# CANADA

British Columbia Groundfish Fisheries and Their Investigations in 2013

**April 2014**

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**REVIEW OF AGENCY GROUNDFISH RESEARCH, STOCK ASSESSMENT, AND MANAGEMENT**

## A. Agency overview

Fisheries and Oceans Canada (DFO), Science Branch, operates three principal facilities in the Pacific Region: the Pacific Biological Station (PBS), the Institute of Ocean Sciences (IOS), and the West Vancouver Laboratory (WVL). These facilities are located in Nanaimo, Sidney and West Vancouver, British Columbia (BC), respectively. Dr. Laura Richards is the Regional Director of Science and will be retiring in May 2014. The Divisions and Sections are as follows:

Division Heads in Science Branch reporting to Dr. Richards are:

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| Canadian Hydrographic Service | Mr. David Prince (Acting) |
| Ocean Science | Mr. Robin Brown |
| Salmon & Freshwater Ecosystems | Mr. Mark Saunders |
| Marine Ecosystems & Aquaculture | Dr. Laura Brown |

Section Heads within the Marine Ecosystems & Aquaculture Division (MEAD) are:

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|---|---|
| Groundfish | Mr. Greg Workman |
| Invertebrates | Mr. Dennis Rutherford (Acting) |
| Pelagic Fish Research & Conservation Biology | Dr. Nathan Taylor (Acting) |
| Applied Technologies | Mr. Henrik Krieberg |
| Aquaculture and Environmental Research | Dr. Steven MacDonald |

Groundfish research and stock assessments are conducted in the Groundfish Section. Groundfish specimen ageing and hydroacoustic work are conducted in the Applied Technologies Section. The Canadian Coast Guard operates DFO research vessels. These research vessels include the *W.E. Ricker, J.P. Tully, Vector*, and *Neocaligus*. A replacement vessel for the *W.E. Ricker* has been delayed until 2014 or beyond.

The Pacific Region Headquarters (RHQ) of Fisheries and Oceans Canada is located at 401 Burrard Street, in Vancouver, BC, V6C 3S4. Management of groundfish resources is the responsibility of the Pacific Region Groundfish Regional Manager (Mr. Neil Davis, Acting) within the Fisheries and Aquaculture Management Branch (FAM). Fishery Managers receive assessment advice from MEAD through the Canadian Centre for Scientific Advice Pacific (CSAP) review committee which is headed by Mrs. Marilyn Hargreaves. The Groundfish Section has at least two review meetings per year, in which stock assessments or other documents undergo scientific peer review (including external reviewers who are often from NOAA). The resulting Science Advisory Report summarizes the advice to Fishery Managers, with the full stock assessment becoming a Research Document. Both documents can be viewed on the Canadian Stock Assessment Secretariat website: http://www.dfo-mpo.gc.ca/science/advice-avis/index-eng.html.

The Trawl, Sablefish, Rockfish, Lingcod, North Pacific Spiny Dogfish, and Halibut fishery sectors continue to be managed with Individual Vessel Quotas (IVQs). IVQs can be for specific areas or coastwide. Within the general IVQ context, managers also use a suite of management tactics including time and area specific closures and bycatch limits. Details for the February 2014 Groundfish Integrated Fisheries Management Plan can be viewed at http://www.pac.dfo-mpo.gc.ca/fm-gp/ifmp-eng.htm#Groundfish.

A shift in the funding of industry collaborations, particularly in conducting cooperative surveys, was required after the *Larocque* court decision of June 23, 2006. Prior to the *Larocque* decision, compensation provided to fishers for their data collection services took the form of the proceeds of the unavoidable fish kills in the research surveys, less any samples retained for detailed scientific analysis. In instances where these proceeds did not cover the cost of the research survey, the department allowed fishers to catch additional fish for payment purposes. Post-*Larocque* these "top up" payments for fishing activities were no longer possible. Larocque Relief Funding, to replace fish allocations, was provided in 2007 and continued to fund surveys through March 2013. Recent legislative changes grant the Minister of Fisheries and Oceans the authority to allocate fish or fishing gear for the purpose of financing scientific and fisheries management activities that are described in a joint project agreement entered into with any person or body, or any federal or provincial minister, department, or agency. Larocque Relief funded projects were transitioning to the new Fisheries Act provisions for the 2013-14 fiscal year, where stakeholders were willing.

Allocations of fish for financing scientific and management activities are identified in the Groundfish Integrated Fisheries Management Plan. Joint Project Agreements are being considered for 2014-15 between Fisheries and Oceans Canada and several partner organisations to support groundfish science activities through the allocation of fish to finance the activities.

