recruit estimates (JTC 2013a; Fig. 29), showing both the extremely large variability about the year-class strengths and the lack of relationship between spawning stock and subsequent recruitment. The scatter plot also shows that the female spawning biomass is observed to be less than 20% of B_0 before the recruitment would be impaired. This is consistent with the assumptions about the steepness of the Berverton-Holt stock recruitment function used in the assessment. The Beverton-Holt function is reparameterised in terms of the steepness parameter. Steepness is defined as the proportion of virgin recruitment (R_0) obtained when the spawner abundance is 20% of the virgin level (SB_0). The mean prior for steepness (h=0.78) is based on a meta-analysis of the family Gadidae (Myers *et al*. 1999), and has been used in previous Hake assessments since 2007. It is well known that the higher h is, the more resilient the population is, and the more robust the stock is to harvesting.  It is considered that there is a high degree of certainty that the female spawning biomass (SSB) is above the point where recruitment would be impaired. Thus the SG 100 is met.

PI 1.1.1		**The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing**		
b	**Guidepost**		The stock is at or fluctuating around its target reference point.	There is a high degree of certainty that the stock has been fluctuating around its target reference point, or has been above its target reference point, over recent years.
	Met?		Yes	No
	Justification	SG60 – See SG80 SG80 The estimated target reference point is $SB_{40\%}$ or 833,000 mt. The female spawning biomass has been fluctuating around or above $SB_{40\%}$ from 2004-2013. The female spawning biomass has been estimated to be above $SB_{40\%}$ in 2012 and 2013. Thus the requirement for SG 80 is met.  		
References		JTC 2013a http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/groundfish/whiting/Hakeassessment2013_final.pdf Myers *et al*. 1999		

Stock Status relative to Reference Points			
	Type of reference point	**Value of reference point**	**Current stock status relative to reference point**
Target reference point	$SB_{40\%}$	833,000 metric tonnes (mt) Female Spawning Biomass	The 2013 Female Spawning Biomass was estimated to be 1,504,000 mt (posterior credibility interval 710,000-3,680,000 mt). The current stock status relative to SB40% is 1.8 (e.g., 1,504,000/$SB_{40\%}$=1.81).
	$SB_{F40\%}$	744,000 mt Female Spawning Biomass	1,504,000/ $SB_{F40\%}$ =2.02
Limit reference point	$SB_{10\%}$	208,100 mt Female Spawning Biomass	1,504,000/$SB_{10\%}$=7.23

PI 1.1.1	The stock is at a level which maintains high productivity and has a low probability of recruitment overfishing		
	Default $SB_{20\%}$	416,200 mt Female Spawning Biomass	1,504,000/$SB_{20\%}$=3.61
OVERALL PERFORMANCE INDICATOR SCORE: This PI receives a score of 90 because the requirements of both scoring issues are fulfilled at the 80 level and item a meets the 100 level.			**US 90** **Can 90**
CONDITION NUMBER (if relevant):			**N/A**

Evaluation Table: PI 1.1.2

PI 1.1.2		Limit and target reference points are appropriate for the stock		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Generic limit and target reference points are based on justifiable and reasonable practice appropriate for the species category.	Reference points are appropriate for the stock and can be estimated.	
	Met?	Yes	Yes	
	Justification	SG60 – See SG80 SG80 Biomass and fishing mortality target reference points are appropriate and have been estimated based on an analytical stock assessment (JTC 2013a). Target reference points are MSY proxies. The target fishing mortality rate is $F_{40\%}$ is the default harvest rate with a 40:10 adjustment set by the Hake Agreement. This target level of exploitation reduces the female spawning biomass ($SB_{F40\%}$) to 744,000 mt (with a 95% credibility range of 556,000-942,000 mt). The target reference point based on $SB_{40\%}$ is estimated at 833,000 mt (with a 95% credibility range of 661,000-1,084,000 mt). $SB_{40\%}$ is the biomass level below which the harvest is reduced below $F_{40\%}$. $SB_{40\%}$ is set at a level well above where recruitment could be impaired. This fulfils the requirement of SG 80.		
b	**Guidepost**		The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity.	The limit reference point is set above the level at which there is an appreciable risk of impairing reproductive capacity following consideration of precautionary issues.
	Met?		Yes	No

PI 1.1.2		Limit and target reference points are appropriate for the stock		
	Justification	SG80 The limit biomass reference point is set at $SB_{10\%}$ as part of the harvest policy with the 40:10 adjustment set by the Hake Agreement. The 40:10 harvest policy reduces the harvest linearly from the $F_{40\%}$ rule when the female spawning biomass is below $SB_{40\%}$ such that the harvest goes to zero when $SB_{10\%}$ is reached. The 40:10 harvest policy provides a precautionary mechanism to reduce harvest during times when the Hake stock is low. Evidence has been provided to the Assessment Team to demonstrate that the management strategy has been precautionary. The 40:10 rule is by nature precautionary in the sense that harvest rate is reduced as stock biomass declines. Punt *et al*. (2008) evaluated the effectiveness of threshold policies for a range of west coast groundfish species, including Pacific Hake. Ishimura *et al.* (2005) is a peer-reviewed Management Strategy Evaluation (MSE) focused on management of the Pacific Hake fishery and the 40:10 harvest control rule. It describes a stochastic population dynamics model, which includes multiple fishery sectors and a stock–recruitment relationship tailored to generate occasional extremely strong year-classes. Simulations were used to evaluate the performance of various harvest strategies in terms of average catch, variation in catch, the probability of closing the fishery, and a variety of other conservation-related performance measures. The simulations account for the error and imprecision associated with estimating biomass from stock assessments. Most of the harvest strategies are based on constant escapement. The "best performing" of the harvest strategies involves closing the fishery only when the biomass is estimated to be below 5% of its pre-fishery size (i.e., $SB_{5\%}$).		
c	**Guidepost**		The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome.	The target reference point is such that the stock is maintained at a level consistent with B_{MSY} or some measure or surrogate with similar intent or outcome, or a higher level, and takes into account relevant precautionary issues such as the ecological role of the stock with a high degree of certainty.
	Met?		Yes	Yes
	Justification	SG80 – See SG100 SG100 A proxy female spawning biomass target reference point ($SB_{40\%}$) has been established using the Beverton-Holt stock-recruit relationship with steepness (*h*) set at 0.78. $SB_{40\%}$ has been estimated at 833,000 mt with 95% posterior credibility interval ranging from 661,000 – 1,084,000 mt. The target reference point is consistent with B_{MSY}, and is at a higher level than B_{MSY}, estimated to occur at 24% SB_0 at 500,000 mt with 95% posterior credibility interval ranging from 328,000 – 840,000 mt. The target reference point SB40% has allowed the stock to rebound over the assessed period 1966-2012 despite wide fluctuations in recruitment and thus is considered precautionary.		
d	**Guidepost**		For key low trophic level stocks, the target reference point takes into account the ecological role of the stock.	
	Met?		Not relevant	

PI 1.1.2		Limit and target reference points are appropriate for the stock	
	Justification	Pacific Hake is not a low trophic level species. Therefore the scoring issue d is not assigned a score.	
References		JTC 2013a, Punt *et al*., Ishimura *et al*. 2005	
OVERALL PERFORMANCE INDICATOR SCORE: All issues meet SG80; 1 of 2 issues achieves performance at SG100; issue b does not meet SG100. Therefore a score of 90 is given.			**US 90** **Can 90**
CONDITION NUMBER (if relevant):			**N/A**

Evaluation Table: PI 1.1.3

PI 1.1.3		Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Where stocks are depleted rebuilding strategies, which have a reasonable expectation of success, are in place.		Where stocks are depleted, strategies are demonstrated to be rebuilding stocks continuously and there is strong evidence that rebuilding will be complete within the specified timeframe.
	Met?	Not Relevant		Not relevant
	Justification	The Pacific Hake stock is not considered to be depleted, and so PI 1.1.3 is not scored.		
b	**Guidepost**	A rebuilding timeframe is specified for the depleted stock that is the shorter of 30 years or 3 times its generation time. For cases where 3 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	A rebuilding timeframe is specified for the depleted stock that is the shorter of 20 years or 2 times its generation time. For cases where 2 generations is less than 5 years, the rebuilding timeframe is up to 5 years.	The shortest practicable rebuilding timeframe is specified which does not exceed one generation time for the depleted stock.
	Met?	Not relevant	Not relevant	Not relevant
	Justification			
c	**Guidepost**	Monitoring is in place to determine whether the rebuilding strategies are effective in rebuilding the stock within a specified timeframe.	There is evidence that they are rebuilding stocks, or it is highly likely based on simulation modelling or previous performance that they will be able to rebuild the stock within a specified timeframe.	
	Met?	Not relevant	Not relevant	
	Justification			
References				
OVERALL PERFORMANCE INDICATOR SCORE:				**N/A**

PI 1.1.3	Where the stock is depleted, there is evidence of stock rebuilding within a specified timeframe	
CONDITION NUMBER (if relevant):		N/A

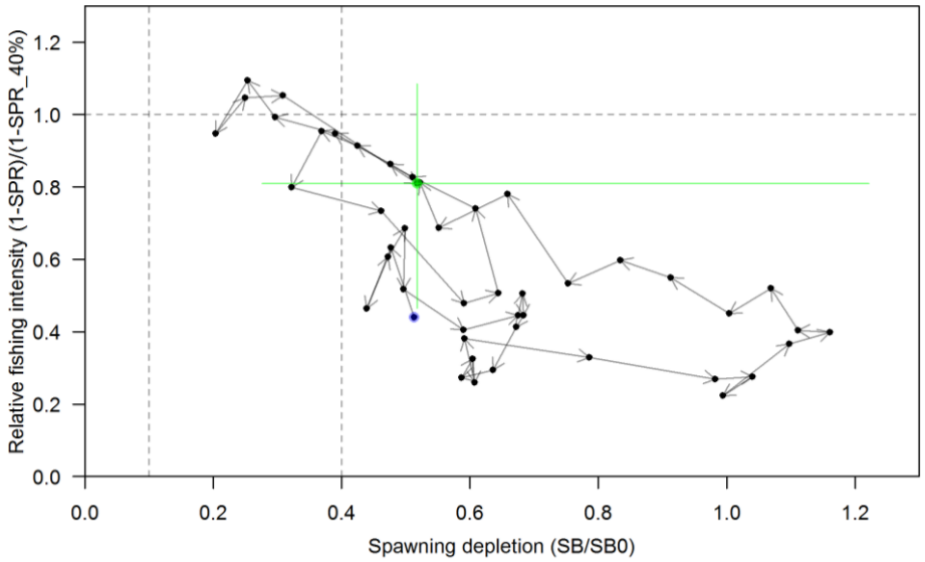
Evaluation Table: PI 1.2.1

<table>
<tr><td colspan="2">PI 1.2.1</td><td colspan="3">There is a robust and precautionary harvest strategy in place</td></tr>
<tr><td colspan="2">Scoring Issue</td><td>SG 60</td><td>SG 80</td><td>SG 100</td></tr>
<tr><td rowspan="3">a</td><td>Guidepost</td><td>The harvest strategy is expected to achieve stock management objectives reflected in the target and limit reference points.</td><td>The harvest strategy is responsive to the state of the stock and the elements of the harvest strategy work together towards achieving management objectives reflected in the target and limit reference points.</td><td>The harvest strategy is responsive to the state of the stock and is designed to achieve stock management objectives reflected in the target and limit reference points.</td></tr>
<tr><td>Met?</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td>Justification</td><td colspan="3">SG60 – See SG100
SG80 – See SG100
SG100
The Pacific Hake harvest strategy is defined in Article III of the Hake Agreement between the U.S. and Canada: “…the default harvest rate shall be F-40 percent with a 40/10 adjustment”. The 40:10 harvest policy is responsive to the state of the stock as it reduces the harvest linearly from the $F_{40\%}$ rule when the female spawning biomass is below $SB_{40\%}$ such that the harvest goes to zero when $SB_{10\%}$ is reached. The 40:10 harvest policy provides a precautionary mechanism to reduce harvest during times when the Hake stock is low. In recent years, the total landings have not exceeded the recommended catch limit set by the harvest policy, indicating that management procedures have been effective in achieving stock management objectives. Further considerations, such as by-catch limits, have often resulted in catch targets to be set lower than the recommended catch limit. The TAC-setting and monitoring process, the catch share program, and the high level of at-sea and shoreside monitoring further demonstrate the design of a harvest strategy.

<table>
<tr><th>Year</th><th>Total Landings (mt)</th><th>Coast-wide (US+Canada) catch target (mt)</th></tr>
<tr><td>2003</td><td>205,177</td><td>228,000</td></tr>
<tr><td>2004</td><td>338,654</td><td>501,073</td></tr>
<tr><td>2005</td><td>363,157</td><td>364,197</td></tr>
<tr><td>2006</td><td>361,761</td><td>364,842</td></tr>
<tr><td>2007</td><td>291,129</td><td>328,358</td></tr>
<tr><td>2008</td><td>322,145</td><td>364,842</td></tr>
<tr><td>2009</td><td>177,459</td><td>184,000</td></tr>
<tr><td>2010</td><td>226,202</td><td>262,500</td></tr>
<tr><td>2011</td><td>286,055</td><td>393,751</td></tr>
<tr><td>2012</td><td>204,040</td><td>251,809</td></tr>
</table>

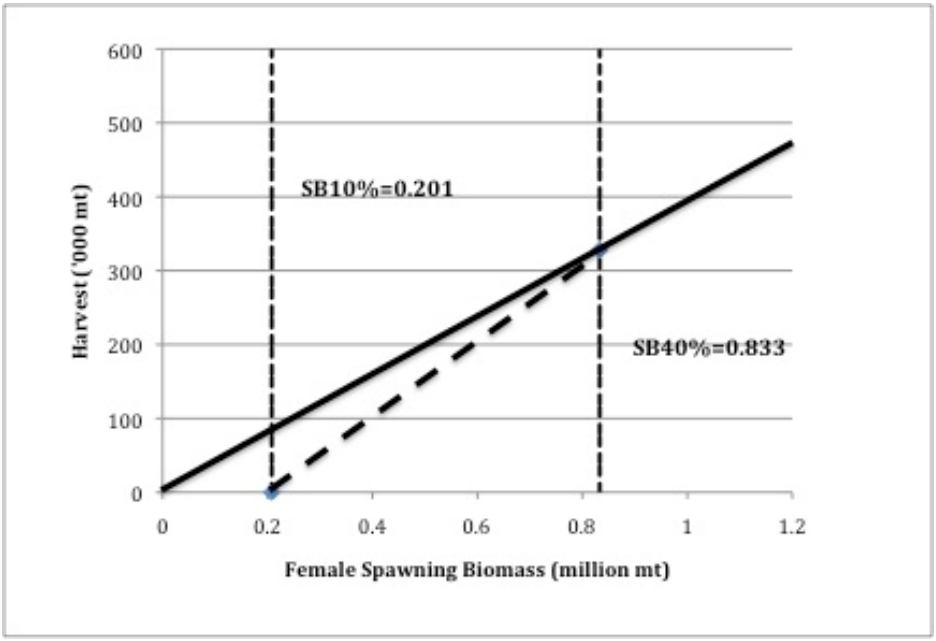
The exploitation history in terms of both the biomass ($SB_{40\%}$) and F-target reference points, portrayed graphically in the 2013 stock assessment document via a phase-plot, shows that historically the fishing intensity has been low and the biomass has been high demonstrating that the harvest strategy is responsive to the state of the stock. The harvest rate strategy plus TAC setting, catch shares, and fishery monitoring demonstrate that the harvest strategy is designed to achieve stock management objectives reflected in the target and limit reference points.</td></tr>
<tr><td>b</td><td>Guidepost</td><td>The harvest strategy is likely to work based on prior experience or plausible argument.</td><td>The harvest strategy may not have been fully tested but evidence exists that it is achieving its objectives.</td><td>The performance of the harvest strategy has been fully evaluated and evidence exists to show that it is achieving its objectives including being clearly able to maintain stocks at target levels.</td></tr>
</table>

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
	Met?	Yes	Yes	No
	Justification	SG60 – See SG80 Evidence has been provided to the Assessment Team to demonstrate that the management strategy is achieving its objectives and that the 40:10 rule is by nature precautionary in the sense that harvest rate is reduced as stock biomass declines. Annual harvest levels are based on rigorously reviewed stock assessments and strictly follow recommendations made by the Hake Agreement Scientific Review Group, Joint Management Committee and Advisory Panel. Since 2007, the combined US and Canadian harvests have not exceeded annual catch targets derived from applying the harvest policy, averaging 87.5% of the target. In 2013 applying the default harvest control rule with the base case model predicted a median TAC of 626,000 mt. The considerable uncertainty in the assessment especially with regard to the uncertainty of the strength of the 2010 year-class was taken into consideration for setting the 2013 TAC. The model runs using recruitment from the lower 10% of those estimated by the base case model suggested that a 2013 catch of 336,000 mt would result in stable or increasing biomass over the next two years, even under this lower-recruitment scenario. The SRG suggested that this could be used as a precautionary lower bound of the suggested catch range. The JMC recommended (and adopted) coast-wide TAC of 336,200 mt demonstrating that management decisions are precautionary. Past management responses have been effective as indicated in the Phase Plot. Historically the fishing intensity has been low and the biomass has been high. In 2009, spawning depletion was around 20% triggering a response of the Pacific Fisheries Management Council to initiate a rebuilding plan for Pacific Hake because the depletion level was below 25% of unfished spawning biomass (SB_0). However, due to the strong 1999 year class entering the fishery the stock rebuilt and the rebuilding plan did not have to be implemented Further evidence that the Pacific Hake harvest strategy is effective and precautionary is based on the recent temporal progression of years (Phase Plot). Recently, the estimated depletion level has been below 40% and the fishing intensity high, until 2012 when fishing intensity was below target and depletion was above 40%. Thus recent management actions have resulted in the Pacific Hake stock reverting to the Precautionary/Healthy Zone. The performance of the harvest strategy has not been fully evaluated. However, Management Strategy Evaluation (MSE) of the Hake Agreement's harvest policy is a priority for the JMC and its advisors. The MSE is being developed as an integral part of the Hake Agreement's management and decision-making process to help inform decision making about harvest policies and research priorities. This is an on-going process.		
c	**Guidepost**	Monitoring is in place that is expected to determine whether the harvest strategy is working.		
	Met?	Yes		

PI 1.2.1		There is a robust and precautionary harvest strategy in place		
	Justification	SG60 Monitoring is in place through the Hake Agreement's committee structure and the DFO and PMFC groundfish fisheries management plans. Evidence that the harvest strategy is working is best illustrated with the Phase Plot.  		
d	Guidepost			The harvest strategy is periodically reviewed and improved as necessary.
	Met?			Incomplete
	Justification	SG100 (partial) Management Strategy Evaluation (MSE) of the Hake Agreement's harvest policy is a priority for the JMC and its advisors. The MSE is being developed as an integral part of the Hake Agreement's management and decision-making process to help inform decision making about harvest policies and research priorities. This is an on-going process. In the 2013 stock assessment, the JTC described development of an MSE to explore the basic performance of the default harvest policy (F40%-40:10). Results from the initial simulations indicated that the current F40%-40:10 management strategy with perfect knowledge of current biomass resulted in a median long-term average depletion of less than 30%. The results of these explorations showed that biomass levels and average catch are variable, mainly because of the high recruitment variability seen with Pacific Hake coupled with potentially large stock assessment estimation biases. Even though the Pacific Hake fishery is relatively data-rich, the data are less informative about incoming recruitment.		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant

PI 1.2.1		There is a robust and precautionary harvest strategy in place	
	Justification	Scoring issue e is not scored as sharks are not a target species.	
References		JTC 2013a, JTC 2013b, SRG 2013, John DeVore, PFMC, pers com., PFMC 2011, DFO 2013a, DFO 2013b, PMFC 2011	
OVERALL PERFORMANCE INDICATOR SCORE: All issues meet SG80; issue a achieves performance at SG100. Therefore a score of 85 is given.			**US 85** **Can 85**
CONDITION NUMBER (if relevant):			**N/A**

Evaluation Table: PI 1.2.2

PI 1.2.2		There are well defined and effective harvest control rules in place		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Generally understood harvest rules are in place that are consistent with the harvest strategy and which act to reduce the exploitation rate as limit reference points are approached.	Well defined harvest control rules are in place that are consistent with the harvest strategy and ensure that the exploitation rate is reduced as limit reference points are approached.	
	Met?	Yes	Yes	
	Justification	SG60 – See SG80 SG80 As per the Hake Agreement, the 40:10 harvest policy reduces the harvest linearly from the $F_{40\%}$ rule when the female spawning biomass is below $SB_{40\%}$ such that the harvest goes to zero when limit reference point, $SB_{10\%}$, is reached.  		
b	**Guidepost**		The selection of the harvest control rules takes into account the main uncertainties.	The design of the harvest control rules takes into account a wide range of uncertainties.
	Met?		Yes	No
	Justification	SG80 The Pacific Hake harvest control rule adopted by the Hake Agreement originates from Amendment 11 of the Magnuson-Stevens Act national standards guidelines. The $F_{40\%}$ target catch level for Hake is explicitly risk averse, taking into account uncertainty of the production capacity of Hake corresponds to greater caution in setting target catch levels. The main uncertainty taken into account is the uncertainty in year class strength.		