## B. Multispecies or ecosystem models and research

1. Stock Assessment Prioritization

A Groundfish Section stock assessment prioritization and scheduling plan was developed in 2011 and early 2012. This first plan covers 10 years (2012-2021) but the process calls for it to be reviewed and updated every five years, rolling forward over time. The current schedule focuses on 39 "Type A" species which includes species identified as being conservation concerns (i.e., Bocaccio, Basking Shark, etc.) and species which are important to the First Nations, commercial and recreational fisheries. The frequency of assessment for Type A species ranges from 1 year (i.e., Pacific Hake), to 2 years (Sablefish and Pacific Cod), and to 5 or 10 years for the remaining Type A species depending upon biological characteristics, stock status, and FAM priorities.

The timing of assessment for species that have been flagged as conservation issues by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) is synchronized with the timing of COSEWIC re-assessments.

The remaining 200+ non-commercial fish species that can be considered to lie within the Groundfish research mandate are classified as Type B species. The current process calls for a fast

screening of the relative abundance trends in surveys and commercial CPUE for each of these species every five years. The fast screening is designed to provide a short-list of the 20-30 Type B species that should receive more detailed consideration in order for them to be scheduled into the coming 10 year workplan.

2. NSERC Canadian Fisheries Research Network (CFRN)

Starting in 2010, Groundfish staff have participated in the National Sciences and Engineering Research Council of Canada's (NSERC) *Canadian Fisheries Research Network*. The CFRN is a collaboration of academic researchers, the fishing industry, and government researchers and managers from across Canada. The Network includes 33 academics from 13 universities, working with collaborators in the Canadian fishing industry, DFO, and provincial governments. The Network is industry-driven and focussed on projects that have the active collaboration of each sector. The Network will link with other strategic networks and coordinate with DFO programs, where appropriate.

The vision of the Network is to re-shape fisheries research in Canada, bringing together industry, academia and government on priority research questions and linking existing research so that it is useful to industry and management. The research of the Network is aimed at increasing knowledge that will enhance the ecological sustainability, socio-economic viability and management of Canadian fisheries. Specifically, the research objectives are to:

- overcome information gaps for important commercial fisheries and improve the use of industry information in assessment and management;
- enhance ecological sustainability while achieving operational efficiency; and improve the basis for the ecosystem approach to fisheries management.

The Network will provide a forum for sharing research objectives and results that will build capacity in each sector; as well as establish a tradition of collaborative, strategic fisheries research in Canada that is expected to extend beyond its timeline. In addition, the Network will train a cohort of new researchers that will be equipped to meet the research challenges of a new fisheries management regime.

The information and technological advances gained through the research of the Network will have a significant impact on the sustainability, viability and competitiveness of Canada's capture fisheries industry, and will provide environmental and socio-economic benefits. The research will build upon and inform the development of policies and strategies for the management of capture fisheries in Canada and internationally. Details can be found at: http://www.nsercpartnerships.ca/How-Comment/Networks-Reseaux/CCFRN-CCRRN-eng.asp

The 2014 Annual Meeting was held in February in Montreal and was attended by academics, DFO scientists, industry members and students from around the country. Students gave presentations and posters on progress to date, and discussions were held on future directions for the network. A report will be posted shortly on the CFRN website.

3. Summary of research surveys in 2013

A number of multi-species trawl surveys are conducted by the Groundfish Section and Groundfish staff participate in trawl surveys conducted by other groups. For a summary of research trawl survey activity in 2013, please see Appendix 2. Other research surveys conducted in 2013 include longline and trap surveys. These surveys are described under their respective species programs below.

**C. By species**

1. Pacific Cod

i. Research program in 2013

In 2013, staff in the Groundfish Section made significant progress on development of feedback simulation software to analyse the performance of alternative management procedures along a gradient of assessment complexity and frequency, for stocks with a range of life-history and data-availability. Preliminary results have tested the performance of alternative fishery reference points and assessment models under a set of alternative frequencies of surveys and assessments. Results for Pacific Cod were presented at National Workshop on Evaluating the Effects of Changes in Monitoring and Assessment Frequency on Management Advice for Canadian Fisheries (Ottawa, October 2013) and at the Western Groundfish Conference (Victoria 2014).

Dr Robyn Forrest has begun development of analyses to investigate alternative drivers of productivity and abundance of Pacific Cod in British Columbia. Simulation models and statistical analysis are being developed to evaluate competing hypotheses about contributors to large apparent cycles in recruitment and abundance of Pacific Cod since the 1950s. Alternative drivers include changes in fishing and fisheries management, climate drivers and predator-prey dynamics. A first step in this work is to evaluate alternative methods for developing a recruitment index, including length-based and age-based methods. The feedback simulation methods described above will be used to identify management procedures that are robust to uncertainty in underlying drivers of abundance and productivity.

Several analyses of age and length data have been done, including analysis of reader bias, and development of a new age-length key. Fishery-dependent and independent indices of abundance were developed for the 2013 stock assessment.

Genetic samples were collected from the 2013 Hecate Strait Synoptic Bottom Trawl survey and the Strait of Georgia Synoptic Longline survey. Genetic samples will be collected from the 2014 WCVI Synoptic Bottom Trawl survey. Collection from the commercial fishery during the spawning season has been delayed until 2015.

ii. Stock Assessments

A new stock assessment for Pacific Cod in Area 5AB (Queen Charlotte Sound) and 5CD (Hecate Strait) was developed in 2013. A Canadian Science Advisory Secretariat (CSAS) meeting was held January 9 - 10, 2014, to review the CSAS Working Paper Forrest et al. (in press).

The status of Pacific Cod populations in Hecate Strait and Queen Charlotte Sound were assessed using a delay difference model fit to fishery–independent survey data, commercial catch per unit effort data, commercial catch data, and estimates of annual mean weight. Pacific Cod stocks in BC are difficult to assess, primarily due to the relatively short time-series of fishery-independent stock index data, changes in fishery selectivity over time that result from trawl gear changes, the transition to quotas (early 1990s) and the introduction of 100% at-sea observer coverage (beginning in 1995/96). There is no reliable catch-at-age time series for this difficult-to-age species that would help estimate recruitment and selectivity patterns over time. Furthermore, it is unclear whether Pacific Cod in area 5AB and 5CD are biologically distinct populations.

Model estimates of biomass and stock status in both management areas were very sensitive to prior assumptions about natural mortality, variance in the mean weight data, and the fit to the indices of abundance, particularly the commercial catch per unit effort (CPUE) data. Estimates of fishery reference points based on equilibrium maximum sustainable yield (MSY) were poorly estimated, and differed substantially among model sensitivity cases; the use of MSY-based reference points was not supported for these stocks. Proposed reference points were based on values estimated from the stock reconstruction (called "historical" reference points), based on the precedent established by the previous assessment for Pacific Cod:

- a limit reference point defined as the minimum biomass from which the stock had recovered to an above average biomass level (biomass in 1985 for Area 5AB and biomass in 1971 for Area 5CD);
- an upper stock reference point based on the average biomass from 1956 to 2004; and
- a limit fishing rate based on average fishing mortality from 1956-2004.

Despite large uncertainty, biomass in Hecate Strait is estimated to have been on a gradual increasing trajectory since 2001, but is estimated to be in the Cautious Zone.
Recruitment is estimated to have been below average for the past two decades. Advice to managers was provided using decision tables that summarized the probability of breaching reference points at a range of fixed catches for a one-year projection. Decision tables were developed using a model-averaging approach that integrated across major structural uncertainties in the model.

The Working Paper was accepted, with major revisions requested for the assessment of the 5AB stock, to address problems with calculation of annual mean weights. Minor revisions were requested for the assessment of the 5CD stock. A Research Document and Science Advisory Report are in press.

2. <u>Rockfish – inshore</u>

i. Research programs in 2013 and planned for 2014
    1. Surveys on the Inside (PMFC Area 4B)

A research longline survey designed for the Inside waters east of Vancouver Island and initiated in 2003, surveyed the southern half of the study area in 2013. Hard bottom areas were identified through bathymetric analyses, inshore rockfish fishing records and fishermen consultations. The hard bottom survey areas were then overlain with a 2 km by 2 km grid and survey blocks were stratified by area and depth (41 – 70 m and 71 – 100 m) and selected for sampling at random. Twenty-one days of DFO ship time are allocated in August for this survey in 2014 which will cover the northern half of the study area.

Visual surveys have not been conducted since 2012.

2. Surveys on the Outside (PMFC Areas 3CD, 5ABCDE)

Since 2003, a third technician has been deployed on the annual International Pacific Halibut Commission (IPHC) Area 2B setline survey to collect hook-by-hook catch data and conduct biological sampling of non-Halibut catch (Yamanaka et al. 2011; Flemming et al. 2011). The third technician was supported by Larocque funds between 2007 and 2012. A transition to other funding mechanisms was not completed in time for a survey program in 2013 but a survey program is planned for 2014 under a "Use-of-Fish" policy.

In collaboration with the halibut industry, a research longline survey was designed and conducted in the outside BC coastal waters in 2006. Hard bottom areas were identified through bathymetric analyses, inshore rockfish fishing records and fishermen consultations. The hard bottom survey areas were then overlain with a 2 km by 2 km grid (matched with the adjacent trawl survey grid) and survey blocks were stratified by area and depth and chosen at random. Approximately 200 survey sets are targeted annually. The survey covers the coastwide Outside waters over two years, alternating annually between the north and the south. Three chartered fishing vessels conduct this survey between August 15 and September 15. The northern portion of BC was surveyed in 2012. Similar to the IPHC survey, alternative funding was not secured for this program in 2013 but a survey program is planned for the southern portion of BC in 2014 under a "Use-of-Fish" policy which includes a collaborative agreement with industry.

ii. Stock assessment

There were no stock assessments prepared in 2013. ~~and no plans for~~ An outside population stock assessment for Yelloweye Rockfish will be prepared in 2014 with a proposed review in May 2015.

iii. Management

Public consultations on the potential Quillback Rockfish listing under SARA were conducted in 2012. Subsequent to the consultations, the Minister of Environment will make a decision on whether to list Quillback Rockfish as *threatened*. Quillback Rockfish remain unlisted in 2014.