PI 1.2.2		There are well defined and effective harvest control rules in place		
c	Guidepost	There is some evidence that tools used to implement harvest control rules are appropriate and effective in controlling exploitation.	Available evidence indicates that the tools in use are appropriate and effective in achieving the exploitation levels required under the harvest control rules.	Evidence clearly shows that the tools in use are effective in achieving the exploitation levels required under the harvest control rules.
	Met?	Yes	Yes	No
	Justification	SG60 – See SG80 SG80 Evidence has been provided to the Assessment Team to demonstrate that the management strategy is achieving its objectives and that the 40:10 rule is by nature precautionary in the sense that harvest rate is reduced as stock biomass declines. Further evidence that the Pacific Hake harvest strategy is effective and precautionary is based on the recent temporal progression of years (Phase Plot; see PI 1.2.1b above). Recently, the estimated depletion level has been below 40% and the fishing intensity high, until 2012 when fishing intensity was below target and depletion was above 40%. Thus recent management actions have resulted in the Pacific Hake stock reverting to the Precautionary/Healthy Zone. Since the Pacific Hake agreement, TACs have been set at or below harvest at the F40%, demonstrating that the application of the rules is appropriate and effective (SG80). From the recent MSE exercise it has been learned that the F40%-40:10 rule reduces the median average depletion of the stock to below 30% in the long-term which is less than the SB40% target level. Thus SG 100 is not met.		
References		JTC 2013a, Senate 2004, PFMC 2011 http://www.westcoast.fisheries.noaa.gov/publications/fishery_management/groundfish/whiting/whiting-treaty.pdf		
OVERALL PERFORMANCE INDICATOR SCORE: All issues meet SG80. Therefore a score of 80 is given.				**US 80** **Can 80**
CONDITION NUMBER (if relevant):				

Evaluation Table: PI 1.2.3

PI 1.2.3		Relevant information is collected to support the harvest strategy		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Some relevant information related to stock structure, stock productivity and fleet composition is available to support the harvest strategy.	Sufficient relevant information related to stock structure, stock productivity, fleet composition and other data is available to support the harvest strategy.	A comprehensive range of information (on stock structure, stock productivity, fleet composition, stock abundance, fishery removals and other information such as environmental information), including some that may not be directly related to the current harvest strategy, is available.
	Met?	Yes	Yes	Yes

PI 1.2.3		Relevant information is collected to support the harvest strategy
	Justification	SG60 – See SG100 SG80 – See SG100 SG100 Stock structure: Knowledge of the spatial distribution and seasonal migration for the migratory coastal Pacific Hake is fairly well understood. Pacific Hake have a range that extends from the southern portions of Baja California (winter) to as far north as southeast Alaska (late summer). Typical northward migrations usually extend to the northern portions of Vancouver Island, but have ranged to southeast Alaska on a few occasions. Stock productivity: Overall, there is comprehensive knowledge of the life-history parameters for Pacific Hake to conduct robust assessments and develop appropriate biological reference points. Biological samples are routinely collected on an annual basis from both domestic and joint venture fisheries in both US and Canada, as well as the fisheries independent surveys. Annual length-weight relationships are established each year for US and Canada and this information has been used in stock assessment models to convert population numbers to biomass. Mean weight at age is calculated from samples pooled from all fisheries and acoustic surveys. The fraction mature, by size and age, is based on data collected from 782 females. In recent stock assessments, natural mortality has either been fixed at 0.23, or estimated using an informative prior. The stock-recruitment function is a Beverton-Holt parameterization with a prior for steepness (*h*) of 0.79. Fleet composition: <u>US</u> High quality data are available for the U.S. Hake fleet sectors. The catcher/processor sector, or C/P Coop Program, is composed of catcher/processors registered to a limited entry permit with a C/P endorsement; the mothership sector, or MS Coop Program, is composed of motherships and catcher vessels that harvest Pacific whiting for delivery to motherships. Motherships are vessels registered to an MS permit, and catcher vessels are vessels registered to a limited entry permit with an MS/CV endorsement or vessels registered to a limited entry permit without an MS/CV endorsement if the vessel is authorized to harvest the coop's allocation; and the Pacific whiting IFQ fishery is composed of vessels that harvest Pacific whiting for delivery shore-side to IFQ first receivers during the primary season. <u>Canada</u> High quality data are available for the Canadian Hake fleet sectors from the DFO vessel licensing system, the observer program and the dockside monitoring program (see DFO IFMP Groundfish). Stock abundance: The joint U.S. and Canadian integrated acoustic and trawl survey has been the primary fishery independent tool use to assess distribution, abundance and biology of coastal Pacific Hake. Data sources used in the 2013 assessment included biomass indices and age compositions from the 1995, 1998, 2001, 2005, 2007, 2009, 2011 and 2012 surveys. Fishery removals: Total catch from all U.S. and Canadian fisheries (including tribal catches) from 1966 to 2012 have been used to undertake the 2013 stock assessment. In Canada on-board observers have monitored and sampled catch of all domestic groundfish vessels since 1996. All landed catch is subject to dockside monitoring. The U.S. Pacific Hake fishery is fully monitored by observers. Other data: NMFS and PBS have completed studies on environmental influences on Hake distribution. The NFMS component of the project describes the north-south summertime distribution of Hake and involves developing both descriptive and forecast models for Hake distribution. The PBS component describes cross-shelf summertime distribution for the central California Current, and looks at a fine scale (5km grid) distribution of Hake in relation to sea surface temperature and other variables. The NMFS and PBS study results will allow future surveys to be designed to better capture concentrations of target species from predictive models of Hake distribution based on environmental parameters.

PI 1.2.3		Relevant information is collected to support the harvest strategy		
b	Guidepost	Stock abundance and fishery removals are monitored and at least one indicator is available and monitored with sufficient frequency to support the harvest control rule.	Stock abundance and fishery removals are regularly monitored at a level of accuracy and coverage consistent with the harvest control rule, and one or more indicators are available and monitored with sufficient frequency to support the harvest control rule.	All information required by the harvest control rule is monitored with high frequency and a high degree of certainty, and there is a good understanding of inherent uncertainties in the information [data] and the robustness of assessment and management to this uncertainty.
	Met?	Yes	Yes	No
	Justification	SG60 – See SG80 SG80 All information required by the HCR is monitored annually. Removals are monitored annually through comprehensive on-board observer programs and dockside monitoring. The joint U.S. and Canadian integrated acoustic and trawl survey regularly monitors stock abundance. The annual stock assessment estimates spawning biomass and fishing mortality in relation to target and limit reference points taking uncertainty into account. Therefore, the fishery meets the SG100. However, terminal year estimates of recruitment are highly uncertain. More information could potentially be collected by doing an annual recruitment survey. Thus the SG100 is not met.		
c	Guidepost		There is good information on all other fishery removals from the stock.	
	Met?		Yes	
	Justification	SG80 There is good information on Pacific Hake removals in the U.S. and Canadian groundfish trawl fisheries as these fisheries have on-board observations as well as dockside monitoring.		
References		JTC 2013a, Haltuch *et al*. 2012, Holt et al. 2012		

OVERALL PERFORMANCE INDICATOR SCORE: All issues meet SG80; only issue a achieves performance at SG100. Therefore a score of 90 is given.	**US 90** **Can 90**
CONDITION NUMBER (if relevant):	**N/A**

Evaluation Table: PI 1.2.4

PI 1.2.4		There is an adequate assessment of the stock status		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**		The assessment is appropriate for the stock and for the harvest control rule.	The assessment is appropriate for the stock and for the harvest control rule and takes into account the major features relevant to the biology of the species and the nature of the fishery.
	Met?		Yes	Yes
	Justification	SG80 – See SG100 SG100 The assessment for Pacific Hake is carried out with the Stock synthesis (SS version 3.24j) model written by Richard Methot of the National Marine Fisheries Service. SS is a statistical age-structured population modeling framework that has been applied in a wide variety of fish assessments globally. The method has generally been accepted as rigorous. SS is a state of the art software that is implemented in the Automatic Differentiation Model Builder (ADMB) software developed by David Fournier. The 2013 assessment reports a single base-case model representing the collective work of the Joint Technical Committee. The assessment is fully Baysian, with the base-case model incorporating prior information on natural mortality (M) and the steepness (*h*) of the stock-recruit relationship. SS jointly estimates the unfished biomass, recruitment deviations and selectivity parameters for separate Canadian and U.S. fisheries. Thus the model implicitly represents the spatial nature of the fisheries operating in Canadian and U.S. waters. The model incorporates sources of information on catch (1966-2012), relative abundance (acoustic survey 1995, 98, 2001, 03, 05, 07, 09, 11, 12), age composition, growth and maturity.		
b	**Guidepost**	The assessment estimates stock status relative to reference points.		
	Met?	Yes		
	Justification	SG60 The 2013 assessment estimates Pacific Hake stock status relative to the fishing intensity target and the 40:10 control rule limits. This is depicted as a phase plot of the posterior median fishing intensity (F-axis) vs. the posterior median depletion (B-axis) from 1966-2012. The temporal pattern is shown relative to the fishing intensity target (y-axis) and the 40:10 control rule limits (x-axis).		
c	**Guidepost**	The assessment identifies major sources of uncertainty.	The assessment takes uncertainty into account.	The assessment takes into account uncertainty and is evaluating stock status relative to reference points in a probabilistic way.
	Met?	Yes	Yes	Yes

PI 1.2.4		There is an adequate assessment of the stock status		
	Justification	SG60 – See SG100 SG80 – See SG100 SG100 Pacific Hake displays the highest degree of recruitment variability of any west coast groundfish stock. This results in large and rapid changes in stock biomass. A major source of uncertainty in the 2013 status and target catch is in the estimate of the size of the 2010 year class. This volatility, coupled with a dynamic fishery, which potentially targets strong cohorts resulting in time-varying selectivity, and little data to inform incoming recruitment until the cohort is age 2 or greater, will continue to result in highly uncertain estimates of current stock status and even less-certain projections of future stock trajectory. The base case assessment model integrates over the substantial uncertainty associated with several important model parameters including: acoustic survey catchability (q), the productivity of the stock (via the steepness parameter, *h*, of the stock-recruit relationship), the rate of natural mortality (M), and recruitment deviations. Although the Bayesian results presented include estimation uncertainty, this within-model uncertainty is likely an underestimate of the true uncertainty in current stock status and future projections, since it does not include structural modelling choices, data-weighting uncertainty and scientific uncertainty in selection of prior probability distributions. Given the uncertainty in stock status and magnitude, the JTC developed a Management Strategy Evaluation (MSE) to explore topics including testing of the basic performance of the default harvest policy and the effect of annual vs. biennial surveys. The results of these explorations showed that biomass levels and average catch was variable, mainly because of the high recruitment variability seen with Pacific Hake. Even though the Pacific Hake fishery is relatively data-rich, with a directed fishery- independent survey program, substantial biological sampling for both commercial fisheries and the acoustic survey, and reliable estimates of catch, the data are less informative about incoming recruitment which results in large differences between the simulated abundance and the estimated abundance. Thus the assessment takes uncertainty into account. The assessment reports stock status relative to reference points in a probabilistic way. The median posterior distribution for spawning depletion (SB_t/SB_0) with 95% credibility intervals is shown relative to the 40:10 reference levels. Also, a decision table showing predicted status and fishing intensity relative to target fishing intensity is presented with uncertainty represented from within the base-case model. The decision table shows the projected outcomes for each potential catch level (rows) and can be evaluated across the quantiles (columns) of the posterior distribution.		
d	**Guidepost**			The assessment has been tested and shown to be robust. Alternative hypotheses and assessment approaches have been rigorously explored.
	Met?			Yes

PI 1.2.4		There is an adequate assessment of the stock status		
	Justification	SG100 The assessment team conducted extensive structural explorations of the assessment model in 2011 (Stewart et al. 2011). These analyses ranged from simple production models to seasonal, sex- fleet/sector-specific approaches incorporating time-varying growth. In 2013 the JTC devoted their efforts instead to a few structural uncertainties, and to the development of a management strategy evaluation (MSE). Sensitivity analyses were conducted to investigate the structural uncertainty of the base model by examining the effect of changing parameter priors and assumptions. The sensitivities included the following: 1. Increasing the standard deviation on the prior for natural mortality (M), 2. Decreasing the mean of the prior on steepness (h) or increasing steepness to 1.0, 3. Increasing or decreasing the recruitment variability assumption (σR), 4. Increasing or decreasing the maximum age for which selectivity was estimated, and 5. Allowing fishery selectivity to change from year to year. Retrospective analyses were conducted by systematically removing the terminal year's data sequentially for ten years. A retrospective pattern is not apparent in estimates of spawning biomass over the last decade, but the large amount of variability and a pattern of low spawning biomass predicted immediately after a strong recruitment event, followed by a large biomass when the year class is finally observed suggests that the model is unable to accurately predict recruitment until it has been observed a few years. Parameter estimates showed no clear patterns except that the additional variability on the acoustic survey index increased in 2011 due to the contrast in 2009 and 2011 survey biomass. Thus the assessment has been tested using a systematic exploration of the interactions among different sets of assumptions. This confirms that alternative hypothesis and assessment approaches have been rigorously explored.		
e	**Guidepost**		The assessment of stock status is subject to peer review.	The assessment has been internally and externally peer reviewed.
	Met?		Yes	No
	Justification	SG80 Under the authority of the Hake Agreement the Scientific Review Group conducts the peer review of the assessment of the Pacific Hake stock status. In 2013 the SRG included two U.S., two Canadian and two additional members designated by the Joint Management Committee. In addition the JMC appointed one U.S. and one Canadian industry advisor to the SRG. The SRG met in Vancouver February 19-22, 2013 the draft stock assessment document prepared by the JTC. Thus, the peer review occurs only within the framework of the Hake Agreement.		
References		Fournier *et al*. 2012; JTC 2013; Methot and Wetzel 2013, SRG 2013, Stewart *et al*. 2011, DFO 2013a, DFO 2013b. http://www.sciencedirect.com/science/article/pii/S0165783612003293		
OVERALL PERFORMANCE INDICATOR SCORE: This PI receives a score of 95 because all issues of the G80 are met, and most issues achieve higher performance at SG 100; only issuee fails to meet SG100 (no external peer review at this time).				**US 95** **Can 95**
CONDITION NUMBER (if relevant):				**N/A**

Principle 2

Evaluation Table: PI 2.1.1

PI 2.1.1		**The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main retained species are likely to be within biologically based limits (if not, go to scoring issue c below).	Main retained species are highly likely to be within biologically based limits (if not, go to scoring issue c below).	There is a high degree of certainty that retained species are within biologically based limits and fluctuating around their target reference points.
	Met?	US: Yes Can: No – see issue c	US: Yes Can: No – see issue c	US: Partial Can: No
	Justification	U.S. Fishery SG60 – see SG 80 and 100 for details SG80 – Shortraker Rockfish has not been assessed (PFMC 2013e) but because Shortraker occurs with Aurora and Rougheye in the slope other rockfish complex, and because Shortraker Rockfish is a minor species on the west coast and at the tail end of the distribution of the stock, such that catches in west coast fisheries have little effect on overall stock status (PFMC 2013e), it is reasonable to conclude its status in the west coast region is very likely within biologically based reference points. SG100 – Stock assessments for Yellowtail Rockfish (Wallace and Lai 2005), Widow, rockfish (He et al. 2011), aurora rockfish (Hamel et al. 2013), rougheye Rockfish (Hicks et al. 2014), and Spiny Dogfish (Gertseva and Taylor 2012) indicate there is a high degree of certainty that these main retained species are fluctuating around target reference points. See Section 3.4.2 for details. Additionally, 33% of the minor retained species are within biologically based limits and fluctuating around their target reference points. See Section 3.4.2 for details. Yellowtail Rockfish – 80 Shortraker Rockfish – 80 Widow Rockfish – 100 Rougheye Rockfish – 100 Spiny Dogfish – 100 Minor retained species – 90 Canadian Fishery SG60 – According to the 2013 review of annual survey abundance index trends, Bocaccio has a negative trend (CGRCS 2013) and abundance is below the limit reference point. No biomass reference points have been established for Yellowtail Rockfish, Redstripe Rockfish, or Walleye Pollock. Therefore, we cannot determine if these species are within biological limits. Yellowtail Rockfish – see 2.1.1 (c) Redstripe Rockfish – see 2.1.1 (c) Bocaccio – see 2.1.1 (c) Walleye Pollock – see 2.1.1 (c)		
b	**Guidepost**			Target reference points are defined for retained species.
	Met?			US: Partial Can: Partial

<table>
<tr><td colspan="2">PI 2.1.1</td><td colspan="3">The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S. Fishery
SG60 – NA
SG80 - NA
SG100 – Target reference points are defined for yellowtail rockfish (Wallace and Lai 2005), widow, rockfish (He et al. 2011), aurora rockfish Hamel et al. 2013, rougheye rockfish (Hicks et al. 2014), sablefish (PFMC and NMFS 2013) and spiny dogfish (Gertseva and Taylor 2012), and 45% of the minor retained species, but not for shortraker rockfish (PFMC and NMFS 2013), and remaining 55% of the minor retained species. See Section 3.4.2 for background.
Widow Rockfish – 100
Rougheye Rockfish – 100
Shortraker Rockfish - 80
Spiny Dogfish – 100
Minor species – 90
Yellowtail Rockfish – not scored here

Canadian Fishery
SG60 – NA
SG80 - NA
SG100 – This only applies to Bocaccio and five minor retained species.</td></tr>
<tr><td>c</td><td>Guidepost</td><td>If main retained species are outside the limits there are measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding of the depleted species.</td><td>If main retained species are outside the limits there is a partial strategy of demonstrably effective management measures in place such that the fishery does not hinder recovery and rebuilding.</td><td></td></tr>
<tr><td></td><td>Met?</td><td>US: NA; Can: Yes</td><td>US: NA; Can: Yes</td><td></td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S. Fishery
SG60 – NA
SG80 – NA
SG100 – NA

Canadian Fishery
SG60 – see SG80
SG80 – With input from several advisory bodies, DFO implemented Bocaccio catch reduction measures in 2013 such that the fishery does not hinder recovery and rebuilding. The Canadian hake fishery avoids Bocaccio under fishing requirements, and takes less than 20% of the Bocaccio TAC. For the remainder of the major retained species, no biomass limit points have been developed so there is no basis for determination of status with respect to reference points. Qualified harvest recommendations for non-assessed stocks are provided based on average catch history, trends in survey results, and expert opinion, and are designed to maintain these stocks at precautionary levels. For Shortraker Rockfish, Redstripe Rockfish, and Walleye Pollock, the Hake fishery takes less than 15% of the TAC, thereby not posing a risk to the species. 100% on board observer coverage and fish tickets account for all catch. If data indicate any resource concerns management mechanisms are in place to address them (DFO 2013b).</td></tr>
</table>

PI 2.1.1		**The fishery does not pose a risk of serious or irreversible harm to the retained species and does not hinder recovery of depleted retained species**		
d	**Guidepost**	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery.		
	Met?	Yes		
	Justification	U.S. Fishery SG60 – This applies to Shortraker Rockfish. Measures/practices in place expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery include IFQ for this complex, 100% onboard observer coverage, RCAs, and the fact that Shortraker are managed as part of the minor slope rockfish complex by the PFMC. Canadian Fishery SG60 – Measures/practices in place expected to result in the fishery not causing the retained species to be outside biologically based limits or hindering recovery include IFQ for most species, because of implementation of the IFMP (DFO 2013b), which includes 100% on-board observer coverage, etc. Pollock harvest has exceeded its annual TAC by 10+% the last two years. However, the IVQ program in Canada includes carryover provisions that allow for specified catch overage and underage amounts in a given year. For this reason, in a given year, the catch may exceed the TAC. However, overages that occur in one year are subtracted from the fisher's quota holdings the next year, thereby ensuring that the fishery remains within TACs over a multi-year period.		
References		DFO 2013b; Hamel *et al.* 2013; He *et al*. 2011; Gertseva and Taylor 2012; Hicks *et al*. 2014; PFMC 2013e; PFMC and NMFS 2013, and Wallace and Lai 2005		

OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet SG 60 and SG 80. The US fishery meets the SG100 for nearly half of the retained species for scoring issues (a) and (b) so a US score of 90 is given. The Canadian fishery meets the SG100 for scoring issue (b) for one species.	U.S. 90 Can 80
CONDITION NUMBER	**NA**

Evaluation Table: PI 2.1.2

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main retained species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing retained species.
	Met?	Yes	Yes	Yes
	Justification	U.S. SG60 – see SG100 SG80 – see SG100 SG100 – The strategy in place for managing retained species is outlined in the PFMC Groundfish Management Plan (GMP) (PFMC 2011d, PFMC and NMFS 2013). See Section 3.4.2 for background. Canada SG60 – see SG100 SG80 – see SG100 SG100 – The strategy in place for managing retained species is outlined in the IFMP (DFO 2013b) and Hake Management Plan (DFO 2013a). See Section 3.4.2 for background.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Yes	Yes	No
	Justification	U.S. SG60 – see SG80 SG80 –There is objective basis for confidence that the strategy in the GMP (PFMC 2011d) will work, based on information directly obtained from the fishery through the 100% coverage observer program of species involved. See section 3.5.11 for background. Canada SG60 – see SG80 SG80 – There is objective basis for confidence that the strategy in the IFMP (DFO 2013b) will work, based on information directly obtained from the fishery through the 100% coverage observer program of species involved. See section 3.4.2 for background.		