3. Rockfish – shelf

i. Research Programs in 2013

There was no directed biological research work on shelf rockfish in 2013.

ii. Stock assessments in 2013

In 2013, an updated stock assessment (since 2002) for the Silvergray Rockfish (SGR, *Sebastes brevispinis*) stock along the BC coast was presented. This was the first time that SGR was assessed using a Bayesian model that generated decision tables for management use.

The estimated beginning year 2014 stock status (2014 spawning biomass relative to $B_0$) is 0.559 (5–95% range=0.405-0.698) (**Error! Reference source not found.**~~Figure 1~~). The estimated ratio of spawning biomass at the start of 2014 to the equilibrium spawning biomass associated with MSY, $B_{2014}/B_{MSY}$, is 2.035 (5–95% range=1.223-2.997). The estimated median MSY is 1,998 t (5–95% range=1,299–2,688). For reference, the average catch from 2008-2012 was 1,408 t.

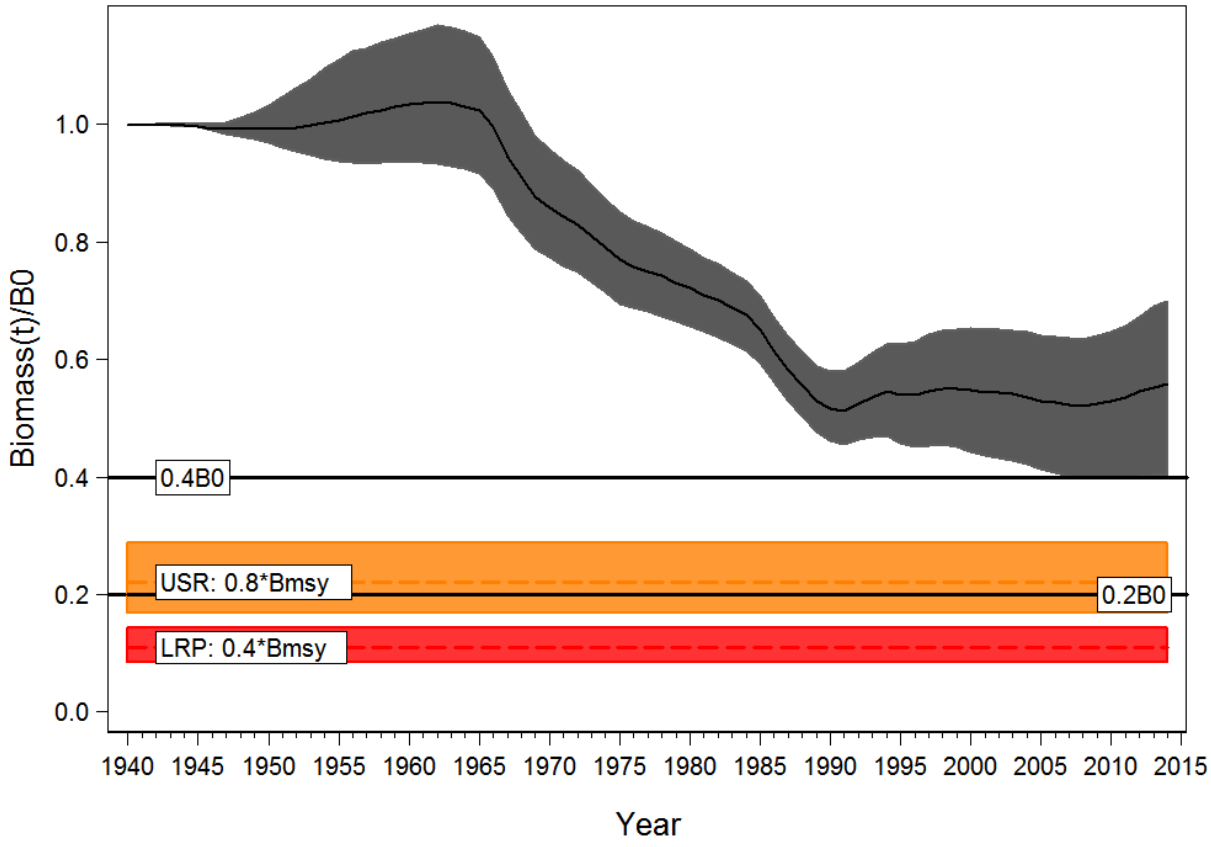


Figure 1. Posterior median estimates and 90% credibility intervals for female spawning biomass by year relative to $B_0$ for Silvergray Rockfish (black line and grey fill). Also shown are posterior median estimates and 90% credibility intervals for the MSY-based reference points (LRP: Limit Reference Point = $0.4B_{MSY}$; USR: Upper Stock Reference Point = $0.8B_{MSY}$) relative to $B_0$. The $B_0$ reference points: $0.2B_0$ and $0.4B_0$ are shown as solid black lines.