PI 2.1.2		There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Yes	Yes
	Justification	U.S. SG60 – NA SG80 – see SG100 SG100 – There is clear evidence that the strategy is being implemented successfully as evidenced by implementation of 100% observer coverage in both countries, the reduction of bycatch and all main retained species stocks are deemed to be above limit reference points and most are above target reference points. Hake fishers from all sectors are engaged in the management process. The Hake fleet is very aware of the potential to exceed the ACL for Rougheye Rockfish, and has been working towards reducing the catch of rougheye rockfish, especially in the CP fleet. The at-sea fleets monitor catch closely and identify bycatch hotspots to avoid those areas. The CP fleet, at least, has been using some in-net BRD's and there is ongoing work at the NWFSC with cooperation from the fleet to design better BRDs (Hicks 2014). See Sections 3.4.2.2 and 3.5 for background. Canada SG60 – NA SG80 – see SG100 SG100 – There is clear evidence that the strategy is being implemented successfully as evidenced by implementation of 100% observer coverage, the reduction of bycatch and all main retained species stocks (except Boccaccio in Canada) are above target reference points. Hake fishery stakeholders from all sectors are engaged in the management process. See Section 3.5 for background.		
d	Guidepost			There is some evidence that the strategy is achieving its overall objective.
	Met?			Yes
	Justification	Both fisheries SG60 – NA SG80 – NA SG100 – There is some evidence that the strategy is achieving its overall objective as evidenced by the reduction of bycatch, rebuilding as necessary such that all main retained species stocks are above limit reference points and most above target reference points (DFO 2013b) and there is high levels of regulation compliance (Matthews 2013 and Gilcrest 2013) because fishers understand and participate in the respective management processes.		
e	Guidepost	It is likely that shark finning is not taking place.	It is highly likely that shark finning is not taking place.	There is a high degree of certainty that shark finning is not taking place.
	Met?	Not relevant	Not relevant	Not relevant

PI 2.1.2		**There is a strategy in place for managing retained species that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to retained species**	
	Justification	NA	
References		DFO 2013a; DFO 2013b; Gilcrest 2013; Hicks 2014; Matthews 2013; PFMC 2011d, PFMC and NMFS 2013	
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet SG 60 and SG 80 and 3 of 4 SG 100 issues, so scores of 95 are given.			U.S. 95 Can 95
CONDITION NUMBER (if relevant):			

Evaluation Table: PI 2.1.3

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main retained species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main retained species taken by the fishery.	Accurate and verifiable information is available on the catch of all retained species and the consequences for the status of affected populations.
	Met?	Yes	Yes	US: Yes Can: No
	Justification	US SG60 – see SG100 SG80 – see SG100 SG100 – the U.S. maintains 100% observer coverage on at-sea processor and catcher-processor Hake vessels and 100% dockside monitoring of shore plants (PFMC 2011f). The U. S. had a wide amount of high quality information on fishing catch, effort, and mortality, and biological parameters with which to determine consequences for affected (and more) populations. The populations without sufficient information are affected to a minor degree by the Hake fishery. See Sections 3.4.2 and 3.5.11 for details. Canada SG60 – see SG80 SG80 – Canada maintains 100% at sea monitoring via either observer or electronic monitoring and 100% dockside monitoring of shore plants (DFO 2013b). All retained catch is accurately determined to species. DFO has a wide amount of high quality information on fishing catch, effort, and mortality, and biological parameters for many species but it is unclear how well DFO can determine consequences for affected populations. Most populations of minor retained species without sufficient information are affected to a minor degree by the Hake fishery. See Sections 3.4.2 and 3.5.11 for details.		
b	**Guidepost**	Information is adequate to qualitatively assess outcome status with respect to biologically based limits.	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with a high degree of certainty.
	Met?	Yes	US: Yes Can: Partial	US: Yes Can: No

<table>
<tr><td colspan="2">PI 2.1.3</td><td colspan="3">Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S.
SG60 – see SG100
SG80 – see SG100
SG100 – The U.S. maintains 100% observer coverage on all trawl, including Hake, vessels (PFMC. 2011f). The PFMC documents the key information in The Stock Assessment and Fishery Evaluation (SAFE) documents, Stock Assessment Review (STAR) panel reports (PFMC 2014a) and PFMC and NMFS 2013. See Section 3.5.11 for details. Resulting data are used, or will be used, by scientists in the respective countries to quantitatively estimate outcome status of retained species with a high degree of certainty for affected populations.

Canada
SG60 – See SG80
SG80 – Outcome status for non-assessed stocks are estimated based on average catch history, trends in survey results, and expert opinion. 100% on board observer coverage and fish tickets account for all catch. If data indicate any resource concerns management mechanisms are in place to address them (DFO 2113b). Canada maintains 100% at sea coverage on Hake vessels. Canadian monitoring data are evaluated through the annual IFMP process (DFO 2013b). DFO has a wide amount of information on fishing catch, effort, and mortality for many species suitable for assessment, as demonstrated by Bocaccio; however, acceptable assessments for Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock have not been completed to determine biological reference points and status relative to reference points. It is not clear that all main species have sufficient biological parameters available for an assessment.
SG100 – N/A</td></tr>
<tr><td>c</td><td>Guidepost</td><td>Information is adequate to support measures to manage main retained species.</td><td>Information is adequate to support a partial strategy to manage main retained species.</td><td>Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.</td></tr>
<tr><td></td><td>Met?</td><td>Yes</td><td>Yes</td><td>US: Yes Can: No</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S.
SG60 – see SG100
SG80 – see SG100
SG100 – The U.S. maintains 100% observer coverage on Hake vessels and 100% monitoring of shore side processors (PFMC. 2011f). Fishery monitoring demonstrates that fishermen comply with regulations. Assessments show the status of most species. Therefore, Information is adequate to support a strategy to manage affected populations, and evaluate with a high degree of certainty whether the strategy is achieving its objective. See Sections 3.4.2 and 3.5.11 for details.

Canada
SG60 – see SG100
SG80 –Canada maintains 100% at sea coverage on Hake vessels and 100% monitoring of shore side processors (DFO 2013b). Fishery monitoring demonstrates that fishermen comply with regulations. Assessments show the status of many species. Because acceptable assessments for Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock have not been completed to determine biological reference points, there is not a high degree of certainty whether the strategy is achieving its objective.</td></tr>
</table>

PI 2.1.3		Information on the nature and extent of retained species is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage retained species		
d	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g. due to changes in the outcome indicator score or the operation of the fishery or the effectiveness of the strategy)	Monitoring of retained species is conducted in sufficient detail to assess on-going mortalities to all retained species.
	Met?		US: Yes Can: Partial	US: Yes Can: No
	Justification	U.S. SG60 – NA SG80 – see SG100 SG100 – The US maintain 100% observer coverage on Hake vessels and assessments demonstrate stock status such that changes in risk are evident. See Sections 3.4.2 and 3.5.11 for details. As a result, monitoring of retained species is conducted in sufficient detail to assess on-going mortalities to all retained species. Canada SG60 – NA SG80 – Canada maintains 100% at sea coverage on Hake vessels and for those species with assessments, demonstrates stock status such that changes in risk are evident for those species. Because acceptable assessments for Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock have not been completed to determine biological reference points, it would be difficult to detect an increase in risk level other than anecdotally from fishery performance. SG100 – NA		
References		DFO 2013b; PFMC. 2011f; PFMC 2014a		

OVERALL PERFORMANCE INDICATOR SCORE: The U.S. fishery meet all SG 60, SG 80, and SG 100 issues, so a score of 100 is given. The Canadian fishery meets scoring issues a and c of the SG 80 and partially met scoring issues b and d of the SG80 so a score of 75 is warranted	U.S. 100 Can 75
CONDITION NUMBER	**1**

Evaluation Table: PI 2.2.1

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Main bycatch species are likely to be within biologically based limits (if not, go to scoring issue b below).	Main bycatch species are highly likely to be within biologically based limits (if not, go to scoring issue b below).	There is a high degree of certainty that bycatch species are within biologically based limits.
	Met?	US: Yes Can: No see 2.2.1 (b)	US: Yes Can: No see 2.2.1 (b)	US: Partial Can: No
	Justification	U.S. Fishery SG60 – see SG80 SG80 – No main groundfish bycatch species occur in the fishery. Non-listed salmon stocks are highly likely to be within limits (PFMC 2014c). The extent of mitigation to recover listed salmon ESUs and to prevent jeopardy to non-listed ESUs includes clear management objectives for directed salmon fisheries and fisheries that take salmon as bycatch; by species and region; setting minimum spawning escapement thresholds; maximum exploitation rates; pre-season forecasts; and closed seasons; these mitigation measures often constrain directed salmon fisheries. Vulnerable species (listed salmon, Green Sturgeon, Eulachon) are considered as ETP. SG100 – Two of the bycatch species, Pacific Halibut and Dungeness crab, are MSC certified and are therefore considered with a high degree of certainty to be within biological limits. The other minor bycatch species do not have stock assessments so do not have a high degree of certainly of being within biological limits. However, the fisheries do not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups because the amount of bycatch is insignificant. Canadian Fishery SG60 – Qualified harvest recommendations for Rougheye Rockfish are provided based on average catch history, trends in survey results, and expert opinion (DFO 2013b). Total harvest has been steady the past five years ranging from 75-82% of the TAC (Ackerman 2014), so it is likely to be within biological limits. SG80 – Rougheye Rockfish is a vulnerable species, and there has not been an assessment to estimate biological reference points in Canadian waters, one cannot say it is highly likely to be within biologically based limits. See 2.2.1 b Of the 26 Chinook Outlook Units, 7 are Stocks of Concern, 14 are Below Target, 4 are Near Target, and none are Well Above Target. Therefore, we cannot say that all Chinook stocks are within limits. See 2.2.1 b. SG100 – N/A		
b	**Guidepost**	If main bycatch species are outside biologically based limits there are mitigation measures in place that are expected to ensure that the fishery does not hinder recovery and rebuilding.	If main bycatch species are outside biologically based limits there is a partial strategy of demonstrably effective mitigation measures in place such that the fishery does not hinder recovery and rebuilding.	
	Met?	US: Yes Can: Yes	US: Yes Can: Yes	

PI 2.2.1		The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups		
	Justification	US Chinook ESUs evaluated in the Salmon SAFE (PFMC 2014c) are specified as within biological limits, but we cannot assure that they are highly likely within limits. Some stocks reach or exceed the MSY escapement goals only occasionally, but all exceeded the minimum spawning escapement threshold in most years. The Pacific Fishery Management Council has established a rigorous conservation plan to avoid jeopardy for non-listed stocks. The extent of mitigation to recover listed salmon ESUs and to prevent jeopardy to non-listed ESUs includes clear management objectives for directed salmon fisheries and fisheries that take salmon as bycatch; by species and region; setting minimum spawning escapement thresholds; maximum exploitation rates; pre-season forecasts; and closed seasons; these mitigation measures often constrain directed salmon fisheries. The Hake fishery has a Chinook cap sufficient to not hinder recovery of ESA listed Chinook stocks; NMFS issued a Supplemental Biological Opinion in 2006 that addressed a 2005 overage, and determined that the Hake fishery did not constitute a significant threat to the recovery of the Chinook stocks (NMFS 2006). This provides evidence that the fishery does not jeopardize non-listed stocks. Canada The only main bycatch groundfish species that occurs in the Canadian fishery is Rougheye Rockfish. Qualified harvest recommendations for non-assessed stocks are provided based on average catch history, trends in survey results, and expert opinion. Specific measures include prohibition of fishing in MPAs for bottom contact gear, 100% at sea coverage and full accounting of the catch (DFO 2013b). Total harvest has been steady the past five years ranging from 75-82% of the TAC (Ackerman 2014). In Canada, Chinook Salmon stocks are being managed such that the fishery does not hinder recovery and rebuilding (DFO 2013g, 2013h, and 2013i). The stocks are managed under the PST, have thresholds, exploitation rates, and forecasts; catch remains within agreed catch limits. For very weak stocks, fishery closures and other restrictions are implemented, based on analysis of fishery dependent and independent and biological data.		
c	**Guidepost**	If the status is poorly known there are measures or practices in place that are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		
	Met?	Yes		
	Justification	U.S. Fishery SG60 – Measures and practices in place by the PFMC (PMFC 2011d) that put limits on catch, foster low non-target catch rates, and require full observations of bycatch are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery. Canadian Fishery SG60 – Measures and practices in place by the DFO (DFO 2013b) that put limits on catch, foster low non-target catch rates, and require full observations of bycatch are expected to result in the fishery not causing the bycatch species to be outside biologically based limits or hindering recovery.		

PI 2.2.1	**The fishery does not pose a risk of serious or irreversible harm to the bycatch species or species groups and does not hinder recovery of depleted bycatch species or species groups**	
References	NMFS 2006; PFMC 2014c; Ackerman 2014; DFO 2013b; DFO 2013g; 2013h; 2013i; Ford et al. 2010; and PMFC 2011d	
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries achieve SG60 and the SG80 and 2 of 6 US species meet the requirements for SG100, so the US fishery receives an 85 score.		U.S. 85 Can 80
CONDITION		

Evaluation Table: PI 2.2.2

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a partial strategy in place, if necessary, that is expected to maintain the main bycatch species at levels which are highly likely to be within biologically based limits, or to ensure the fishery does not hinder their recovery and rebuilding.	There is a strategy in place for managing and minimizing bycatch.
	Met?	Yes	Yes	Yes
	Justification	U.S. SG60 – see SG100 SG80 – see SG100 SG100 – There is clear evidence (PFMC and MFS 2013) that the strategy is being implemented successfully. Pacific halibut and Dungeness crab are MSC certified and carefully monitored for impacts of bycatch; the Hake fishery successfully minimizes bycatch of these species. Chinook Salmon are highly managed in the Hake fishery and in the directed Pacific Salmon fisheries. For minor species, the management system is developed by the PFMC and implemented by the NMFS, which includes monitoring by observer from 100% coverage of fishing activities for any changes in bycatch rates and quantities for indications of adverse impacts. Hake fishers from all sectors are engaged in the management process. See sections 3.2 and 3.4 for details. Canada SG60 – see SG100 SG80 – see SG100 SG100 – There are several strategies in place that are described in DFO's Guidance on Implementation of the Policy on Managing Bycatch (DFO 2013e). These include: • Develop data collection and monitoring systems that will support timely, reliable, and aggregated reporting on retained and non-retained bycatch species. • Evaluate the impact of fishing on bycatch species, whether they are retained or returned to the water. • Minimize the capture of bycatch species and specimens that will not be retained, to the extent practicable. • Where capture of bycatch species and specimens that will not be retained is unavoidable, maximize the potential for live release and post-release survival. • Manage the catch of retained bycatch so as not to exceed established harvest levels for the species.		

PI 2.2.2		There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/species).	There is some objective basis for confidence that the partial strategy will work, based on some information directly about the fishery and/or species involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or species involved.
	Met?	Yes	Yes	Yes
	Justification	U.S. SG60 – see SG100 SG80 – see SG100 SG100 There is an objective basis for confidence that the strategy in the GMP (PFMC 2011d) will work, based on information directly about the fishery through the 100% coverage observer program of species involved. The low quantities of bycatch and high monitoring activities provide a basis for necessary actions to avoid serious or irreversible. The management system has demonstrated willingness and ability to implement restrictions that lead to rebuilding as necessary. The PFMC uses its Scientific and Statistical Committee and the STAR Panel to test development and critique structured logical arguments and analyses that support the choices of strategies for bycatch species complexes. This includes empirical testing based on evidence of past performance, and simulation testing on bycatch species that have stock assessment. Canada SG60 – see SG100 SG80 – see SG100 SG100 There is objective basis for confidence that the strategy in the IFMP (DFO 2013b) will work, based on information directly about the fishery through the 100% coverage observer program of species involved. DFO uses a process similar to that of the US to support the choices of strategies for bycatch species complexes implemented in the IFMP (DFO 2013b), including empirical testing based on evidence of past performance, and simulation testing on bycatch species that have stock assessment.		
c	**Guidepost**		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Yes	Yes

PI 2.2.2		**There is a strategy in place for managing bycatch that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to bycatch populations**		
	Justification	U.S. SG60 – NA SG80 – see SG100 SG100 – There is clear evidence that the strategy is being implemented successfully as evidenced by implementation of 100% observer coverage (PFMC. 2011f), the reduction of bycatch, and Hake fishers from all sectors are engaged in the management process. The various fishing sectors communicate on the water to avoid areas of high bycatch. Canada SG60 – NA SG80 – see SG100 SG100 – There is clear evidence that the strategy is being implemented successfully as evidenced by implementation of IFQs; improvement of the design and use of fishing gear and bycatch mitigation devices; spatial and temporal closures; 100% at sea coverage. Hake fishery stakeholders from all sectors are engaged in the management process; and enforcement incentives for harvesters to comply with measures to manage bycatch (DFO 2013a, (DFO 2013b).		
d	**Guidepost**			There is some evidence that the strategy is achieving its overall objective.
	Met?			Yes
	Justification	Both countries SG60 – NA SG80 – NA SG100 – There is some evidence that the strategy is achieving its overall objectives. Bycatch levels (the objectives) are set annually based on scientific research on each stock or complex, to assure they are not overfished. Evidence that these objectives are being achieved is demonstrated by fishers managing their bycatch of these species within their authorized quotas. There is a high level of regulation compliance (Matthews 2013 and Gilcrest 2013) because fishers understand and participate in the respective management processes (DFO 2013b).		
References		DFO 2013a; DFO 2013b, DFO 2013e; Gilcrest 2013; Matthews 2013; PFMC 2011d; PFMC 2011f; PFMC and MFS 2013.		