Two periods of high recruitment, 1982-1984 and 2000-2001, were estimated for this stock. Increased catch followed the large recruitment of 1982-1984, but not the large recruitment of 2000-2001.

Decision tables were presented using the provisional reference points from the Fisheries and Oceans Canada *Sustainable Fisheries Framework Precautionary Approach*, namely a limit reference point (LRP) of $0.4B_{MSY}$ and upper stock reference (USR) point of $0.8B_{MSY}$. Advice to management is presented in the form of decision tables using ten-year projections for a range of constant catch strategies up to 3,000 t/year, where t = metric tonnes; the mean annual coastwide catch was 1,408 t from 2008-2012. The probability of remaining above the LRP at the beginning

of 2024 is estimated to be at least 0.99 for all catch strategies tested. The probability of remaining above the USR at the beginning of 2024 is estimated to be at least 0.89 for all catch strategies tested. Stock sizes are predicted to decrease at catch levels at or greater than 1,750 t/year. The probability that the exploitation rate at the beginning of 2024 will be below that associated with MSY at equilibrium is at least 0.56 for all catch strategies tested.

iii. Research activities planned for 2014

Completion of a Yellowtail Rockfish genetics paper is planned but requires a sample from the Strait of Georgia, which is proving difficult to obtain.

iv. Stock assessments planned for 2014

A ~~yellowtail~~ Yellowtail ~~rockfish~~ Rockfish stock assessment is scheduled for November 2014.

4. Rockfish – slope

i. Research programs

The Slope Rockfish Program remains responsible for the assessment of rockfish species living on the marine continental slope of British Columbia (BC). The program also tackles a variety of other issues: COSEWIC (Committee on the Status of Endangered Wildlife in Canada) listing requirements, oceanographic exploration, software development for the R statistical platform, and scientific research in marine ecological modelling.

The Groundfish Section at the Pacific Biological Station (PBS, Nanaimo BC) conducts a suite of synoptic surveys that covers most of BC's ocean bottom ecosystems, including those on the continental shelf and slope. The survey team gathers information on abundance and biology (lengths, weights, maturity, otoliths, etc.). The Slope Rockfish Program, headed by Andrew M. Edwards (PBS research scientist) and including Rowan Haigh (PBS research biologist), focuses on the development of models and software tools for the analysis of data pertaining to groundfish and other species. The program retains the interest of two scientists – Jon T. Schnute (PBS scientist emeritus) who contributes time and expertise; and Paul J. Starr who works for the Canadian Groundfish Research and Conservation Society and plays an integral role in the stock assessments assigned to our program.

Work continued on an International Governance Strategy (IGS) project entitled *Ocean Acidification and Impacts on Marine Ecosystems* headed by Debby Ianson at the Institute of Ocean Sciences (IOS, Sidney BC). Participants include Andrew Edwards (PBS), Rowan Haigh (PBS), Carrie Holt (PBS), and Holly Neate, a co-op student from the University of Victoria. In 2013 we made substantial progress on a manuscript for publication entitled *Vulnerability of Canadian Pacific fisheries and marine ecosystems to ocean acidification*.

In 2013, work continued on maintaining and upgrading the suite of PBS packages for the R statistical platform:

PBSmodelling http://cran.r-project.org/web/packages/PBSmodelling/index.html

| | |
|---|---|
| PBSmapping | http://cran.r-project.org/web/packages/PBSmapping/index.html |
| PBSadmb | http://cran.r-project.org/web/packages/PBSadmb/index.html |
| PBSddesolve | http://cran.r-project.org/web/packages/PBSddesolve/index.html |
| PBStools | http://code.google.com/p/pbs-tools/ |
| PBSmapx | http://code.google.com/p/pbs-mapx/ |
| PBSdata | http://code.google.com/p/pbs-data/ |
| PBSawatea | http://code.google.com/p/pbs-awatea/ |

In particular, substantial changes were made to PBSawatea to accommodate (i) single-sex models, (ii) commercial CPUE index data, and (iii) variable CV process errors by index series. We will likely continue using Awatea (a variant of Coleraine) in 2014 for slope rockfish stock assessments, but will be testing the social network-facilitated iSCAM software (see research activities for 2014 below).