OVERALL PERFORMANCE INDICATOR SCORE: Because both fisheries meet all issues for SG 60, SG 80, and SG100, scores of 100 are given.	U.S. 100 Can 100
CONDITION NUMBER (if relevant):	

Evaluation Table: PI 2.2.3

PI 2.2.3		Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Qualitative information is available on the amount of main bycatch species taken by the fishery.	Qualitative information and some quantitative information are available on the amount of main bycatch species taken by the fishery.	Accurate and verifiable information is available on the catch of all bycatch species and the consequences for the status of affected populations.
	Met?	Yes	Yes	Yes
	Justification	Both countries SG60 – See SG 100 SG80 – See SG 100 SG100- Both countries maintain 100% observer coverage on Hake vessels and 100% dockside monitoring (Al-Humadhi ***et al.*** 2012, 2012a, Bellman, ***et al***. 2013, DFO 2013b, PFMC. 2011f) that provide a wide amount of high quality information on fishing catch, effort, and mortality. See Section 3.5.11 for details. For the many minor bycatch species the catch in the hake fisheries are insignificant.		
b	**Guidepost**	Information is adequate to broadly understand outcome status with respect to biologically based limits	Information is sufficient to estimate outcome status with respect to biologically based limits.	Information is sufficient to quantitatively estimate outcome status with respect to biologically based limits with a high degree of certainty.
	Met?	Yes	US: Yes Canada: No	No
	Justification	US SG60 – See SG 80 SG80 –Both countries maintain 100% at sea coverage on Hake vessels. See Section 3.5.11 for details. Resulting data are used by scientists in the respective countries to quantitatively estimate outcome status of most, but not every bycatch species with a high degree of certainty (DFO 2013b, PFMC. 2011f). Canada SG60 – Outcome status for non-assessed stocks are estimated based on average catch history, trends in survey results, and expert opinion. 100% on board observer coverage and fish tickets account for all catch. If data indicate any resource concerns management mechanisms are in place to address them (DFO 2113b). Canada maintains 100% at sea coverage on Hake vessels. Canadian monitoring data are evaluated through the annual IFMP process (DFO 2013b). DFO has a wide amount of information on fishing catch, effort, and mortality for many species suitable for assessment, as demonstrated by Bocaccio; however, an acceptable assessment for Rougheye Rockfish has not been completed to determine biological reference points and status relative to reference points. It is not clear that Rougheye has sufficient biological parameters available for an assessment. SG80 – N/A		
c	**Guidepost**	Information is adequate to support measures to manage bycatch.	Information is adequate to support a partial strategy to manage main bycatch species.	Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective.
	Met?	Yes	Yes	Yes

PI 2.2.3		**Information on the nature and the amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch**		
	Justification	Both countries SG60 – See SG 100 SG80 – See SG 100 SG100- Both countries maintain 100% at sea coverage on Hake vessels. See Section 3.5.11 for details. Information is adequate to support a strategy to manage retained species, and evaluate with a high degree of certainty whether the strategy is achieving its objective (DFO 2013b, PFMC. 2011f).		
d	**Guidepost**		Sufficient data continue to be collected to detect any increase in risk to main bycatch species (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectively of the strategy).	Monitoring of bycatch data is conducted in sufficient detail to assess ongoing mortalities to all bycatch species.
	Met?		US: Yes Canada: No	US: Yes Canada: No
	Justification	US SG60 – NA SG80 – See SG 100 SG100 – The US maintains 100% observer coverage on Hake vessels. See Section 3.5.11 for details. As a result, monitoring of retained species is conducted in sufficient detail to assess ongoing mortalities to all retained species (Al-Humadhi *et al.* 2012, 2012a, Bellman, *et al*. 2013, PFMC. 2011f). Canada SG60 – NA SG80 – Canada maintains 100% monitoring coverage on Hake vessels and for those species with assessments, demonstrates stock status such that changes in risk are evident for those species (DFO 2013b). Because an acceptable assessment for Rougheye Rockfish has not been completed to determine biological reference points, it would be difficult to detect an increase in risk level other than anecdotally from fishery performance. SG100 – NA		
References		Al-Humadhi *et al.* 2012, 2012a, Bellman, *et al*. 2013; DFO 2013b, PFMC. 2011f		
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG60 scoring issues. The US meets all SG80 and 3 of 4 scoring issues for SG 100, so a score of 95 is given. Canada meets 2 (a and c) of 4 SG80 scoring issues so a score of 70 is given.				U.S. 95 Can 70
CONDITION NUMBER (if relevant):				**2**

Evaluation Table: PI 2.3.1

PI 2.3.1	**The fishery meets national and international requirements for the protection of ETP species** **The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species**		
Scoring Issue	SG 60	SG 80	SG 100

PI 2.3.1		The fishery meets national and international requirements for the protection of ETP species The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species		
a	Guidepost	Known effects of the fishery are likely to be within limits of national and international requirements for protection of ETP species.	The effects of the fishery are known and are highly likely to be within limits of national and international requirements for protection of ETP species.	There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species.
	Met?	Yes	Yes	Yes
	Justification	U.S. SG60 – See SG 100 SG80 – See SG 100 SG100- There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species. There is 100% observer coverage (PFMC. 2011f) and these data are analyzed and ETP interactions assessed to determine if any species are subject to unacceptable risk (Jannot *et al*. 2011). Of the ETP species that have had observed interactions with the Hake fishery, none other than Chinook salmon have interactions at a high enough level to require specific management of the Pacific Hake fishery; other species take is generally at the *di minimis* level. Salmon takes averaged 7,300 Chinook per year for the 15 years prior to the 2006 BiOP, and below the incidental take limit of 11,000 per year set by the 2006 BiOp. Listed Chinook Salmon ESUs are not in jeopardy from the incidental catch in the hake fisheries (Ford et al. 2010), and the near-zero catch of other species meets the MSC requirement that if there are no ETP species caught in the fishery then the fishery would meet the 100 SG. The 100% observer coverage demonstrates that Green Sturgeon occur at a near-zero catch, such that the mid-water trawl fishery has no demonstrable effect. Similarly, Eulachon occur at a near-zero catch. The mid-water Hake fishery is listed as a Category III fishery (remote likelihood of/ no known marine mammal interactions) by the NOAA Fisheries Office of Protected Resources (NMFS 2014a). Discussions between NMFS and FWS may result in measures addressing sea bird interactions, but none exist at present. See Section 3.4 for further details. Canada SG60 – See SG 100 SG80 – See SG 100 SG100 – No ETP species occur in the Canadian Hake fishery to a degree that the hake fishery would cause any impacts. See Section 3.4.3 for more details. There is a high degree of certainty that the effects of the fishery are within limits of national and international requirements for protection of ETP species. There is 100% at sea coverage and these data are analyzed and ETP interactions assessed to determine if any species are subject to unacceptable risk through the Fisheries and Oceans Acts and SARA processes (DFO 2013b).		
b	Guidepost	Known direct effects are unlikely to create unacceptable impacts to ETP species.	Direct effects are highly unlikely to create unacceptable impacts to ETP species.	There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species.
	Met?	Yes	Yes	Yes

PI 2.3.1		**The fishery meets national and international requirements for the protection of ETP species** **The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species**		
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species because of 100% fishery monitoring tracks all interactions. The mid-water Hake fishery is listed as a Category III fishery for marine mammals (remote likelihood of/ no known interactions) by the NOAA Fisheries Office of Protected Resources (NMFS 2014a) so has been determined to create no unacceptable impacts. Reviews of impacts on seabirds and fish other than salmon have led to determinations that impacts do not require measures for additional protection. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- There is a high degree of confidence that there are no significant detrimental direct effects of the fishery on ETP species because of 100% fishery monitoring tracks all interactions. Results are discussed and acted upon, if necessary during the annual process of the IFMP (DFO 213b).		
c	**Guidepost**		Indirect effects have been considered and are thought to be unlikely to create unacceptable impacts.	There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species.
	Met?		Yes	US: Yes Can: Yes

PI 2.3.1		**The fishery meets national and international requirements for the protection of ETP species** **The fishery does not pose a risk of serious or irreversible harm to ETP species and does not hinder recovery of ETP species**
	Justification	U.S. Fishery SG60 – NA SG80 – See SG 100 SG100- There is a high degree of confidence that there are no significant detrimental indirect effects of the fishery on ETP species. Results of 100% fishery monitoring justifies the mid-water Hake fishery listing as a Category III fishery (remote likelihood of/ no known interactions) by the NOAA Fisheries Office of Protected Resources (NMFS 2014a), based on monitoring results (Jannot et al. 2011). The PFMC adopted the Fishery Ecosystem Plan (FEP), the Ecosystem Initiatives Appendix, and a schedule for implementation (PFMC 2013c). The purpose of the FEP is to enhance the PFMC's species-specific management programs with more ecosystem science, broader ecosystem considerations and management policies that coordinate PFMC management across its Fishery Management Plans and the California Current Ecosystem. These activities are providing best available science to inform managers of any indirect effects of the fishery. Analysis by Kaplan et al. (2012) suggests that the Hake mid-water trawl fishery has direct impacts primarily only on its target and bycatch species. Few indirect effects from the fleet extended through predator-prey links to other parts of the food web, but the few include increases krill, small plantivores, large piscivorous flatfish, Dover sole, shortbelly rockfish, and shrimp. Canadian Fishery SG60 – NA SG80 – See SG 100 SG100- The 100% at sea observer coverage and subsequent data analysis demonstrates that the Canadian Pacific Hake fishery has no significant interactions with any species protected under SARA (DFO 2013b). Analysis by Kaplan et al. (2012) suggests that the Hake mid-water trawl fishery has direct impacts primarily only on its target and bycatch species. Few indirect effects from the fleet extended through predator-prey links to other parts of the food web, but the few include increases krill, small plantivores, large piscivorous flatfish, Dover sole, shortbelly rockfish, and shrimp.
References		DFO 2013b; Ford et al. 2010; Jannot ***et al***. 2011; NMFS 2014a; PFMC 2011f; PFMC 2013c
OVERALL PERFORMANCE INDICATOR SCORE: Both the US and Canadian fisheries met all issues for SG 60, SG 80, and SG100, a score of 100 is given.		U.S. 100 Can 100
CONDITION NUMBER (if relevant):		

Evaluation Table: PI 2.3.2

PI 2.3.2		The fishery has in place precautionary management strategies designed to: • Meet national and international requirements; • Ensure the fishery does not pose a risk of serious harm to ETP species; • Ensure the fishery does not hinder recovery of ETP species; and • Minimise mortality of ETP species.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place that minimise mortality of ETP species, and are expected to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to be highly likely to achieve national and international requirements for the protection of ETP species.	There is a comprehensive strategy in place for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species.
	Met?	Yes	US: Yes Can: Yes	US: Yes Can: Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – There is a comprehensive strategy in place (NMFS Office of Protected Resources 2008) for managing the fishery's impact on ETP species, including measures to minimise mortality, which is designed to achieve above national and international requirements for the protection of ETP species. Consultations occur to achieve protection of ETP species under the U.S. Marine Mammal Protection Act (MMPA), the Endangered Species Act (ESA), and the Migratory Bird Treaty Act (MBTA). The strategy applies to the Pacific Hake fishery to the degree that Hake fishery may cause adverse impacts. Restrictions on interactions with Pacific salmon, for example, provide a high level of protection. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – With implementation of the Fisheries Act and SARA there are comprehensive strategies in place for managing the fishery's impact on ETP species, including measures to minimise mortality (DFO 2013b), which is designed to achieve above national and international requirements for the protection of ETP species (Species at Risk Public Registry 2014). Chinook Salmon are included in the U.S.-Canada Salmon Treaty containing monitoring and management measures to protect listed U.S. ESUs, even though Chinook Salmon are not ETP species in Canada. Species that have designations from COSEWIC, which do not yet have SARA protection, including Pacific salmon, have specific US national protection under the US BiOp in US waters.		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/species).	There is an objective basis for confidence that the strategy will work, based on information directly about the fishery and/or the species involved.	The strategy is mainly based on information directly about the fishery and/or species involved, and a quantitative analysis supports high confidence that the strategy will work.
	Met?	Yes	Yes	Yes

<table>
<tr><td colspan="2">PI 2.3.2</td><td colspan="3">The fishery has in place precautionary management strategies designed to:
• Meet national and international requirements;
• Ensure the fishery does not pose a risk of serious harm to ETP species;
• Ensure the fishery does not hinder recovery of ETP species; and
• Minimise mortality of ETP species.</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S. Fishery
SG60 – See SG 100
SG80 – See SG 100
SG100 – Under EPA, MMPA, and other legislation, the US must have strategies to recover ETP species. Strategies are explicit where fishing cause adverse impacts. If impacts are considered sufficiently low, the strategy consists of monitoring fishing activities (through 100% observer coverage in the case of the Pacific Hake fishery) to watch for changes that could signal a change in status. The strategy (PFMC 1997) is based on information directly from the 100% observer coverage on Hake vessels (PFMC. 2011f). See Section 3.5.11 for details. As a result, monitoring of ETP is conducted in sufficient detail to assess on-going mortalities (Al-Humadhi et al. 2012, 2012a, Bellman, et al. 2013) about the fishery and/or species involved, and a quantitative analysis by the NMFS Office of Protected Species supports high confidence that the strategy will work.

Canadian Fishery
SG60 – See SG 100
SG80 – See SG 100
SG100- The strategy is mainly based on information directly from the 100% at sea coverage on Hake vessels (DFO 2013b). Analysis of data for the fishery and/or species involved, and a quantitative analysis by DFO, supports high confidence that the strategy will work.</td></tr>
<tr><td>c</td><td>Guidepost</td><td></td><td>There is evidence that the strategy is being implemented successfully.</td><td>There is clear evidence that the strategy is being implemented successfully.</td></tr>
<tr><td></td><td>Met?</td><td></td><td>Yes</td><td>US: Yes Can: No</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S. Fishery
SG60 – NA
SG80 – See SG 100
SG100- Evidence that the strategy is being implemented successfully comes from activities of the NMFS Office of Protected Species (NMFS. 2014b) and activities of the PFMC process (PMFC 1997).

Canadian Fishery
SG60 – NA
SG80 –There is evidence that the strategy is being implemented successfully through the IFMP annual updates (DFO 2013b).
SG100- While there is clear evidence the strategy is being implemented, there are many species that have Endangered and Threatened designations from COSEWIC, which do not yet have decisions on status under SARA, including Yellowmouth Rockfish, some BC salmon runs, and Eulachon. Bocaccio and Canary Rockfish were designated for listing by COSEWIC in 2002 and 2007, respectively. The decision not to list these was not made until 2014. Timeliness for decisions whether to list COSEWIC-designated species prevents clear evidence of successful implementation.</td></tr>
</table>

PI 2.3.2		**The fishery has in place precautionary management strategies designed to:** • **Meet national and international requirements;** • **Ensure the fishery does not pose a risk of serious harm to ETP species;** • **Ensure the fishery does not hinder recovery of ETP species; and** • **Minimise mortality of ETP species.**		
d	**Guidepost**			There is evidence that the strategy is achieving its objective.
	Met?			US: Yes Can: No
	Justification	U.S. Fishery SG100 - The strategy is achieving its objective from activities of the NMFS Office of Protected Species (NMFS. 2014b) and actions by the PFMC (PFMC. 2004). Canadian Fishery SG100 - There are many species that have designations from COSEWIC, for which decisions under SARA have not occurred, including some runs of BC Pacific salmon and rockfish. However, there is evidence that the strategy is achieving its objective for listed species through the IFMP annual updates (DFO 2013b). The U.S. ESA-listed Chinook ESUs have been determined not to be in jeopardy by U.S. BiOps, and are also addressed under the US-Canada Salmon Treaty. An independent advisory panel has supported DFO management and the Pacific Salmon Commission's work (Davis 2014). Therefore, the fishery partially meets this scoring issue.		
References		Al-Humadhi *et al.* 2012, 2012a; Bellman, *et al*. 2013; Davis 2014; DFO 2013b; NMFS Office of Protected Resources 2008; NMFS 2014b; PMFC 1997; PFMC 2004; PFMC 2006; PFMC. 2011f; Species at Risk Public Registry 2014.		
OVERALL PERFORMANCE INDICATOR SCORE: Because the US fishery met all issues for SG 60, SG 80, and SG100, a score of 100 is given. The Canadian fishery meets SG 80 for issues c and d, and issues a and b of SG 100 so a score of 90 is given.				U.S. 100 Can 90
CONDITION NUMBER (if relevant):				

Evaluation Table: PI 2.3.3

PI 2.3.3		Relevant information is collected to support the management of fishery impacts on ETP species, including: • Information for the development of the management strategy; • Information to assess the effectiveness of the management strategy; and • Information to determine the outcome status of ETP species.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Information is sufficient to qualitatively estimate the fishery related mortality of ETP species.	Sufficient information is available to allow fishery related mortality and the impact of fishing to be quantitatively estimated for ETP species.	Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- Information is sufficient to quantitatively estimate mortalities from the Pacific Hake fishery and outcome status of ETP species with a high degree of certainty resulting from 100% observer coverage of the fishery which document occurrence of ETP species (Al-Humadhi et al. 2012, 2012a, Jannot et al. 2011, and PFMC. 2011f). Information was sufficient for NMFS NWR Sustainable Fisheries Division (SFD) to complete consultation with Protected Resources Division (PRD) pursuant to section 7(a)(2) of the ESA on the effects of the operation of the Pacific coast groundfish fishery in 2012 on most of the ETP under the PRD jurisdiction. PRD published a Biological Opinion on February 9, 2012, documenting their findings. In the Opinion, NMFS concluded that operation of the Pacific coast groundfish fishery (including the Pacific Hake fishery) in 2012) was not likely to jeopardize the continued existence of ETP under the PRD jurisdiction. Only Chinook salmon occurs in the Hake fishery at above near-zero levels, and stock status of Chinook is regularly quantitatively estimated and reviewed by the PFMC. Observer date show near-zero catch of other ETP species, and a determination by NFMS OPR that no Hake-specific measures are required for protection of these species. The USFWS and NMFS are working on a Memorandum of Understanding concerning seabirds. Until and unless the Memorandum of Understanding describes measures for the Pacific Hake fishery necessary for migratory bird protection, none are currently required of the fishery. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – Information is sufficient to quantitatively estimate outcome status of ETP species with a high degree of certainty resulting from 100% at sea coverage of the fishery (DFO 2013b), which documents occurrence of ETP species (e.g. Appendix Table 2). SARA establishes a process for conducting scientific assessments of the status of individual wildlife species and a mechanism for listing extirpated, endangered, threatened and special-concern species. SARA also includes provisions for the protection, recovery and management of listed wildlife species and their critical habitats and residences. Current species listed in Canada that have interaction with the hake fishery are whales, Short-tailed albatross, and some runs of white sturgeon. Assessments and action plans for listed species can be found in the SARA Registry at URL: http://www.sararegistry.gc.ca/sar/recovery/action_e.cfm. No ETP species occur in the Canadian Hake fishery to a degree that the Hake fishery could cause adverse impacts.		

PI 2.3.3		**Relevant information is collected to support the management of fishery impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**		
b	**Guidepost**	Information is adequate to broadly understand the impact of the fishery on ETP species.	Information is sufficient to determine whether the fishery may be a threat to protection and recovery of the ETP species.	Accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – U.S. observer data (Al-Humadhi *et al.* 2012, 2012a, Jannot et al. 2011) from 100% coverage results in accurate and verifiable information on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – DFO observer data (Ackerman 2013) from 100% coverage results in accurate and verifiable information is available on the magnitude of all impacts, mortalities and injuries and the consequences for the status of ETP species are found in the SARA Registry as noted above.		
c	**Guidepost**	Information is adequate to support measures to manage the impacts on ETP species.	Information is sufficient to measure trends and support a full strategy to manage impacts on ETP species.	Information is adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- U.S. observer data (Al-Humadhi *et al.* 2012, 2012a, Jannot et al. 2011) from 100% coverage results in information adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – DFO observer data (Ackerman 2013) from 100% coverage results in information adequate to support a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives during the IFMP process (DFO 2013b). SARA action plans for listed species are reviewed and updated every five years to evaluate whether recovery strategies are achieving their respective objectives. Adjustments are made as needed to achieve a high degree of certainty that recoveries are on track.		

PI 2.3.3	**Relevant information is collected to support the management of fishery impacts on ETP species, including:** • **Information for the development of the management strategy;** • **Information to assess the effectiveness of the management strategy; and** • **Information to determine the outcome status of ETP species.**
References	Ackerman 2013; Al-Humadhi *et al.* 2012, 2012a, DFO 2013b; and PFMC 2011f

OVERALL PERFORMANCE INDICATOR SCORE: Because both fisheries met all issues for SG 60, SG 80, and SG100, a score of 100 is given.	U.S. 100 Can 100
CONDITION NUMBER (if relevant):	

Evaluation Table: PI 2.4.1

PI 2.4.1		**The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	The fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.	There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm.
	Met?	Yes	Yes	Yes

PI 2.4.1		The fishery does not cause serious or irreversible harm to habitat structure, considered on a regional or bioregional basis, and function	
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – There is evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm (Hannah et al. 2010; PFMC 2014b). Mid-water or pelagic trawl gear is required for the directed Hake fishery and mid-water trawl gear components only make bottom contact infrequently (NMFS, 2005). The NMFS PRD issued a Biological Opinion on February 9, 2012, which concluded that the operation of the Pacific coast groundfish fishery (including the Pacific Hake fishery) in 2012, is not likely to destroy or adversely modify designated critical habitat of green sturgeon, sei whales, North Pacific right whales, blue whales, fin whales, sperm whales, Southern Resident killer whales, Guadalupe fur seals, Green sea turtles, or leatherback sea turtles. As part of EFH considerations, the Council adopted mitigation measures directed at the adverse impacts of fishing on groundfish EFH. Principal among these are closed areas to protect sensitive habitats. There are three types of closed areas: bottom trawl closed areas, bottom contact closed areas, and a bottom trawl footprint closure. The 34 bottom trawl closed areas are closed to all types of bottom trawl fishing gear. The bottom trawl footprint closure closes areas in the EEZ between 1,280 meters (700 fathoms) and 3,500 meters (1,094 fathoms), which is the outer extent of groundfish EFH. The 17 bottom contact closed areas are closed to all types of bottom contact gear intended to make contact with bottom during fishing operations, which includes fixed gear, such as longline and pots. The PFMC and NMFS did not feel it was necessary to exclude mid-water trawling to protect essential fish habitat. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – There is similar evidence that the fishery is highly unlikely to reduce habitat structure and function to a point where there would be serious or irreversible harm. As in the U.S., DFO permits mid-water trawling in 164 Rockfish Conservation Areas and Coral and Sponge Habitat off the west coast of Canada because mid-water trawling has negligible impact on benthic rockfish species and their habitat that the RCAs are intended to protect (DFO 2013b).	
DFO 2013		DFO 2013b; Hannah *et al.* 2010, NMFS, 2005; PFMC 2014b	
OVERALL PERFORMANCE INDICATOR SCORE: Because both fisheries meet all issues SG 60, SG 80, and SG 100, scores of 100 are given.			U.S. 100 Can 100
CONDITION NUMBER (if relevant):			

Evaluation Table: PI 2.4.2

PI 2.4.2		**There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary, that are expected to achieve the Habitat Outcome 80 level of performance.	There is a partial strategy in place, if necessary, that is expected to achieve the Habitat Outcome 80 level of performance or above.	There is a strategy in place for managing the impact of the fishery on habitat types.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- The Pacific Council considered EFH, and developed comprehensive strategies for managing fishing impacts on EFH (PFMC 2014b). The strategy in place for managing the impact of the fishery on habitat types is to specify that only mid-water or pelagic trawl gear is required for the directed Hake fishery. Mid-water trawl gear components only make bottom contact infrequently (NMFS, 2005). The 100% observer coverage of the fishery will provide data that will be used to detect any increased risk to habitat types. If such an increased risk were detected, it would be submitted to the PFMC process for development and implementation of management measures. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- Similarly, in Canada only mid-water or pelagic trawl gear can be used for the directed Hake fishery. DFO permits mid-water trawling in 164 Rockfish Conservation Areas and Coral and Sponge Habitat off the west coast of Canada because mid water trawling has negligible impact on these key benthic habitats (DFO 2013b). The 100% at sea coverage would detect any increased risk to habitat types. The main strategy in place for managing the impact of the fishery on habitat types is described in *Risk-based assessment framework to identify priorities for ecosystem-based oceans management in the Pacific Region* (CSAC 2012a).		
b	**Guidepost**	The measures are considered likely to work, based on plausible argument (e.g. general experience, theory or comparison with similar fisheries/habitats).	There is some objective basis for confidence that the partial strategy will work, based on information directly about the fishery and/or habitats involved.	Testing supports high confidence that the strategy will work, based on information directly about the fishery and/or habitats involved.
	Met?	Yes	Yes	Yes

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types		
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- Analysis of data from the A-SHOP has not detected any evidence (such as notable increased presence of benthic in-fauna or coral) that the at-sea Hake fleet is increasing risks to habitat (Northwest Fisheries Science Center 2014). This is supported by Chuenpagdee et al. (2003), who rated 10 commercial fishing gears for habitat (both physical and biological) impacts and effects on crab and shellfish, and concluded that mid-water trawl had the lowest rating (very low). Observer monitoring data provides high confidence that the strategy works. The conclusions are also reviewed by the PFMC's SSC, as well as the public. This demonstrates that the conclusions are robust to uncertainty. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100- The testing that supports high confidence that the strategy is working comes directly from the 100% at sea coverage, DFO discussions with industry during the IFMP process (DFO 2013b), and peer review by the Canadian Science Advisory Secretariat (CSAS).		
c	Guidepost		There is some evidence that the partial strategy is being implemented successfully.	There is clear evidence that the strategy is being implemented successfully.
	Met?		Yes	Yes
	Justification	U.S. Fishery SG60 – NA SG80 – See SG 100 SG100 – 100% observer coverage documents that the fishing vessels comply with the mid-water trawl requirement, and analysis of data would detect any increased risk to habitat types; this is evidence that the strategy is being implemented successfully. Additional evidence is demonstrated by adoption of the PFMC's Fishery Ecosystem Plan (FEP), the Ecosystem Initiatives Appendix, and a schedule for implementation (PFMC 2013c), and studies related to the California Current Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) (NOAA Fisheries 2014b). These activities consider the pelagic habitat type. Canadian Fishery SG60 – NA SG80 – See SG 100 SG100- Similarly, in Canada, there is clear evidence that the strategy is being implemented successfully because adjustments, if necessary, could be made each year, depending on analysis of results of the 100% monitoring (DFO 2013b).		
d	Guidepost			There is some evidence that the strategy is achieving its objective.
	Met?			Yes

PI 2.4.2		There is a strategy in place that is designed to ensure the fishery does not pose a risk of serious or irreversible harm to habitat types	
	Justification	U.S. Fishery SG60 –NA SG80 – NA SG100- The A-SHOP has not detected any increased risk to habitat types as a result of the Pacific Hake fishery, and there is no information to suggest requirement of additional restrictions for the fishery. This is evidence that the strategy achieves its objectives of preventing serious or irreversible damage to habitat. Canadian Fishery SG60 – NA SG80 – NA SG100 - Gathering information on gear impacts from commercial groundfish fisheries continues to be an area of priority for both the DFO and its stakeholders. Gear impact studies are working towards improving data and developing management strategies to address the concerns (DFP 2013b). Because the Hake fishery is still allowed in areas closed to bottom trawling is an indication that the mid-water Hake trawl fishing strategy is achieving its objective of preventing serious or irreversible damage to habitat.	
References		DFO 2013b; NMFS 2014b; PFMC 2014b; Northwest Fisheries Science Center 2014	
OVERALL PERFORMANCE INDICATOR SCORE: Because both fisheries meet all issues SG 60, SG 80, and SG 100, scores of 100 are given.			U.S. 100 Can 100
CONDITION NUMBER (if relevant):			

Evaluation Table: PI 2.4.3

PI 2.4.3		Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is basic understanding of the types and distribution of main habitats in the area of the fishery.	The nature, distribution and vulnerability of all main habitat types in the fishery are known at a level of detail relevant to the scale and intensity of the fishery.	The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types.
	Met?	Yes	Yes	Yes
	Justification	U.S. SG60 – See SG 100 SG80 – See SG 100 SG100- The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types. The PFMC 5-year review of EFH for the west coast groundfish fishery has included a substantive analysis of the spatial and temporal distribution of fishing effort over the whole of the west coast (PFMC 2012a, Wright 2011). Vulnerable habitats are identified as habitat areas of particular concern (HAPC). HAPC receives scrutiny for management actions as required. The results have been the basis for adjustments to ROCs and other sensitive habitat restrictions. These restrictions do not apply to the Pacific Hake fishery because of its demonstrably minimal impacts. Canada SG60 – See SG 100 SG80 – See SG 100 SG100- The distribution of habitat types is known over their range, with particular attention to the occurrence of vulnerable habitat types. In 2009, the SFU/DFO/Industry team assembled information on fishing effort, bottom habitat, and biological communities in BC's offshore fishing areas and, in 2010, collaborated on a joint research cruise of Hecate Strait, B.C, collecting a combination of ROV video and still photo data, oceanographic data, benthic grab samples and acoustic multi-beam bathymetry and backscatter data (DFO 2013b). There has also been an evaluation of proposed ecologically and biologically significant areas in marine waters of British Columbia (CSAS 2012) that has involved comprehensive benthic and rugosity mapping (Ministry of Sustainable Resource Management (MSRM) 2012). Evidence of attention to the occurrence of vulnerable habitat types is in risk-based assessment framework to identify priorities for ecosystem-based oceans management in the Pacific Region (DFO 2012a) and evaluation of proposed ecologically and biologically significant areas in marine waters of British Columbia (DFO. 2012b).		
b	**Guidepost**	Information is adequate to broadly understand the nature of the main impacts of gear use on the main habitats, including spatial overlap of habitat with fishing gear.	Sufficient data are available to allow the nature of the impacts of the fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear.	The physical impacts of the gear on the habitat types have been quantified fully.
	Met?	Yes	Yes	U.S: Yes Canada: Yes

<table>
<tr><td colspan="2">PI 2.4.3</td><td colspan="3">Information is adequate to determine the risk posed to habitat types by the fishery and the effectiveness of the strategy to manage impacts on habitat types</td></tr>
<tr><td></td><td>Justification</td><td colspan="3">U.S. Fishery
SG60 – See SG 100
SG80 – See SG 100
SG100- Data are available to allow the nature of the impacts of the bottom trawl fishery on habitat types to be identified and there is reliable information on the spatial extent of interaction, and the timing and location of use of the fishing gear (Hannah 2003, Bellman et al., 2005, and Hixon and Tissot 2007, and Hannah et al. 2010). Because the mid-water trawl for Hake has infrequent contact with the bottom, physical impacts of the gear on the habitat types is not significant.

Canadian Fishery
SG60 – See SG 100
SG80 – See SG 100
SG100- Same justification as the U.S. fishery,</td></tr>
<tr><td rowspan="3">c</td><td>Guidepost</td><td></td><td>Sufficient data continue to be collected to detect any increase in risk to habitat (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).</td><td>Changes in habitat distributions over time are measured.</td></tr>
<tr><td>Met?</td><td></td><td>U.S.: Yes Canada: Yes</td><td>U.S.: Yes, Can: Yes</td></tr>
<tr><td>Justification</td><td colspan="3">U.S. Fishery
SG60 – NA
SG80 – See SG 100
SG100 – Data continue to be collected to detect any increase in risk to habitat extent of interaction, and the timing and location of use of the fishing gear. The PFMC 5-year review of EFH for the west coast groundfish fishery has included a substantive analysis of the spatial and temporal distribution of fishing effort over the whole of the west coast (PFMC 2012a). Local studies on the distribution of effort and impacts support the perspective that spatial distribution of a fishery is not uniform (Hannah 2003), Bellman et al., 2005, and Hixon and Tissot 2007, and Hannah et al. (2010).

Canadian Fishery
SG60 – NA
SG80 – See SG 100
SG100 – Periodic comprehensive benthic and rugosity mapping is carried out as part of the activities of the BC Marine Conservation Analysis (BCMCA), which produces the marine Atlas of Pacific Canada (BCMCA 2014).</td></tr>
<tr><td colspan="2">References</td><td colspan="3">Bellman et al., 2005; BCMCA 2014; DFO 2013b; Hannah 2003; Hannah et al. 2010; Hixon and Tissot 2007; Wright 2011</td></tr>
<tr><td colspan="5">OVERALL PERFORMANCE INDICATOR SCORE: Because both fisheries met all issues SG 60, SG 80, and SG 100, a score of 100 is given.</td><td>U.S. 100
Can 100</td></tr>
<tr><td colspan="5">CONDITION NUMBER (if relevant):</td><td></td></tr>
</table>

Evaluation Table: PI 2.5.1

PI 2.5.1		**The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery is unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	The fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.	There is evidence that the fishery is highly unlikely to disrupt the key elements underlying ecosystem structure and function to a point where there would be a serious or irreversible harm.
	Met?	Yes	US: Yes Can: Yes	US: Yes Can: Partial

PI 2.5.1		The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function
	Justification	U.S. SG60 – See SG 100 SG80 – See SG 100 SG100 – The fishery is highly unlikely to disrupt the key issues underlying ecosystem structure and function to a point where there would be a serious or irreversible harm, as shown in studies of the California Current Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) (NOAA Fisheries 2014b) and Kaplan et al. (2012). Results suggest Hake mid-water trawl primarily has direct impacts on its target and bycatch species. Few indirect effects from the fleet extended through predator–prey links to other parts of the food web, but the few include increases krill, small planctivores, large piscivorous flatfish, Dover Sole, Shortbelly Rockfish, and shrimp. In addition, the NMFS PRD issued a Biological Opinion on February 9, 2012, which concluded that the operation of the Pacific coast groundfish fishery (including the Pacific Hake fishery) in 2012, is not likely to destroy or adversely modify designated critical habitat of Green Sturgeon, sei whales, North Pacific right whales, blue whales, fin whales, sperm whales, Southern Resident killer whales, Guadalupe fur seals, green sea turtles, or leatherback sea turtles. See Section 3.4 for details. Canada SG60 – See SG 80 SG80 – See SG 100 SG100 – The northern boundary of the California Current Ecosystem (CCE) is defined as the northern tip of Vancouver Island, British Columbia (Levin and Schwing, 2011). Field et al. (2006), however, demonstrated the northern boundary of the CCE is not static at the northern tip of Vancouver Island, but fluctuates north or south depending on La Niña and El Niño conditions. In relation to the ecosystem effect of fisheries in most of the Canadian waters, the evidence presented above for the US summarizes the status of empirical indicators of the principle prey and predator species of Pacific Hake, and of other ecosystem components that are affected by the Hake fishery. Since these indicators are measured throughout the Hake range, except for a small amount of fishing that occurs north of the CCE, this satisfies the requirements because “fishery impacts on ecosystem structure and function” are now known and “available data on the consequences of removal of the target species” demonstrate there are likely negligible fishery impacts on ecosystem structure and function within key fishing areas. Therefore, it can reasonably be concluded that the best available information indicates that there are no unacceptable fishery impacts on ecosystem structure and function within key fishing areas within the CCE. Given that about 90% of the Canadian fishery occurs in the CCE, and that the Canadian fleet is similar to the US fleet and operates in a similar manner, much of the US research in the CCE will apply to Canada. However, Canada has presented no studies to specifically complement the US CCE studies to confirm that the Canadian fleet has the same impacts as the US fleet; the team considered that this represents partial evidence. For the small portion of Pacific hake range in the transition zone north of the CCE, Crawford and Irvine (2010, 2011) report minimal fishing impacts on the marine ecosystem of the Pacific North Coast Integrated Management Area (PNCIMA), which encompasses approximately 102,000 km^2 from the edge of the continental shelf east to the British Columbia mainland, and from the British Columbia-Alaska border south to Bute Inlet on the mainland, across to Campbell River on the east side of Vancouver Island and the Brooks Peninsula (50 mi S of Cape Scott) on the west side of Vancouver Island. See Section 3.4 for details.
References		Crawford and Irvine 2010, 2011; Field et al. 2006; Kaplan *et al.* 2012; Levin and Schwing, 2011; NOAA Fisheries 2014b

OVERALL PERFORMANCE INDICATOR SCORE: Because the US fishery met all issues SG 60, SG 80, and SG 100, a score of 100 is given. The Canadian fishery meets all issues	U.S. 100 Can 90

PI 2.5.1	The fishery does not cause serious or irreversible harm to the key elements of ecosystem structure and function	
of SG 60 and SG 80, and partially meets the SG100.		
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 2.5.2

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are measures in place, if necessary.	There is a partial strategy in place, if necessary.	There is a strategy that consists of a plan, in place.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – There is a strategy in place. In April 2013, the Council adopted the Pacific Coast Fishery Ecosystem Plan for the U.S. Portion of the California Current Large Marine Ecosystem (PFMC 2013c). This document contains a wealth of information on characteristics of the California Current large marine ecosystem (CCE) where the groundfish fishery occurs and the types of impacts fisheries and other anthropogenic activities have on ecosystem dynamics and marine habitat. In addition, the NMFS OPR and USFW monitor populations of marine mammals, sea turtles, and sea birds, and based on results, develop plans for recovery of critical habitats for (and resources of) protected species where necessary. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – The strategy for the fishery in Canadian waters is contained in the IFMP (DFO 2013b). This plan provides for development of a full strategy that restrains impacts on the ecosystem, based on well-understood functional relationships between the fishery and the Components and issues of the ecosystem, to ensure the fishery does not cause serious or irreversible harm. This is supported by development of a hierarchical marine ecological classification system (DFO 2013f) by DFO's Oceans and Ecosystems Management staff		
b	**Guidepost**	The measures take into account potential impacts of the fishery on key elements of the ecosystem.	The partial strategy takes into account available information and is expected to restrain impacts of the fishery on the ecosystem so as to achieve the Ecosystem Outcome 80 level of performance.	The strategy, which consists of a plan, contains measures to address all main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the Components and elements of the ecosystem. This plan provides for development of a full strategy that restrains impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm.
	Met?	Yes	Yes	Yes

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – The plan is the Pacific Coast Fishery Ecosystem Plan for the U.S. portion of the California Current Large Marine Ecosystem (PFMC 2013c), which informs the PFMC process to determine if Groundfish Plan amendments are needed restrain impacts on the ecosystem to ensure the fishery does not cause serious or irreversible harm. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – The foundations of the strategic plan are found in Canada's Ocean Action Plan (DFO 2005a); the DFO Framework for the Future (DFO 2008); and the development of a hierarchical marine ecological classification system to support ecosystem approaches to management in Pacific Canada (DFO 2013f). The IFMP (DFO 2013b) contains the measures to address main impacts of the fishery on the ecosystem, and at least some of these measures are in place. The plan and measures are based on well-understood functional relationships between the fishery and the components and issues of the ecosystem to ensure the fishery does not cause serious or irreversible harm.		
c	Guidepost	The measures are considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The partial strategy is considered likely to work, based on plausible argument (e.g., general experience, theory or comparison with similar fisheries/ecosystems).	The measures are considered likely to work based on prior experience, plausible argument or information directly from the fishery/ecosystems involved.
	Met?	Yes	Yes	US: Yes Can: Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – The strategy is considered likely to work, based on continuing development of the CCE IEA, and the annual stock assessment of Hake by the JTC, which will guide the current and future versions of the Pacific Coast Fishery Ecosystem Plan. The Plan provides a framework for considering policy choices and trade-offs as they affect FMP species and the broader CCE. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – Canada's Ocean Action Plan (DFO 2005a) and the IFMP (DFO 2013b) evaluated the measures that make up the ecosystem management strategy, and determined that past implementation domestically and abroad provide evidence that they will work. The IFMP (DFO 2013b) is the plan in place and will be adjusted annually based on on-going ecosystem research within the areas of the Hake fishery.		
d	Guidepost		There is some evidence that the measures comprising the partial strategy are being implemented successfully.	There is evidence that the measures are being implemented successfully.

PI 2.5.2		There are measures in place to ensure the fishery does not pose a risk of serious or irreversible harm to ecosystem structure and function		
	Met?		Yes	US: Yes Can: Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – An example of such evidence is the adoption of the Pacific Coast Fishery Ecosystem Plan (FEP). It discusses processes for bringing ecosystem science into the Council process. The FEP is meant to be an informational document. It is not meant to be prescriptive relative to Council fisheries management. Information in the FEP, results of the Integrated Ecosystem Assessment (IEA), and the Annual State of the California Ecosystem Report will be available for consideration during the routine management processes for fisheries managed in each FMP. How exactly these items will affect fishery management decisions on fishery management is at the discretion of the Council. Full evidence that the measures are being implemented successfully are the products of the PFMC process (e.g., management plans with conservation measures that are periodically publically reviewed and implemented by the NMFS). Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – Monitoring the physical and biological oceanographic conditions and fishery resources of this region is done regularly by several Canadian government departments to understand the natural variability of these ecosystems and how they respond to both natural and anthropogenic stresses. Support for these programs is provided by DFO and Environment Canada. Members of the Fisheries Oceanography Working Group of the DFO Centre for Science Advice Pacific Region (CSAP), with additional contributions from other Canadian and American fisheries and climate scientists. The result is an annual State of the Ocean workshop, which produces an annual report (Irvine and Crawford 2013) that typically describes trends in oceanographic conditions and selected species assemblages of the Pacific coast of Canada. This information is factored into the annual updates of the IFMP (DFO 2013b). Evidence that the measures are being implemented successfully comes from the IFMP process, which receives critique and input from: Groundfish Trawl Advisory Committee (GTAC), Commercial Industry Caucus (CIC), and the Groundfish Integrated Advisory Board (GIAB). If measures are lacking, adjustments can be made based on the process inputs.		
References		DFO 2013b; PFMC 2013c		
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries met all issues SG 60, SG 80, and SG 100, a score of 100 is given.				U.S. 100 Can 100
CONDITION NUMBER (if relevant):				

Evaluation Table: PI 2.5.3

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Information is adequate to identify the key elements of the ecosystem (e.g., trophic structure and function, community composition, productivity pattern and biodiversity).	Information is adequate to broadly understand the key elements of the ecosystem.	
	Met?	Yes	Yes	
	Justification	U.S. Fishery SG60 – See SG 80 SG80 – Information is adequate to broadly understand the key issues as provided in studies of the Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) (NOAA Fisheries 2014b) and Kaplan *et al. (*2012). See Section 3.4 for details. SG100 – NA Canadian Fishery SG60 – See SG 80 SG80 – Information is adequate to broadly understand the key issues as provided in studies of the Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) (NOAA Fisheries 2014b) and Kaplan *et al. (*2012). See Section 3.4 for details. SG100 – NA		
b	**Guidepost**	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information, and have not been investigated in detail.	Main impacts of the fishery on these key ecosystem elements can be inferred from existing information and some have been investigated in detail.	Main interactions between the fishery and these ecosystem elements can be inferred from existing information, and have been investigated.
	Met?	Yes	Yes	US: Yes Can: Yes
	Justification	U.S. Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – Main impacts of the fishery on these key ecosystem issues can be inferred from the Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) (NOAA Fisheries 2014b) and Kaplan *et al. (*2012). Results suggest Hake mid-water trawl primarily has direct impacts on its target and bycatch species. Few indirect effects from the fleet extended through predator–prey links to other parts of the food web, but the few include increases krill, small plantivores, large piscivorous flatfish, Dover sole, shortbelly rockfish, and shrimp. See Section 3.4 for details. Canadian Fishery SG60 – See SG 100 SG80 – See SG 100 SG100 – Main interactions between the fishery and these ecosystem issues can be inferred from information developed for the US fishery. These interactions have been investigated and taken into account during the IFMP (DFO 2013b) and IFMP (DFO 2013a) development processes.		

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
c	Guidepost		The main functions of the Components (i.e., Target, Bycatch, Retained and ETP species and Habitats) in the ecosystem are known.	The impacts of the fishery on Target, Bycatch, Retained and ETP species are identified and the main functions of these Components in the ecosystem are understood.
	Met?		Yes	U.S. Yes Can: Yes
	Justification	U.S. Fishery SG60 – NA SG80 – See SG 100 SG100 – The impacts of the fishery on target, Bycatch, Retained and ETP species are identified (See scoring justifications for PI2.1, 2.1, and 2.3) and the main functions of these Components in the ecosystem are understood. The Final Environmental Impact Statement for Proposed Harvest Specifications And Management Measures For The 2011-2012 Pacific Coast Groundfish Fishery (PMFC 2011d) describes the main functions of the Bycatch and Retained species. The NOAA Fisheries Office of Protected Resources maintains descriptions on the main functions (life histories) of the ETP in the ecosystem. Canadian Fishery [SG60 – NA SG80 – See SG 100 SG100 – The impacts of the fishery on target, Bycatch, Retained and ETP species are identified (See scoring justifications for PI2.1, 2.1, and 2.3) based on 100% at sea observer coverage. The main functions of these components in the ecosystem are understood, and taken into account during the IFMP (DFO 2013b) and IFMP (DFO 2013a) development processes.		
d	Guidepost		Sufficient information is available on the impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred.	Sufficient information is available on the impacts of the fishery on the Components and elements to allow the main consequences for the ecosystem to be inferred.
	Met?		Yes	U.S. Yes Can: No
	Justification	U.S. Fishery SG60 – NA SG80 – See SG 100 SG100 – The Final Environmental Impact Statement for Proposed Harvest Specifications And Management Measures For The 2011-2012 Pacific Coast Groundfish Fishery (PMFC 2011d) describes impacts of the fishery on these Components. The FEP (PFMC 2013d) describes impacts of the fishery on the ecosystem issues. These allow the main consequences for the ecosystem to be inferred. Canadian Fishery SG60 – NA SG80 – The IFMP (DFO 2013b) describes impacts of the fishery on these Components to allow some of the main consequences for the ecosystem to be inferred. Because specific ecosystem studies for the Canadian Hake fishery comparable to those of the US, it is not clear that the extension of the US results reach the SG100 level.		