ii. Stock assessment

The slope rockfish group is scheduled to complete a stock assessment on Redbanded Rockfish (*S. babcocki*) in 2014. We will likely use the Awatea software for ADMB to derive our main analyses and results but also hope to explore the iSCAM (integrated Statistical Catch Age Model) software developed by Steve Martell (International Pacific Halibut Commission, Seattle WA)

iii. Research activities for 2014

~~The slope rockfish group is scheduled to complete a stock assessment on Redbanded Rockfish (*S. babcocki*) in 2014. We will likely use the Awatea software for ADMB to derive our main analyses and results but also hope to explore the iSCAM (integrated Statistical Catch Age Model) software developed by Steve Martell (International Pacific Halibut Commission, Seattle WA)~~.

The collaborative project on ocean acidification will continue until 2015, including completion and submission of the manuscript to PLoS ONE by June of 2014. The second phase will hopefully estimate biological responses to model predictions of $pCO_2$ and pH off the west coast of Vancouver Island, depending on availability of output from physical models.

We will collaborate with Jackie King (PBS) on a project called “Implementing Ecosystem-based Fisheries Management in the Groundfish Stock Assessment Process” funded by the Strategic Program for Ecosystem-Based Research and Advice (SPERA). The objectives are (i) to identify mechanisms linking climate-ocean variability to groundfish recruitment, and (ii) to construct and test the decision-based framework for commercially important groundfish species. A postdoctoral fellow is due to start in May/June 2014.

Additional research projects include: (i) developing a new model for age proportions based on the Dirichlet distribution, (ii) modelling ageing error from fish otolith readings, and (ii) developing methods for calculating biomass size spectra, with a view to applying them to data on the groundfish community.

DFO staff continues to collaborate with NMFS-AFSC staff on the study of Blackspotted and Rougheye Rockfish. Genetics samples from all major surveys are now being collected and

analysed with the results shared with U.S. counterparts. Preliminary results were presented in a poster at the 2012 Western Groundfish Conference.

5. Sablefish

i. Research activities in 2013 and planned for 2014

The Sablefish Research and Assessment Survey Program includes the following program components:

a) A **Traditional Standardized Program** (1990-2010)

This program was not conducted in 2011-2013 and is unlikely to be resumed. This program included standardized sets at nine (9) offshore fishing localities and biological sampling. Starting in 1990, one set was made in each of five (5) depth intervals in each locality. Since 1999, additional shallower and deeper depth intervals have been added, removed and changed. However, the 5 core intervals have remained the same over time. Catch rates from these core sets extend a stock abundance index series and Sablefish are sampled for data on size and growth.

b) A **Traditional Tagging Program** (1991-2007, discontinued)

This program captures Sablefish for tagging and release at historical tagging locations. Sets are made in the 9 traditional standardized program localities as well as five (5) tagging-only localities. The protocol for this program is to release a specified number of tagged fish in each locality. Low catch rates in some areas in previous years have resulted in survey vessels being required to re-set additional strings in an area. Tag-recoveries from these sets can be used for studying movement, obtaining estimates of gear selectivity, and deriving an index of tagging-based abundance.

c) A **Randomized Tagging Program** (2003-2013)

This program captures Sablefish for tagging and release following a depth and area stratified random survey design. The catch rate data can be used to derive an index of stock abundance. Tag-recoveries can be used for deriving estimates of gear selectivity, studying movement, and deriving an index of tagging-based abundance. The survey also provides biological samples.

d) An **Inlets Program** (1995-2013)

This program includes standardized sets at four (4) mainland inlet localities. Sablefish are tagged and released from inlet sets and are sampled for biological data.

The annual Research and Stock Assessment Survey Program will be conducted in the fall of 2014 contingent on adequate resources from DFO and the Sablefish industry, but will include only the randomized program (c) and the inlets program (d).

A new introduction to the surveys in 2013 was the deployment of (1) tri-axial accelerometers that produce measurements of quasi-continuous 3-axis motion and orientation of fishing traps, (2)

deep-water autonomous cameras affixed to traps that produces motion-activated and fixed-interval high definition video of benthic substrate type, gear interaction with the substrate, and biological communities; and (3) standard oceanographic probes that measure in-situ depth and temperature data needed for gear mobility (depth) and habitat suitability modeling (both).

ii. Stock assessment activities in 2013 and planned for 2014

In 2013, fishing industry stakeholders proposed a TAC floor of 1,992 t, because lower quotas may increase economic risks. The existing management procedure was revised to implement this TAC floor and simulation analyses were conducted to determine whether the revised management procedure would continue to meet agreed conservation objectives. The revised procedure provides conservation performance that is comparable to the existing procedure. Applying the revised procedure to updated landings and biomass index data resulted in a harvest recommendation of 2,129 t, which was above the proposed TAC floor. Development of the Sablefish operating model used for feedback simulations will be conducted in 2014 for application to an updated Management Strategy Evaluation in 2015.

6. Flatfish

i. Research program in 2013

Ongoing data collection in support of the flatfish research program continued in 2013 through the Groundfish Synoptic Surveys, port sampling, and at-sea observer sampling. There was no directed biological research conducted on flatfish during 2013.

ii. Stock assessments in 2013

A stock assessment of Rock Sole (*Lepidopsetta* spp.) in British Columbia was conducted in 2013. Both Northern and Southern Rock Sole species occur in BC. The majority of Rock Sole encountered in BC fisheries and research surveys are believed to be Southern Rock Sole; however, the assessment was for the genus level (*Lepidopsetta* spp.) to allow for the possibility that some Northern Rock Sole occur in commercial catches and survey samples. Rock Sole stocks in Queen Charlotte Sound (Area 5AB) and Hecate Strait (5CD) were assessed as two independent stocks using a female-only catch-at-age model, implemented in a Bayesian framework. Rock Sole catches from commercial fisheries and research surveys in the other three management areas (West Coast Vancouver Island, Strait of Georgia, and West Coast Haida Gwaii), have historically been low and infrequent. As a result, no attempts were made to fit a population model to data from these three areas. Female spawning biomass in Area 5AB at the start of 2014 ($B_{2014}$) was estimated to be 0.37 (0.27 - 0.49) of unfished female spawning biomass ($B_0$), where numbers denote median (and 5-95 percentiles) of the Bayesian results. $B_{2014}$ was estimated to be at 1.52 (0.98 - 2.26) of the female spawning biomass associated with maximum sustainable yield ($B_{MSY}$). In Area 5CD, $B_{2014}$ was estimated to be at 0.80 (0.58 – 1.07) of $B_0$ and 3.22 (2.10 – 4.64) of $B_{MSY}$.

iii. Research activities planned for 2014

A review and summary of biological and abundance information collected from multiple flatfish species during Groundfish Synoptic Surveys between 2003 and 2013 is planned for 2014 – 2015.

iv. Stock assessments planned for 2014

A coastwide assessment of Arrowtooth Flounder in BC is planned for 2014.

7. Lingcod

i. Research programs in 2013

Ongoing data collection in support of the lingcod research program continued in 2013 through the Groundfish Synoptic Surveys, port sampling, at-sea observer sampling, and recreational creel surveys.

As part of the National Sciences and Engineering Research Council of Canada's (NSERC) *Canadian ~~Capture~~ Fisheries Research Network* project on the BC small boats groundfish fleet (lead by Dr. Murdoch McAllistair from the University of British Columbia), DFO staff contributed to a study of the effect of sex-specific seasonal migration patterns on fishery reference points that used BC Lingcod as a case study (Okamura et al. 2013).

ii. Stock assessments planned for 2014

The development of a stock assessment modelling framework for the inside (Strait of Georgia) Lingcod stock is planned for 2014.

8. Pacific Hake

i. Research programs in 2013

Triennial (until 2001), then biennial acoustic surveys, covering the known extent of the Pacific Hake stock have been run since 1995. An acoustic survey, ranging from California to northern British Columbia was run in 2013, to continue the biennial time series. The estimated biomass from the 2013 survey was 2.423 million metric tonnes with a CV of 0.0433. This estimate is approximately 1.75 times the 2012 survey estimate and 4.66 times the 2011 survey estimate. The survey catch was dominated by three-year olds at 76.2% of the total number. Nearly all the three-year olds were found in United States (US) waters, only 4.6% of the overall biomass was in Canadian waters at the time of the survey.

ii. Stock assessments planned for 2014

The majority of the Canadian Pacific Hake catch for the 2013 season was taken from the Southwest coast of Vancouver Island in the third quarter (July-Sept), however the shift in temporal and spatial distribution of Pacific Hake was still apparent with some of the catch being taken from the Quatsino region North of Brooks Peninsula and from Goose Island Gully in Queen Charlotte Sound (PMFC 5A and 5B). These areas have been targeted with regularity since 2008. The Joint Venture (JV) fishery did not choose to take part in 2013, despite being given an

allocation. The total Canadian allocation for 2013 was 95,367 mt. The domestic sector was allocated all of this, including the unused JV allocation, and caught 54,359 mt (57% of total allocation).

Management of Pacific Hake is under Treaty between Canada and the United States. The 2014 harvest advice was prepared jointly by Canadian and US scientists working together, collectively called the Joint Technical Committee (JTC) as stated in the treaty. A single assessment model was used; Stock Synthesis 3 (SS3). The JTC agreed that in the past few years the Canadian (TINSS and CCAM) and U.S. models (SS2 and SS3) agreed closely. This decision also allowed the JTC the time to further investigate a Management Strategy Evaluation (MSE) framework for Pacific Hake. Both the assessment and MSE were reviewed by the Scientific Review Group (SRG) in February 2014.