PI 2.5.3		There is adequate knowledge of the impacts of the fishery on the ecosystem		
e	Guidepost		Sufficient data continue to be collected to detect any increase in risk level (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures).	Information is sufficient to support the development of strategies to manage ecosystem impacts.
	Met?		US: Yes Can: Yes	US: Yes Can: No
	Justification	U.S. SG60 – NA SG80 – See SG 100 SG100 – Sufficient data continue to be collected to detect any increase in risk level (e.g., due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the measures). The A-SHOP continues to collect bycatch data. Continued development the Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) (NOAA Fisheries 2014b) and annual report to the PFMC, as well as the initiatives stated the FEP (PFMC 2013d), confirm this. Information is sufficient to support the development of strategies to manage ecosystem impacts, as evidenced by adoption of the FEP (PFMC 2013c) from which knowledge of ecosystem dynamics will influence fishery management decisions. Canada SG60 – NA SG80 – The Science Advisory Report (DFO 2012a) resulting from a peer review of the framework for considering risks of multiple activities to ecosystem components has been published as has the identification of Ecologically And Biologically Significant Areas (EBSAs) (DFO 2012b). Research papers summarizing the details of both the risk framework and the EBSA evaluation are not yet published.		
References				

OVERALL PERFORMANCE INDICATOR SCORE: Because the US fishery met all issues SG 60, SG 80, and SG 100, a score of 100 is given. The Canadian fishery meets SG100 for issues (b) and (c) but did not meet SG100 for issues d and e, to support a score 90.	U.S. 100 Can 90
CONDITION NUMBER (if relevant):	

Principle 3

Evaluation Table: PI 3.1.1

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There is an effective national legal system and a framework for cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2	There is an effective national legal system and organised and effective cooperation with other parties, where necessary, to deliver management outcomes consistent with MSC Principles 1 and 2.	There is an effective national legal system and binding procedures governing cooperation with other parties which delivers management outcomes consistent with MSC Principles 1 and 2.
	Met?	Yes	Yes	Yes

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**
	Justification	U.S. SG60 – see SG100 for details SG80 – see SG100 for details SG100 – At the national level, management of the U.S. Hake fishery is carried out under the authority of the federal Magnuson-Stevens Fishery Conservation and Management Act (MSA), first passed in 1976 and most recently reauthorized in 2006. The MSA is the principal law governing the harvest of fishery resources within the federal portion of the U.S. 200-mile zone. Under the MSA, the Pacific Fishery Management Council (PFMC) recommends management actions to the National Marine Fisheries Service (NMFS) for approval. In addition to the MSA, the PFMC adheres to a suite of "other applicable laws:" the National Environmental Policy Act (NEPA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Migratory Bird Treaty Act (MBTA); the Administrative Procedure Act (APA), Paperwork Reduction Act (PRA): Regulatory Flexibility Act (RFA): Coastal Zone Management Act (CZMA): and other relevant U.S. laws, Executive Orders and regulations. In addition, Washington coastal tribes have treaty rights that are taken into account in the management of the fishery, coordinated by NMFS. Internationally, the Hake fishery is conducted in a manner consistent with provisions of the U.N. Convention of the Law of the Sea (UNCLOS), the Agreement for the Implementation of the Provisions of the United Nations Convention on the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and the U.N. FAO Code of Conduct. The fishery is also governed by the U.S. High Seas Fishing Compliance Act of 1995. This federal legislation implements the U.N. Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas. The management of the fishery complies with the Migratory Bird Act Treaty, and the NMFS have instituted a number of regulations to further reduce seabird interactions in the fishery. Canada SG60 – see SG100 for details SG80 – see SG100 for details SG100 – DFO is responsible for managing the Canadian Hake fishery off the west coast of British Columbia, under the jurisdiction of the Fisheries Act and the regulations made thereunder, and also the Oceans Act and the Species at Risk Act. Pacific Hake are managed under the IFMP Groundfish and the Hake Addendum, which covers groundfish fisheries occurring in waters of the Pacific Ocean off the west coast of Canada (DFO 2013b, DFO 2013a). The IFMP supports the Species At Risk Act (SARA) and the Oceans Act by adopting an ecosystem-based approach to management and data collection. A Joint US-Canada Agreement for Pacific Hake ("the Agreement") went through final ratification in both counties in 2010. Pacific Hake stock assessments are prepared by a Joint Technical Committee (JTC) comprised of both U.S. and Canadian scientists, and reviewed by a Scientific Review Group (SRG), with national representatives to both groups appointed by their respective governments. Additionally, the Agreement calls for both of these bodies to include industry- nominated scientists, who are selected and appointed jointly by both nations. This process sets the total coast-wide Total Allowable Catch (TAC) to be allocated to each country. The countries then allocate the country quota to each fishery sector with their respective country. The Agreement assigns 73.88% of the TAC to the United States and 26.12% to Canada for an initial period of nine years, and thereafter unless the Parties agree to change it.

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
b	**Guidepost**	The management system incorporates or is subject by law to a mechanism for the resolution of legal disputes arising within the system.	The management system incorporates or is subject by law to a transparent mechanism for the resolution of legal disputes which is considered to be effective in dealing with most issues and that is appropriate to the context of the fishery.	The management system incorporates or subject by law to a transparent mechanism for the resolution of legal disputes that is appropriate to the context of the fishery and has been tested and proven to be effective.
	Met?	Yes	Yes	Yes

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – In the US, the PFMC relies on a consensus approach among advisory bodies with room for minority reports should these groups fail to reach consensus. The PFMC resolves disputes (after weighing staff reports, advisory body reports, NMFS legal counsel advice, and public testimony) by majority vote held in public session as required in Section 302 of the MSA. All stakeholders have an opportunity for input prior to the decision by the Secretary of Commerce. Legal action may also be used by those individuals or groups dissatisfied with the decisions made by the Council and NMFS through the federal court system. Since 2000 the Council has been subject to litigation, for example on its interpretation of the allocation of Pacific whiting under the treaty rights of the Makah Tribes (2004). NMFS and the Council have responded to the judgments of the Court by following court-specified preparation and implementation of timelines, revisions of rebuilding timelines, revisions to FMP Amendment language, and updating analyses. The trawl IFQ program is the subject of two pending court cases challenging the conduct of NEPA analyses and the formula for initial allocations of IFQ. These challenges to initial allocations of catch shares are not unexpected in a new program. Canadian Fishery SG60 – see SG100 SG80 – see SG100 SG100 – The nature of the Canadian fishery management system is that DFO, through the Minister of Fisheries, maintains full discretion over management of fisheries (from the Fisheries Act), including resolution of disputes arising from advisory body decisions. Legal remedies are available to citizens disputing Ministerial decisions through the court systems. As indicated previously, the most important advisory bodies in the management system in Canada (GTAC, GSIC, IHAC) operate under a consensus decision-making model, meaning that disputes must be resolved internally before advice can be forwarded to DFO. Stakeholder consensus is an increasingly important part of the management decision-making system. In the event that consensus among interest groups cannot be reached within advisory processes, disputes may be resolved through facilitation and arbitration-type process using independent experts to provide advice to the Minister, or the Minister may make decisions within his/her authority based on the provision of the differing points of view among interests and advice from departmental officials. The IHAC is a committee established and chaired by DFO, which encompasses all stakeholders. The committee reviews disputes and using a fair and open consensus process, resolves them. Although the process can be time consuming, it has been able to provide advice used to manage the fishery successfully for many years.

PI 3.1.1		**The management system exists within an appropriate legal and/or customary framework which ensures that it:** • **Is capable of delivering sustainable fisheries in accordance with MSC Principles 1 and 2; and** • **Observes the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood; and** • **Incorporates an appropriate dispute resolution framework.**		
d	**Guidepost**	The management system has a mechanism to generally respect the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to observe the legal rights created explicitly or established by custom of people dependent on fishing for food or livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.	The management system has a mechanism to formally commit to the legal rights created explicitly or established by custom of people dependent on fishing for food and livelihood in a manner consistent with the objectives of MSC Principles 1 and 2.
	Met?	Yes	Yes	Yes
	Justification	Both Canada and the US management systems have mechanisms to formally commit to the legal rights created explicitly for First Nations and Treaty Tribes. U.S. SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Under the Pacific Whiting Act of 2006 (the Whiting Act), 16 U.S.C. 7001-7010 and 50 CFR 660.50 - Pacific Coast Treaty Indian Fisheries, the U.S. Pacific Coast treaty Indian tribes have treaty rights to harvest groundfish, including Hake, in their usual and accustomed fishing areas in U.S. waters. In 1994, the United States formally recognized that the four Washington coastal treaty Indian tribes (Makah, Quileute, Hoh, and Quinault) have treaty rights to fish for groundfish in the Pacific Ocean, and concluded that, in general, the quantification of those rights is 50 percent of the harvestable surplus of groundfish that pass through the tribes U&A fishing areas. Canada SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The Canadian Oceans Act of 1997 directs a coordinated approach to ensure the federal government will work together with Aboriginal groups (First Nations with Treaty Rights), governments and communities to advance marine conservation in an efficient and effective manner. DFO developed and published the Integrated Aboriginal Policy Framework (DFO 2010) to guide DFO to taking into account Aboriginal treaty rights. Section 7 of the IFMP (DFO 2013b) specifically addresses its formal commitment to the aboriginal Food, Social, and Ceremonial Fishery.		
References		DFO 2010; DFO 2013b; DFO 2013a		
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG 60, SG 80, and SG 100 issues, so scores of 100 are given.				US 100 Can100
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.1.2

PI 3.1.2		The management system has effective consultation processes that are open to interested and affected parties. The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are generally understood.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for key areas of responsibility and interaction.	Organisations and individuals involved in the management process have been identified. Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – In the US, the PFMC process is the primary means for soliciting stakeholder information important to the Pacific Hake fishery. Organizations/individuals involved in the management process are identified, including the PFMC staff, advisory bodies such as the Groundfish Advisory Panel (GAP), Groundfish Management Team (GMT), SSC Ecosystem Plan Development Team (EPDT), Habitat Committee (HC), Groundfish Allocation Committee (GAC), and several ad-hoc committees (PFMC 2009; 2011a). Functions, roles and responsibilities are explicitly defined and well understood for all areas of responsibility and interaction (PFMC 2009; 2011). Management measures developed by the PFMC are recommended to the Secretary of Commerce through the NMFS). Such measures are implemented by NMFS Pacific Regional office and enforced by the NOAA Office of Law Enforcement, the U.S. Coast Guard 11th District, and state enforcement agencies (PFMC 2014d). Additional details provided in Sections 3.5.2 and 3.5.3. Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – In Canada, organisations/individuals (e.g., First Nations, the Groundfish Trawl Advisory Committee (GTAC), the Commercial Industry Caucus (CIC), the Groundfish Integrated Advisory Board (GIAB), IHAC, and the Groundfish Special Issues Committee (GSIC)) involved in the management process are identified in the IFMP and Pacific Hake Harvest Plan (DFO 2013b and 2013a). Functions, roles and responsibilities are explicitly defined and well understood (Terms of reference, membership and meeting minutes are also in the IFMP and Pacific Hake Harvest Plan) for all areas of responsibility and interaction (DFO 2013b and 2013a). Additional details provided in Sections 3.5.2 and 3.5.3. International The Agreement on Pacific Hake between U.S. and Canada explicitly defines functions, roles and responsibilities of the committees.		

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**		
b	**Guidepost**	The management system includes consultation processes that obtain relevant information from the main affected parties, including local knowledge, to inform the management system.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information obtained.	The management system includes consultation processes that regularly seek and accept relevant information, including local knowledge. The management system demonstrates consideration of the information and explains how it is used or not used.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – In the US, the PFMC process is the primary means for soliciting stakeholder consultation relevant to the Pacific Hake fishery. The Council develops a meeting agenda and prepares a briefing book on issues of concern to Fisheries Conservation Zone (FCZ) management, including trans-boundary issues. Stakeholders are encouraged to prepare written and oral testimony on these issues. Written testimony submitted before briefing book deadlines is incorporated into the briefing book. Stakeholders can also provide public comment during the Council meeting. Additional details provided in Sections 3.5.2 and 3.5.3. Canadian Fishery SG60 – see SG100 SG80 – see SG100 SG100 – In Canada, DFO and the GTAC routinely receives presentations and engages in discussions with other interests in the fishery, for example environmental organizations, research organization (e.g. projects such as hydro-acoustic testing), stock assessment authors, and private firms exploring projects that may impact the fishery. The management system demonstrates consideration of the information and explains how it is used or not used (DFO 2013a and 2013b). Additional details provided in Sections 3.5.2 and 3.5.3. International In addition to the consultations undertaken within the US and Canadian systems, the Joint Agreement requires meetings open to stakeholders and encourages stakeholder participation; the results of the meetings are widely distributed by both the US and Canada.		
c	**Guidepost**		The consultation process provides opportunity for all interested and affected parties to be involved.	The consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement.
	Met?		Yes	Yes

PI 3.1.2		**The management system has effective consultation processes that are open to interested and affected parties.** **The roles and responsibilities of organisations and individuals who are involved in the management process are clear and understood by all relevant parties**
	Justification	Both fisheries have consultation processes that provide opportunity and encouragement for all interested and affected parties to be involved, and facilitate their effective engagement. See Section 3.5.12 for details U.S. Fishery SG60 – N/A SG80 – see SG100 for details SG100 – In the US, the PFMC process is the primary means for opportunity and encouragement for all interested and affected parties to be involved in the Pacific Hake fishery. Stakeholders are encouraged to prepare written and oral testimony on published issues. Written testimony submitted before PFMC briefing book deadlines is incorporated into the briefing book. Stakeholders can also provide public comment during the Council meeting (PFMC 2014d). Canadian Fishery SG60 – N/A SG80 – see SG100 for details SG100 – In Canada, the consultation process provides opportunity and encouragement for all interested and affected parties to be involved, and facilitates their effective engagement (DFO 2013a and 2013b). Additional details are provided in Sections 3.5.2 and 3.5.3. International Under the Joint Agreement, the system encourages and supports effective engagement, as demonstrated by open meetings with substantial advance notice to stakeholders.
References		DFO 2013a; DFO 2013b; PFMC 2009; PFMC 2011a; PFMC 2014d
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG 60, SG 80, and SG 100 issues, so scores of 100 are given.		US 100 Can100
CONDITION NUMBER (if relevant):		

Evaluation Table for PI 3.1.3

PI 3.1.3		The management policy has clear long-term objectives to guide decision-making that are consistent with MSC Principles and Criteria, and incorporates the precautionary approach		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Long-term objectives to guide decision-making, consistent with the MSC Principles and Criteria and the precautionary approach, are implicit within management policy	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach are explicit within management policy.	Clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach, are explicit within and required by management policy.
	Met?	Yes	Yes	Yes
	Justification	Both Canada and the U.S. management policies have clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach are explicit and required within management policy. See details in Section 3.5.7. U.S. SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Legislation in the U.S. has established fisheries-management criteria that have been interpreted as being consistent with international agreements and criteria for precautionary approaches. Guidelines for implementing the legislation have been translated into scientific and technical guidance for developing limit and target control reference points for assessing stock abundance reference points, with some suggestions for defaults. The control rules specify management actions (fishing mortality rate), based upon current stock status. (Restrepo and Powers 1999). Canada SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The United Nations *Agreement on Straddling and Highly Migratory Fish Stocks* (UN 1995), which came into force in 2001, commits Canada to use the precautionary approach in managing straddling stocks as well as, in effect, domestic stocks. In 2003, the Privy Council Office (2003), on behalf of the Government of Canada published a framework applicable to all federal government departments that set out guiding principles for the application of precaution to decision making about risks of serious or irreversible harm where there is a lack of full scientific certainty. As presented in item 6.4 of the IFMP, all new groundfish stock assessments will be written in a manner consistent with the DFO's Precautionary Approach. International The Joint Agreement incorporates the explicit fishery objectives, including the precautionary approach, of the US and Canada.		
References		Canada Privy Council Office (2003); Restrepo and Powers (1999); United Nations (1995)		

OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG 60, SG 80, and SG 100 issues, so scores of 100 are given.	US 100 Can100
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.1.4

PI 3.1.4		The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and seeks to ensure that perverse incentives do not arise.	The management system provides for incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2, and explicitly considers incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices.
	Met?	Yes	Yes	Yes
	Justification	The management systems in both the U.S. and Canada provide for positive incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2; avoid perverse incentives; and explicitly consider incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices. U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The PFMC has regularly demonstrated incentives to best manage the Hake fishery. For examples: Reducing the slope rockfish limits is intended to eliminate any incentive to target slope rockfish species and to make reductions in darkblotched rockfish more certain (PFMC 2006); and compliance incentives for carrying observers for discard monitoring (PFMC 2013a). Regular enforcement of Hake fishing regulations also provide incentives to properly manage the fishery. Effectiveness is evaluated annually (Matthews 2013). Catch shares within the US Hake fishery provides explicit incentives for fishermen to act as good stewards of the resource. Hake fishermen participate in conservation activities through the Pacific Whiting Conservation Cooperative. Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The IFMP provided incentives, such as the Individual Vessel Accountability element, which have the objective to ensure full accountability and responsibility for catch of all quota species while continuing to provide incentive for better utilization of catch, reduce at-sea releases and development of improved fishing practices (DFO 2013b). Catch shares within the Canadian Hake fishery provides explicit incentives for fishermen to act as good stewards of the resource. Hake fishermen participate in conservation activities through the Association of Pacific Hake Fishermen. Regular enforcement of Hake fishing regulations also provides incentives to properly manage the fishery. Effectiveness is evaluated annually (Gilchrest 2013).		
References		DFO 2013b; Gilchrest 2013; Matthews 2013; PFMC 2006; and PFMC 2013a		
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG 60, SG 80, and SG 100 issues, so scores of 100 are given.				US US100 Can100

PI 3.1.4	The management system provides economic and social incentives for sustainable fishing and does not operate with subsidies that contribute to unsustainable fishing
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.2.1

PI 3.2.1		**The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2**		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Objectives, which are broadly consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are implicit within the fishery's management system	Short and long-term objectives, which are consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.	Well defined and measurable short and long-term objectives, which are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the fishery's management system.
	Met?	Yes	Yes	Yes

PI 3.2.1		The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Well-defined and measurable short and long-term objectives are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the U.S. fishery's management system (MSA 2007, PFMC 2010b, PFMC 2011). Objectives specific to the Pacific groundfish, including Pacific hake, fishery are explicitly expressed in the Pacific Groundfish FMP as well as in the Groundfish Strategic Plan, the Final EIS for Amendment 20 and to the FMP. The PFMC has developed an ecosystem FMP, which contains long-term objectives. The PFMC's Ecosystem Plan Development Team (EPDT) has been charged with providing analyses and recommendations to the Council on the latest science in support of ecosystem-based fishery management principles and to develop goals, objectives, and policy alternatives for Council consideration. The groundfish IFQ program is motivated by the long-term goal of capacity rationalization that increases net economic benefits, creates individual economic stability, provides for full utilization of the trawl sector allocation, considers environmental impacts, and achieves individual accountability of catch and bycatch. This goal is supported by 8 measurable objectives that are long-term in their implementation: a system of total catch accounting, profitable, and efficient fishery, reduction of bycatch and discard mortality and the minimization of ecological impacts, avoidance of adverse effects on communities and other fisheries, promotion of measurable economic and employment benefits, provision of quality product and increased safety. The PFMC maintains an on-going five-year statement of research and data needs. In the document, individual fishery management plans, as well as ecosystem issues drive research and data needs, it is divided into needs that extend out several years. High priority and emerging issues, as well as issues for stock assessment, habitat, and other research and data are described for each. Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The IFMP (DFO 2013b) and addendum 2013 Pacific Hake Harvest Plan (DFO 2013a) have well-defined and measurable short and long-term objectives are demonstrably consistent with achieving the outcomes expressed by MSC's Principles 1 and 2, are explicit within the Canadian fishery's management system. Further details are presented in Section 3.5.7, which show time-frames and explicit deliverables in order to measure whether the stated objective are achieved. In addition, the passage of SARA in 2003 has objectives to prevent species from being extirpated or becoming extinct. That process provides for the recovery of species that are endangered or threatened as a result of human activity, and to manage species of special concern to prevent them from becoming endangered or threatened. The Oceans Act authorises DFO's Minister to lead and facilitate the establishment of a strategy for the integrated management of Canada's oceans through the development of integrated management plans and the establishment of marine protected areas (MPAs).
References		DFO 2013a; DFO 2013b; and MSA 2007; and PFMC 2010b, PFMC 2011 http://www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm).
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG 60, SG 80, and SG 100 issues, so scores of 100 are given.		US 100

PI 3.2.1	The fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2
	Can100
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.2.2

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	There are some decision-making processes in place that result in measures and strategies to achieve the fishery-specific objectives.	There are established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives.	
	Met?	Yes	Yes	
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 –The PFMC has established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives (PMFC 2010, PMFC 2014, PFMC and NMFS 2010). Canadian Fishery SG60 – see SG100 for details SG80 –Established decision-making processes that result in measures and strategies to achieve the fishery-specific objectives are found in the IFMP (DFO 2013b) and 2013 Pacific Hake Harvest Plan, addendum (DFO 2013a). International The US and Canada delegate certain aspects of decision making to the entities established by the Joint Agreement. In this way, the system establishes consistent decisions that result in measures and strategies applicable to both countries.		
b	**Guidepost**	Decision-making processes respond to serious issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take some account of the wider implications of decisions.	Decision-making processes respond to serious and other important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.	Decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions.
	Met?	Yes	Yes	US: Yes Can: Yes

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
	Justification	U.S. SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Through the Hake Agreement (U.S. Government Printing Office 2004) and PFMC (PFMC 2014d), the decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions. Canada SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Through the Hake Agreement (U.S. Government Printing Office. 2004) and DFO, the decision-making processes respond to all issues identified in relevant research, monitoring, evaluation and consultation, in a transparent, timely and adaptive manner and take account of the wider implications of decisions (DFO 2013a, DFO 2013b).		
c	Guidepost		Decision-making processes use the precautionary approach and are based on best available information.	
	Met?		Yes	
	Justification	SG 60-N/A SG 80 –Both the U.S. and Canadian decision-making processes use the precautionary approach (Canada Privy Council Office (2003); Restrepo and Powers (1999); United Nations (1995) and are based on best available information, as mandated in National Standard 2 of the MSA (2007) for the U.S. and item 1 in the Long-Term Objectives of the IFMP, and well as information provided through the Canadian Science Advisory Secretariat (DFO 2013b).		
d	Guidepost	Some information on fishery performance and management action is generally available on request to stakeholders.	Information on fishery performance and management action is available on request, and explanations are provided for any actions or lack of action associated with findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.	Formal reporting to all interested stakeholders provides comprehensive information on fishery performance and management actions and describes how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity.
	Met?	Yes	Yes	Yes

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The PFMC provides a range of opportunities for stakeholder education regarding management, as required by federal statute and implemented through its standard operating procedures (Statement of Organization, Practices and Procedures (SOPPs) (PFMC 2010a). These include: • Publishing timely notice of all meetings and meeting agendas, with meeting dates and locations scheduled three years in advance, posted on PFMC website; • Rotating meeting locations to facilitate public involvement • Regular dissemination of the Council newsletter, blog-post and twitter feed on the PFMC website describing how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity • Environmental Assessments and Environmental Impact Statements provide detailed assessment of alternatives and of stakeholder comments. Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The DFO provides regular dissemination of information describing how the management system responded to findings and relevant recommendations emerging from research, monitoring, evaluation and review activity on the DFO website. The DFO Science Framework for the Future ensures that DFO will be able to continue a long tradition of providing advice and information to Canadians and the world, to ensure that a collective understanding to manage and develop aquatic resources on a sustainable basis (DFO 2014). DFO reviews performance against the short-term objectives for groundfish fisheries defined in the Groundfish IFMP on an annual basis through the Groundfish Integrated Advisory Board (GIAB), which provides seats for all Groundfish fishery interests. Long term objectives are reviewed every two years through GIAB to report out on progress, identify any further actions required to achieve the long term objectives, and update or establish new long term objectives. - Results of the performance reviews with GIAB, any actions / commitments to further work, and responses to stakeholder recommendations are all captured in written meeting summaries that are distributed to GIAB. - The IFMP is also posted for public comment every two years to provide an opportunity for others to review the document and send feedback. - Catch monitoring and reporting requirements in the hake fishery also allow for rigorous evaluation of the fishery's performance in meeting catch handling/retention requirements, closed area / time restrictions, catch reporting requirements, and quota management needs. Performance results from the evaluation of catch monitoring and reporting data are reported in several ways: regular publication of catch reports (described below) and reports from enforcement officials to advisory bodies on trends in infractions.

PI 3.2.2		The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.		
e	Guidepost	Although the management authority or fishery may be subject to continuing court challenges, it is not indicating a disrespect or defiance of the law by repeatedly violating the same law or regulation necessary for the sustainability for the fishery.	The management system or fishery is attempting to comply in a timely fashion with judicial decisions arising from any legal challenges.	The management system or fishery acts proactively to avoid legal disputes or rapidly implements judicial decisions arising from legal challenges.
	Met?	Yes	Yes	US: Yes Can: Yes
	Justification	U.S. SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The U.S. management system, with the collaboration of the fishery, acts proactively to avoid legal disputes through government, fisher, and other stakeholder participation in the PFMC process. The PFMC rapidly implements judicial decisions arising from legal challenges. Canada SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The DFO management system acts proactively with fishers to avoid legal disputes through government, fisher, and other stakeholder participation in the IFMP and Hake Management Plan processes (DFO 2013b and 2013a). DFO has demonstrated its ability to work proactively with fishing interests through advisory bodies and other consultative processes to address issues as they arise. Examples that illustrate the success DFO and fishing interests have had in addressing challenging issues include: annual negotiations among stakeholders to reach consensus recommendations regarding the allocation of hake between shoreside and at sea processors and in-season monitoring of bycatch in the hake fishery to identify and avoid hot spots. In the rare instances where disputes have not been resolved through one of the approaches described above, parties may choose to take their issues to the courts. DFO has demonstrated its responsiveness to judicial decisions. One example of DFO's responsiveness to judicial decisions was its implementation of the 2002 decision in the BC Provincial Court in *R v. Haines,* which held that a licence condition in a Nisga'a communal licence that prohibited fishing for Food, Social, and Ceremonial (FSC) purposes at the same time as fishing for commercial purposes (aka "dual fishing") constituted an unjustified infringement of the First Nation's aboriginal right to fish for FSC purposes. DFO subsequently removed the prohibition on dual fishing from licence conditions and began developing licence conditions for both communal licences and commercial licences that would support proper management and control of dual fishing. Dual fishing is described in the Groundfish IFMP harvest plan appendices. The Minister of Fisheries and Oceans would implement judicial decisions arising from legal challenges, if they arise.		
References		DFO 2013a; DFO 2013b; DFO 2014; PMFC 2010; PMFC 2014d; PFMC and NMFS 2010;United Nations 1995; and U.S. Government Printing Office 2004		
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries met all SG 60, SG 80, and SG 100 issues, so a score of 100 is given.				US 100 Can100

PI 3.2.2	**The fishery-specific management system includes effective decision-making processes that result in measures and strategies to achieve the objectives, and has an appropriate approach to actual disputes in the fishery under assessment.**
CONDITION NUMBER (if relevant):	

Evaluation Table for PI 3.2.3

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Monitoring, control and surveillance mechanisms exist, are implemented in the fishery under assessment and there is a reasonable expectation that they are effective.	A monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated an ability to enforce relevant management measures, strategies and/or rules.	A comprehensive monitoring, control and surveillance system has been implemented in the fishery under assessment and has demonstrated a consistent ability to enforce relevant management measures, strategies and/or rules.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Under the Federal At-Sea Hake Observer Program a comprehensive monitoring, control and surveillance system has been implemented. All Hake vessels are required to carry two observers at all times to collect data on fishing effort, total catch by species, and biological data; characterize marine mammal and sea bird interactions. At-sea and shore-side enforcement is carried out by the state fish and wildlife agencies or California, Oregon and Washington, NMFS Office of Law Enforcement (OLE), and the US Coast Guard (USCG). Ability to enforce relevant rules is demonstrated by very low violation rates: 5 resulted in a Notice of Violation (NOVA) in 2012 (Matthews 2013). More details are presented in Section 3.5.11. Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – DFO has also implemented a comprehensive monitoring, control and surveillance system with a requirement for 100% at sea coverage. Occurrence reporting procedures are reviewed with the objective of ensuring that fishery officers coast-wide are able to provide prompt response to significant enforcement issues. Ability to enforce relevant rules is demonstrated by very low violation rates (Gilchrest 2013). More details are presented in Section 3.5.11.		
b	**Guidepost**	Sanctions to deal with non-compliance exist and there is some evidence that they are applied.	Sanctions to deal with non-compliance exist, are consistently applied and thought to provide effective deterrence.	Sanctions to deal with non-compliance exist, are consistently applied and demonstrably provide effective deterrence.
	Met?	Yes	Yes	US: Yes Can: Yes

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with		
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Sanctions to deal with non-compliance of U.S. rules exist, are consistently applied and demonstrably provide effective deterrence. Under MSA, violations are civil, not criminal. Sanctions include fines or forfeiture of gear. Most fines exceed $1,000 and may reach $1 million. If first violation is 100K, for example, the second is doubled + $50,000. This is an excellent deterrent, based on complains by fishers over severity of such fine (Matthews 2013). Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Sanctions to deal with non-compliance of rules exist, are consistently applied and demonstrably provide effective deterrence (Gilchrest 2013).		
c	Guidepost	Fishers are generally thought to comply with the management system for the fishery under assessment, including, when required, providing information of importance to the effective management of the fishery.	Some evidence exists to demonstrate fishers comply with the management system under assessment, including, when required, providing information of importance to the effective management of the fishery.	There is a high degree of confidence that fishers comply with the management system under assessment, including, providing information of importance to the effective management of the fishery.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – There is a high degree of confidence that fishers comply with the management system under assessment (Matthews 2013), including, providing information of importance to the effective management of the fishery. This is evident from compliance with the Federal Hake Observer Program and participation of fishers in the PFMC process. Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – There is a high degree of confidence that fishers comply with the management system under assessment (Gilcrest 2013), including, providing information of importance to the effective management of the fishery. This is evident from compliance with the 100% Hake fishery at sea coverage and participation of all sectors of the fishing industry in the IFMP (DFO 2013b) and Hake Management Plan ((DFO 2013a) processes.		
d	Guidepost		There is no evidence of systematic non-compliance.	
	Met?		Yes	

PI 3.2.3		Monitoring, control and surveillance mechanisms ensure the fishery's management measures are enforced and complied with	
	Justification	SG 60 – N/A SG 80 – There is no evidence of systematic non-compliance in either the U.S. or Canadian fisheries (Gilcrest 2013; and Matthews 2013). Fisher proactive involvement in the management process is high and rule violation rates are extremely low.	
References		DFO 2013a; DFO 2013b; Gilcrest 2013; and Matthews 2013	
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries met all SG 60, SG 80, and SG 100 issues, so a score of 100 is given.			US 100 Can 100
CONDITION NUMBER (if relevant):			

Evaluation Table for PI 3.2.4

PI 3.2.4		The fishery has a research plan that addresses the information needs of management		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	Research is undertaken, as required, to achieve the objectives consistent with MSC's Principles 1 and 2.	A research plan provides the management system with a strategic approach to research and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.	A comprehensive research plan provides the management system with a coherent and strategic approach to research across P1, P2 and P3, and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2.
	Met?	Yes	Yes	Yes
	Justification	Both Fisheries SG60 – see SG100 for details SG80 – see SG100 for details SG100 – P1: Under the Hake Agreement, the latest available SRG Research Recommendations (SRG 2013) are consistent with a comprehensive research plan that provides the management system with a coherent and strategic approach to research P1 and reliable and timely information sufficient to achieve the objectives consistent with MSC's Principles 1 and 2. For details, see Section 3.5.14. P2: The California Current Ecosystem (CCE) Integrated Ecosystem Assessment (IEA) process of the PFMC continues to make significant progress (Levin et al. 2013). The 2012 CCE IEA includes a preface describing research priorities included in the report and future directions; a description of the engagement processes used to help define management scenarios; an assessment of the large-scale drivers and pressures influencing the state of the California Current; an investigation of status and trends for key components of the ecosystem that tracks changes in the ecosystem over time; an evaluation of risk to certain ecosystem components; and five management scenarios and seven related case studies that explore potential future states of the California Current. <u>P3: U.S.</u> SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The PFMC has a routine process for identifying plans for research and data needs. Council Operating Procedure 12 outlines the PFMC's process for documenting research and data needs and the schedule for completing and communicating these needs to organizations, which may be able to support additional research. Updates to research and data needs documents are timed to influence the annual operating plans and budget requests of the NMFS. The documents also provide information about the Council's needs to other researchers, agencies and institutions. At least every five years, the PFMC staff present an updated version of the Research and Data Needs document(s) (PFMC 2013b) to the SSC for review. After the documents are approved, they are sent to NMFS, regional Sea Grant institutions, and other institutions and agencies. <u>P3: Canada</u> SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The DFO's research plans for stock assessment and status are discussed in the IFMP (DFO 2013b) and Hake Management Plan (DFO 2013a). Current and historical science advice, stock assessments and research program reports are available through the Canadian Science Advisory Secretariat (CSAS). In the Pacific Region, science advisory processes are managed by the Centre for Science Advice Pacific (CSAP).		

PI 3.2.4		**The fishery has a research plan that addresses the information needs of management**		
b	**Guidepost**	Research results are available to interested parties.	Research results are disseminated to all interested parties in a timely fashion.	Research plan and results are disseminated to all interested parties in a timely fashion and are widely and publicly available.
	Met?	Yes	Yes	Yes
	Justification	US SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Research plan and results are disseminated by the U.S. (PFMC 2013b, PFMC 2014d) to all interested parties in a timely fashion and are widely and publicly available. Canada SG60 – see SG100 for details SG80 – see SG100 for details SG100 – In Canada, science advice, proceedings and stock assessments/scientific evaluations resulting from of CSAS meetings are available online at: http://www.meds-sdmm.dfo-mpo.gc.ca/csas- sccs/applications/Publications/index-eng.asp. Research recommendations by SRG and responses by JTC are publicly available on whiting treaty website. See Section 3.5.12 for additional details.		
References		DFO 2013a; DFO 2013b ; Levin et al. 2013; PFMC 2013b; PFMC 2014d; SRG 2013 http://www.westcoast.fisheries.noaa.gov/fisheries/management/whiting/pacific_whiting_treaty.html		
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG 60, SG 80, and SG 100 issues, so scores of 100 are given.				US 100 Can100
CONDITION NUMBER (if relevant):				

Evaluation Table for PI 3.2.5

PI 3.2.5		There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives There is effective and timely review of the fishery-specific management system		
Scoring Issue		SG 60	SG 80	SG 100
a	**Guidepost**	The fishery has in place mechanisms to evaluate some parts of the management system.	The fishery has in place mechanisms to evaluate key parts of the management system	The fishery has in place mechanisms to evaluate all parts of the management system.
	Met?	Yes	Yes	Yes
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – The PFMC meets five times a year, and has mechanisms in place to evaluate all parts of the management system. The biennial management process was implemented in 2003 through Amendment 17 to the groundfish FMP and is detailed in Council Operating Procedure 9. Under the biennial cycle, eligible management measures are implemented for a two-year period and adjusted through routine in-season evaluation and actions. The effectiveness of enforcement is evaluated annually through discussions within the PFMC Enforcement Consultants and presented during the PFMC meetings (Matthews 2013, PFMC 2014d). Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Mechanisms to evaluate all parts of the management system are further described in the annual Hake Management Plan (DFO 2013a). According the IFMP (DFO 2013b), science personnel, in association with DFO fishery managers and groundfish user group representatives, annually establish assessment priorities and timing schedules for assessments. The effectiveness of enforcement is periodically evaluated through discussions between DFO managers and fishery enforcement staff (Gilcrest 2013)		
b	**Guidepost**	The fishery-specific management system is subject to occasional internal review.	The fishery-specific management system is subject to regular internal and occasional external review.	The fishery-specific management system is subject to regular internal and external review.
	Met?	Yes	Yes	Yes

PI 3.2.5		**There is a system of monitoring and evaluating the performance of the fishery-specific management system against its objectives** **There is effective and timely review of the fishery-specific management system**
	Justification	U.S. Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – Under the PFMC's public process, a biennial cycle is used whereby eligible management measures are implemented for a two-year period, as detailed in the Pacific Coast Groundfish Fishery Management Plan (FMP) and its amendments. It contains the measures for managing the groundfish fishery, which are executed by the NMFS rule making process (another public process). Measures may be adjusted through routine in-season evaluation and actions. The effectiveness of enforcement is evaluated annually through discussions within the PFMC Enforcement Consultants and presented during the PFMC meetings (Matthews 2013, PFMC 2014d). Canadian Fishery SG60 – see SG100 for details SG80 – see SG100 for details SG100 – As described in the IFMP (DFO 2013b), science personnel, in association with DFO fishery managers and groundfish user group representatives, annually establish assessment priorities and timing schedules for assessments. These programs support ongoing internal and external review of management measures. Opportunities for stakeholder involvement and co-operative ventures in research and assessment activities are pursued.
References		DFO 2013a; DFO 2013b; Gilcrest 2013; Matthews 2013; PFMC 2014d
OVERALL PERFORMANCE INDICATOR SCORE: Both fisheries meet all SG 60, SG 80, and SG 100 issues, so scores of 100 are given.		US 100 Can100
CONDITION NUMBER (if relevant):		

APPENDIX 2.2 CONDITIONS AND CLIENT ACTION PLAN

Condition 1 - Canada

Performance Indicator	2.1.3 b Information is **sufficient** to estimate outcome status with respect to biologically based limits. 2.1.3 d Sufficient data continue to be collected to detect any **increase in risk level** to main retained species (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy)
Score	75
Rationale	DFO has a wide amount of information on fishing catch, effort, and mortality for many species suitable for assessment, as demonstrated by Bocaccio; however, acceptable assessments for Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock have not been completed to determine biological reference points and status relative to reference points. It is not clear that all main species have sufficient biological parameters available for an assessment. Because acceptable assessments for Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock have not been completed to determine biological reference points, it would be difficult to detect an increase in risk level other than anecdotally from fishery performance.
Condition	By the fourth year, the fishery client shall demonstrate that information is sufficient to estimate outcome status with respect to biologically based limits for Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock and that sufficient data continue to be collected to detect any increase in risk level to Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock
Milestones	At the end of the first year, the client shall provide a plan that will achieve the condition by end of the fourth year. At the end of the second and third years, the client shall provide evidence that achieving the condition will occur by the end of the fourth year. At the end of the fourth year, the client shall provide evidence that information is sufficient to estimate outcome status with respect to biologically based limits for Yellowtail Rockfish, Redstripe Rockfish, and Walleye Pollock and that sufficient data continue to be collected to detect any increase in risk level to these species
Client action plan	There are two very similar conditions covering 4 species caught in association with Pacific hake in Canadian waters. The following action plan is in response to both conditions. The Canadian Client will work collaboratively with DFO to estimate outcome status with respect to biologically based limits for Yellowtail Rockfish, Redstripe Rockfish, Rougheye Rockfish, and Walleye Pollock and to assure that sufficient data continue to be collected to detect any increase in risk level to these species. The Client will report on the progress of this work annually, and will provide evidence by the fourth surveillance audit that information exists to show if these species are within biological limits and that risk levels are monitored. This work will encompass the following action items: • annually collect valuable data on yellowtail rockfish, walleye pollock, rougheye rockfish and redstripe rockfish through established and ongoing research surveys, bio-sampling programs, and catch monitoring programs; • undertake data analysis to assess data accuracy, completeness and representativeness in support of aging and assessment requirements; • undertake a science review of appropriate assessment methodology for groundfish species, including yellowtail rockfish, walleye pollock, rougheye rockfish and redstripe rockfish; • through established DFO processes, consult with stakeholders on assessment requirements for groundfish, including yellowtail rockfish,

	walleye pollock, rougheye rockfish and redstripe rockfish, and identify workplan and human and financial resource requirements; • undertake peer reviewed stock assessments for yellowtail rockfish, walleye pollock, rougheye rockfish and redstripe rockfish through DFO's established CSAP (Center for Scientific Advice Pacific).
Consultation on condition	Key DFO staff members confirmed participation in the client action plan.

Condition 2 - Canada

Performance Indicator	2.2.3 b Information is **sufficient** to estimate outcome status with respect to biologically based limits. 2.2.3 d Sufficient data continue to be collected to detect any **increase in risk level** to main retained species (e.g. due to changes in the outcome indicator scores or the operation of the fishery or the effectiveness of the strategy)
Score	75
Rationale	DFO has a wide amount of information on fishing catch, effort, and mortality for many species suitable for assessment, as demonstrated by Bocaccio; however, an acceptable assessment for Rougheye Rockfish not been completed to determine biological reference points and status relative to reference points. It is not clear that this species has sufficient biological parameters available for an assessment. Because an acceptable assessment for Rougheye Rockfish has not been completed to determine biological reference points, it would be difficult to detect an increase in risk level other than anecdotally from fishery performance.
Condition	By the fourth year, the fishery client shall demonstrate that information is sufficient to estimate outcome status with respect to biologically based limits for Rougheye Rockfish and that sufficient data continue to be collected to detect any increase in risk level to this species.
Milestones	At the end of the first year, the client shall provide a plan that will achieve the condition by end of the fourth year. At the end of the second and third years, the client shall provide evidence that achieving the condition will occur by the end of the fourth year. At the end of the fourth year, the client shall provide evidence that information is sufficient to estimate outcome status with respect to biologically based limits for Rougheye Rockfish and that sufficient data continue to be collected to detect any increase in risk level to this species.
Client action plan	There are two very similar conditions covering 4 species caught in association with Pacific hake in Canadian waters. The following action plan is in response to both conditions. The Canadian Client will work collaboratively with DFO to estimate outcome status with respect to biologically based limits for Yellowtail Rockfish, Redstripe Rockfish, Rougheye Rockfish, and Walleye Pollock and to assure that sufficient data continue to be collected to detect any increase in risk level to these species. The Client will report on the progress of this work annually, and will provide evidence by the fourth surveillance audit that information exists to show if these species are within biological limits and that risk levels are monitored. This work will encompass the following action items: • annually collect valuable data on yellowtail rockfish, walleye pollock, rougheye rockfish and redstripe rockfish through established and ongoing research surveys, bio-sampling programs, and catch monitoring programs; • undertake data analysis to assess data accuracy, completeness and representativeness in support of aging and assessment requirements; • undertake a science review of appropriate assessment methodology for groundfish species, including yellowtail rockfish, walleye pollock, rougheye

	rockfish and redstripe rockfish; • through established DFO processes, consult with stakeholders on assessment requirements for groundfish, including yellowtail rockfish, walleye pollock, rougheye rockfish and redstripe rockfish, and identify workplan and human and financial resource requirements; • undertake peer reviewed stock assessments for yellowtail rockfish, walleye pollock, rougheye rockfish and redstripe rockfish through DFO's established CSAP (Center for Scientific Advice Pacific).
Consultation on condition	Key DFO staff members confirmed participation in the client action plan.

APPENDIX 3. PEER REVIEW REPORTS

Peer Review of
Pacific Hake Fishery Assessment

Reviewer 1

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes/No** Yes	**Conformity Assessment Body Response**
Justification: These are discussed individually in my comments		No response necessary.

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes/No** Yes	**Conformity Assessment Body Response**
Justification: These are discussed individually in my comments		No response necessary.

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes/No** Yes	**Conformity Assessment Body Response**
Justification: The plan provides a path to closing the conditions in the allotted time frames.		No response necessary.

Performance Indicator Review

Please complete the table below for each Performance Indicator which are listed in the Conformity Assessment Body's Public Certification Draft Report.

Performance Indicator	**Has all the relevant information available been used to score this Indicator? (Yes/No)**	**Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)**	**Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)**	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	**Conformity Assessment Body Response**
1.1.1	Yes	Yes	NA	See comments	No response necessary.
1.1.2	Yes	No	NA	See comments	The team agrees with the reviewer's comment on scoring issue c. The report has been modified to include the empirical argument suggested by the reviewer. The scoring has not been changed.
1.1.3	NA	NA	NA	Pacific hake is not overfished.	No response necessary.
1.2.1	Yes	No	NA	See comments	On harvest strategy review (scoring issue d) the assessment team has reviewed the information and can confirm that this scoring issue is only partially met. As such, the score for this PI has been reduced to 85.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.2	No	No	NA	See comments	On the harvest control rules evaluation (scoring issue c) the assessment team has reviewed the information on the recent MSE and agrees with the reviewer that some doubt has been cast on the effectiveness of the HCR. From the recent MSE exercise it has been learned that that the F40%-40:10 rule reduces the median average depletion of the stock to below 30% which is less than the SB40% target level. Therefore the score of this PI has been reduced to 80.
1.2.3	Yes	Yes	NA	See comments	No response necessary.
1.2.4	Yes	Yes	NA	See comments	No response necessary.
2.1.1	Yes	Yes	NA	See comments	No response necessary.
2.1.2	Yes	Yes	NA	There is an effective strategy in place for managing retained species	No response necessary.
2.1.3	Yes	Yes	Yes	See comments	No response necessary.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.2.1	Yes	Yes	NA	A strategy is in place for Canadian rougheye rockfish and chinook stocks.	No response necessary.
2.2.2	Yes	Yes	NA	Effective strategies are in place for managing bycatch in both US and Canada.	No response necessary.
2.2.3	Yes	Yes	Yes	Information concern for rougheye rockfish in Canada, and assessment not available. See comments.	No response necessary.
2.3.1	Yes	Yes	NA	National and international requirements for the protection of ETP species are met by both US and Canada.	No response necessary.
2.3.2	Yes	Yes	NA	Evidence is needed to see if Canadian ETP strategy is being implemented effectively.	No response necessary.
2.3.3	Yes	Yes	NA	Relevent ETP species information is collected by both US and Canada.	No response necessary.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.4.1	Yes	Yes	NA	Habitat impacts are unlikely in the Pacific hake fishery due to the nature of the gear and methods used in fishing this pelagic species.	No response necessary.
2.4.2	Yes	Yes	NA	Effective habitat protection strategies are in place in both countries.	No response necessary.
2.4.3	Yes	Yes	NA	Good information on habitat is available for both countries.	No response necessary.
2.5.1	Yes	Yes	NA	Canada has presented no studies to specifically complement the US CCE studies to confirm that the Canadian fleet has the same impacts as the US fleet with respect to ecosystem structure and function.	No response necessary.
2.5.2	Yes	Yes	NA	In both countries, effective measures are in place to ensure the fishery does not pose a risk of serious harm to ecosystem structure and function.	No response necessary.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.5.3	Yes	Yes	NA	Though certain Canadian research papers have not yet been published, both countries have demonstrated adequate knowledge of the fishery impacts on the ecosystem.	No response necessary.
3.1.1	Yes	Yes	NA	Effective management systems are in place in both countries.	No response necessary.
3.1.2	Yes	Yes	NA	Effective consultation processes are in place in both countries	No response necessary.
3.1.3	Yes	Yes	NA	Both Canada and the U.S. management policies have clear long-term objectives that guide decision-making, consistent with MSC Principles and Criteria and the precautionary approach are explicit and required within management policy,	No response necessary.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.1.4	Yes	Yes	NA	The management systems in both the U.S. and Canada provide for positive incentives that are consistent with achieving the outcomes expressed by MSC Principles 1 and 2; avoid perverse incentives; and explicitly consider incentives in a regular review of management policy or procedures to ensure they do not contribute to unsustainable fishing practices.	No response necessary.
3.2.1	Yes	Yes	NA	In both countries, the fishery has clear, specific objectives designed to achieve the outcomes expressed by MSC's Principles 1 and 2.	No response necessary.
3.2.2	Yes	Yes	NA	The fishery management systems of US and Canada both have effective decision making processes to achieve objectives and deal with disputes.	No response necessary.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.3	Yes	Yes	NA	Effective monitoring, surveillance,and control systems are in place in both countries	No response necessary.
3.2.4	Yes	Yes	NA	Research plans that address the information needs of management are prepared and disseminated widely in a timely fashion in both countries.	No response necessary.
3.2.5	Yes	Yes	NA	Effective systems for monitoring, reviewing, and evaluating the management systems are employed by both countries.	No response necessary.

Any Other Comments

Comments	Conformity Assessment Body Response

Peer Review of Pacific Hake

Reviewer 2

Overall Opinion

Has the assessment team arrived at an appropriate conclusion based on the evidence presented in the assessment report?	**Yes**	**Conformity Assessment Body Response**
Justification: **Sufficient information is available in the report to justify the scores allocated. None of the comments or criticisms made would change the overall conclusion.**		No response required.

Do you think the condition(s) raised are appropriately written to achieve the SG80 outcome within the specified timeframe?	**Yes**	**Conformity Assessment Body Response**
Justification: **The conditions are worded so that they directly address the requirements of the scoring guideposts.**		No response required.

If included:

Do you think the client action plan is sufficient to close the conditions raised?	**Yes**	**Conformity Assessment Body Response**
Justification: ***If achieved, the client action plan is more than sufficient to close the conditions and goes beyond what might be strictly required for the SG80.***		No response required.

General Comments on the Assessment Report (optional)

The report is well written and very detailed. The level of detail makes it difficult to identify the key points that affect MSC scores. Some justifications of the scores could be improved.

The information provided for the US and Canada appears unequal. I am not sure more detail is required in the main report text, but each issue should be addressed equally in the scoring table, where appropriate. In some cases, the text is so terse it is difficult to see how the score was reached.

It would be useful to clearly identify in the executive summary the CR version being used.

Performance Indicator Review

Please complete the table below for each Performance Indicator which are listed in the Conformity Assessment Body's Public Certification Draft Report.

Performance Indicator	**Has all the relevant information available been used to score this Indicator? (Yes/No)**	**Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)**	**Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)**	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	**Conformity Assessment Body Response**
1.1.1	Yes	Yes	NA	No comment	No response required.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.1.2	No	No	NA	The assessment currently states that SB10% is above the level where there is an apreciable risk of impairing reproductive capacity. More specific evdence is required to suggest this is true. The justification discusses the HCR which is also dealt with elsewhere. The justification for this scoring issue b should focus on probability of recruitment failure. The longterm sustainability of the HCR depends on critical assumptions in the stock-recruitment (SR) function. There is no direct evidence on the SR as far as I can see, except the past support for the recruitment variance, which would be the driving force for any recovery. The question is when these infrequent very high recruitments might be compromised which is very difficult to guess since the lowest estimated SSB was in 2009 – above 20%B0. Isn't more precaution warranted? Arguably, Blim has not been analytically determined, so the default ½ BMSY could be used. The justification does not explain why the fishery does not meet the SG100.	While the reviewer's comments are noted the assessment team considers that the evidence provided is sufficient to justify the scoring for this PI. The evidence that that the limit reference point is above the level where there is an appreciable risk of impairing reproductive capacity lies in the steepness of the stock recruitment curve. The high steepness of the Beverton-Holt stock recruitment curve (*h=0.78*) as per the 2013 stock assessment indicates that the hake population is resilient and robust to harvesting (Myers ***et al***. 1999). Given that the target reference point SB40% has allowed the stock to rebound over the assessed period 1966-2012 despite wide fluctuations in recruitment is further evidence that the target reference point is precautionary.
1.1.3	NA	NA	NA	No comment	

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.1	Yes	No	NA	SIa: The justification here treats the harvest strategy and HCR as equivalent, which risks double scoring. There is no mention of other aspects of the harvest strategy, such as mesh size, controls on fishing areas, TAC allocation, etc. which should be "working together" to achieve objectives.	The assessment team noted the comment on 'working together'. Information and a rationale is provided in the report in support of the F40%-40:10 harvest strategy to be responsive to the stock status and is designed to meet stock management objectives. The assessment team finds that monitoring and assessment data indicate that the harvest strategy, based on the hake agreement in recent years and the PFMC and DFO in the past, has proven effective in maintaining the stock.
1.2.2	Yes	No	NA	SIb: What uncertainties other than the main uncertainties have not been accounted for in the HCR for it not to meet the SG100? SIc: The tools in this case are the catch limits, so the SI should address whether these are achieving the fishing mortality (or equivalents) required by the HCR, accounting for the various implementation errors, retrospective errors and so on, rather than the overall performance of the harvest strategy as currently addressed in the justification.	The assessment team has reviewed the information for PI 1.2.2 and can confirm that the scoring issue c for SG100 is not met. As such, the score for this PI has been reduced to 80.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
1.2.3	Yes	No	NA	SIb: No clear explanation is given why SG100 is not met.	The team reviewed the information on scoring issue c and concluded that the score of 80 is appropriate. More information could potentially be collected such as doing an annual recruitment survey (as has been done in the past). The report has been altered to provide explanation why SG100 was not met.
1.2.4	Yes	Yes	NA	SIe: This seems a harsh interpretation of the requirements. There have been regular external reviews. The last CIE review was in 2011, and the recent stock assessments, as I understand it, have been updates. Would this not constitute external peer review?	No response required.
2.1.1	Yes	Yes	NA	I agree with the method used to allocate stocks between main and minor, and retained and bycatch. These allocations are clear and make sense.	No response required.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	**Justification** Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	**Conformity Assessment Body Response**
2.1.2	Yes	No	NA	SId: I am not convinced from the information provided that there is evidence yet that bocaccio rockfish is recovering with the current management strategy.	While there may not be conclusive evidence that Boccacio is recovering, the SI asks if there is **some** evidence that the strategy is achieving its overall objective. This evidence for Boccacio includes: the reduction of bycatch, a rebuilding program has been developed based on science and implemented. There is also a high level of regulation compliance because primary stakeholders understand and participate in the Boccacio management processes.
2.1.3	Yes	No	Yes	SIa: The explanation for why SG100 is not met for Canada is missing (necessary for when the condition is closed). Condition: I would be concerned whether the client action plan can be achieved within 4 years if data are not already available. Some sort of risk assessment should be acceptable to meet the SG80 assuming these stocks are not found to be overexploited, which is a lower requirement than a peer reviewed stock assessment.	Text has been changed from "SG60 – see SG100" to "SG60 – see SG80". It is unclear how well DFO can determine consequences for affected populations of retained species, other than Boccacio, because recent stock assessments for those species are not available. Regarding the Condition, data for stock assessments of retained species appear to be available, but they have not yet been analyzed for those stock assessments.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.2.1	Yes	Yes	NA	No comment	No response required.
2.2.2	Yes	No	NA	SId: The justification text seems to address implementation, covered under SIc. Surely this should explain the evidence that the overall objectives are being met (i.e. that population status objectives are being achieved).	The implementation actions of the strategy discussed in SIc have resulted in achievement of the main objectives for the strategy, which are stated: management of the bycatch to assure these species are not overfished. Text has been changed to better address the reviewer's comment.
2.2.3	Yes	Yes	Yes	I agree with this. It is related to PI2.2.1, but tries to avoid double scoring the issue with rougheye rockfish. However, it is worth noting that meeting the condition on this PI could lower the score and raise a condition on PI2.2.1.	No response required.
2.3.1	Yes	Yes	NA	No comment	No response required.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.3.2	Yes	No	NA	SIc: For Canada, according to the text, this scoring issue is not met because the status is uncertain for some species. Should this not be considered under PI2.3.1 or PI2.3.3 rather than here?	The Team disagrees. The status of the species in question is known, as is the pertinent information. The issue is that the Team has not seen clear evidence the strategy is being implemented successfully.
2.3.3	Yes	No	NA	SIa: For Canada, the text is insufficient. Presumably the same issues apply as for US and should be addressed in the same way. More generally, there is a heavy dependence on the observer data for high scores here. Information is not only data but also what is done with it. The justification should reference population size estimates of ETP and how mortality limits are set (also see comment for 2.3.2).	Text has been added to SIa, Sib, and SIc to address the deficiencies noted.
2.4.1	Yes	Yes	NA	No comment	No response required.
2.4.2	Yes	Yes	NA	No comment	No response required.
2.4.3	Yes	Yes	NA	No comment	No response required.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
2.5.1	Yes	Yes	NA	No comment	No response required.
2.5.2	Yes	Yes	NA	No comment	No response required.
2.5.3	Yes	Yes	NA	No comment	No response required.
3.1.1	Yes	Yes	NA	No comment	No response required.
3.1.2	Yes	Yes	NA	No comment	No response required.
3.1.3	Yes	Yes	NA	No comment	No response required.
3.1.4	Yes	Yes	NA	No comment	No response required.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.1	Yes	No	NA	The justification only refers to the main text, which lists the objectives. It would be better if the justification linked the various objectives to the the MSC P&C. That is, single species – target retained and bycatch - , ETP, habitat and ecosystem objectives, and in particular it is demonstrated that these are all "measurable".	Text has been added to the justification of 3.2.1 to address the reviewer's advice.
3.2.2	Yes	Yes	NA	SIb: As for 3.2.1, the text is a little terse compared to SId for example, although information supporting the conclusion is available in the report as a whole. However, SG100 is quite demanding. It would be more useful, in my opinion, to have a shorter summary of information for each SI, and how it meets the SG rather than the greater detail in the main text which leaves the reader to draw the links. SIe: US: As for Canada, some examples of what the management system has actually done to avoid legal disputes would be useful here.	
3.2.3	Yes	Yes	NA	No Comment	No response required.
3.2.4	Yes	Yes	NA	No Comment	No response required.

Performance Indicator	Has all the relevant information available been used to score this Indicator? (Yes/No)	Does the information and/or rationale used to score this Indicator support the given score? (Yes/No)	Will the condition(s) raised improve the fishery's performance to the SG80 level? (Yes/No/NA)	Justification Please support your answers by referring to specific scoring issues and any relevant documentation where possible. Please attach additional pages if necessary.	Conformity Assessment Body Response
3.2.5	Yes	Yes	NA	No Comment	No response required.

Any Other Comments

Comments	Conformity Assessment Body Response
Three other small stocks are mentioned and referred to in the text, but there appears to be no consideration of whether they might be caught and mistaken for the stock assessed here. If they could enter chain of custody, then the IPI requirements apply (CR 1.3 27.4.9).	The Assessment team removed the reference to the Baja California, as it occurs in another country where neither US nor Canadian vessels may fish. The team has modified the report to describe control requirements for the Puget Sound and Gulf of Georgia stocks.

APPENDIX 4. STAKEHOLDER SUBMISSIONS

No Stakeholders submitted written comments before or during the site visit.

In addition to personnel from science or management agencies, the team spoke with Shems Judd of Environmental Defense Fund and Scott Wallace of the David Suzuki Foundation. Mr. Judd explored environmental issues with the assessment team; in particular abundance variability for Pacific Hake; rougheye rockfish bycatch from the Hake fishery; and ecosystem impacts. Mr. Wallace explored with the team information available for fishery effects on the environment, and rockfish and salmon bycatch from the fishery. In both cases, the assessment team confirmed that we recognized the importance of these issues and that the team would provide extensive details for these issues.

Only the MSC submitted comments to the PCDR. The MSC comments and the MRAG Americas assessment team response are provided here.

APPENDIX 5. SURVEILLANCE FREQUENCY

Table C3 US Pacific Hake

Criteria	Surveillance score
Default Assessment Tree used	
Yes	0
No	2
Number of open conditions	
Zero conditions	0
Between 1-5 conditions	1
More than 5	2
Principle Level scores	
>=85	0
<85	2
Conditions on outcome PIs	
Yes	2
No	0

Total score = 0

Table C3 Canada Pacific Hake

Criteria	Surveillance score
Default Assessment Tree used	
Yes	0
No	2
Number of open conditions	
Zero conditions	0
Between 1-5 conditions	1
More than 5	2
Principle Level scores	
>=85	0
<85	2
Conditions on outcome PIs	
Yes	2
No	0

Total score = 1

Table C4: Surveillance Level

			Years after certification or recertification			
Surveillance score from Table C3)	Surveillance Level		Year 1	Year 2	Year 3	Year 4
2 or more	Normal surveillance audit		On-site surveillance audit	On-site surveillance audit	On-site surveillance audit	On-site surveillance audit & recertification site visit
1	Remote surveillance	Option 1	Off-site surveillance audit	On-site surveillance audit	Off-site surveillance audit	On-site surveillance audit & recertification site visit
		Option 2	Off-site surveillance audit	Off-site surveillance audit	On-site surveillance audit	
0	Reduced Surveillance		Review of new information	On-site surveillance audit	Review of new information	On-site surveillance audit & recertification site visit

APPENDIX 6. CLIENT AGREEMENT

Pacific Whiting Conservation Cooperative

American Seafoods • Glacier Fish Co. • Trident Seafoods

A Partnership to Promote Responsible Fishing

November 18, 2014

Robert J. Trumble, Ph.D.
Vice President
MRAG Americas, Inc.
10051 5th St. N, Suite 105
St. Petersburg FL 33702

Re: US Pacific Hake Fishery Client Acceptance of Final Public Certification Report

Dear Dr. Trumble:

I write on behalf of the Pacific Whiting Conservation Cooperative, who serves as the US Pacific hake fishery client representative. The US Pacific hake fishery client has reviewed the Public Certification Report. The client accepts the report, including its findings and recommendations. The client wishes to thank you and the MRAG-Americas certification assessment team for your thorough analysis as well as the open and transparent process used in your evaluation of the Pacific hake fishery.

Sincerely,

Daniel A. Waldeck
Executive Director

Pacific Whiting Conservation Cooperative
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Seattle, Washington 98199
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Shannon Mann VP Sec-Tres (604) 215-7909
Fax (604) 215-7878

November 18th 2014

To MRAG Americas Inc

Re Canadian Fishery Client Acceptance of Pacific Hake Public Certification Report

Dear Dr Trumble

On behalf of The Association of Pacific Hake Fishermen, I have reviewed and accept the Public Certification Report with great thanks to the Assessment team for all of their hard work, helpful advice, and dedication to getting us through!

Sincerely

Shannon Mann
Association of Pacific Hake Fishermen
Vice President, Secretary-Treasure

APPENDIX 6.1 OBJECTIONS PROCESS

No objection received.