The SS3 model was selected as the base model by the JTC (and endorsed by the SRG).

A notable feature of the 2013 assessment is the appearance of a very strong 2010 year class in the 2012/2013 commercial catch data and in the 2013 survey data. This apparent above-average recruitment event was strongly influential on model results in the 2013 assessment. The 2013 assessment estimated a very large recruitment for the 2010 cohort, at 15.364 billion individuals (posterior median), with the 2008 recruitment estimated at 5.148 billion. These numbers are encouraging to a stock which had no large recruitments since 1999. They were also seen by the 2013 survey, with a large number of age 3's sampled. The lack of large recruitments since 1999 has resulted in a low-aged population, however, with 76% of the stock being age 3 or under in 2013.

In addition to the assessment, the JTC presented a Management Strategy Evaluation (MSE) for Pacific Hake which examined several scenarios, including:

1. Expected long-term performance of applying the $F_{40\%}$-40:10 harvest rule.
2. Relative improvement in management performance of conducting Annual vs. Biennial surveys.
3. Whether or not implementing time-varying selectivity improves management performance.

The results were not used as a basis for allocation of quota for the year but instead as a continued introduction of the method to managers with the hopes of using it in place of traditional single-year assessments in the coming years. The justification of including time-varying selectivity in the base model which is used for advice was based on the MSE work done in part (3). The MSE scenarios in 2014 showed that there would not be any noticeable impact on the stock trajectories and age compositions if there were an annual survey vs. a biennial survey.

The final decision on catch advice for the 2014 fishing season was made at the meeting of the International Pacific Hake Joint Management Committee in Vancouver, BC on March 21, 2014. A coastwide TAC of 428,000 mt for 2014 was established. As laid out in the treaty, Canada will receive 26.12% of this, or 111,793 mt.

The final assessment document and other treaty-related documents are posted at:
http://www.nwr.noaa.gov/fisheries/management/whiting/pacific_whiting_treaty.html

9. Elasmobranchs

i. Research programs in 2013

ii. Stock assessment in 2013

A stock assessment for Big Skate (*Raja binoculata*) and Longnose Skate (*R. rhina*) was completed in May 2013.

iii. Management

There were no new elasmobranch management initiatives in 2013.

iv. Research activities for 2014.

**D. Other related studies**

1. Statistics and Sampling

i. Biological sampling and database work in 2013

Principal Statistics and Sampling activities in 2013 included the ongoing population of the groundfish biological database (GFBio). This database now includes almost 9,800,000 specimens. Data entry activities continue to concentrate on the input of current port sampling and observer biological data and recent research cruises. There was also some targeted funding that was utilized for the entry of historic research cruises and the scanning of original documents to electronic format.

The groundfish trawl fishery continues to be covered by 100% dockside and virtually 100% observer coverage. These observers also provided 360 length/sex/age samples and 177 length samples in 2013. In the lower mainland our port sampler provided an additional 30 samples, all except three samples with ageing structures (length/sex/age/weight). The focus of this sampling effort was from those fisheries not covered by at-sea observers. In addition, there were 59 samples collected in Ucluelet from the domestic hake fishery; 37 of the samples had ageing structures.

GFBioField was modified to facilitate its use on the Sablefish trap survey. This survey typically experiences rough seas and high winds, which have been barriers to the use of electronic data acquisition because marine scales are unable to output a stable printed weight under such conditions. This year we devised a method to continuously log scale output to a database server. This allowed us to compute average stable weights within a time frame of a few seconds, rather than rely on the scale print button. These modifications led to the successful deployment of GFBioField on the 2013 Sablefish trap survey.

ii. Catch monitoring in 2013

Staff continues to be actively involved in the Recreational Catch Monitoring Working Group.

iii. Field work in 2013

Staff participated on various bottom trawl surveys (see Summary of Groundfish Surveys in Appendix 2) including the Hecate Strait and Queen Charlotte Sound groundfish trawl surveys, the West Coast Vancouver Island, and Queen Charlotte Sound shrimp trawl surveys, as well as the Pacific Hake hydroacoustic survey. This group also included the port sampling activity (1 person-year) in the Vancouver area. Staff continued to enhance GFBioField, the integrated (paper-less) data capture system for surveys.

iv. Proposed field and database work for 2014

Port sampling in the Vancouver area will continue in 2014, and will include the addition of sampling sablefish tag recoveries and frozen samples from seamount trips.

Staff will participate in bottom trawl surveys to the west coast of Vancouver Island and the west coast of Haida Gwaii, the shrimp trawl surveys off the west coast of Vancouver Island and in Queen Charlotte Sound, and the Pacific Hake hydroacoustic survey.

Development of "GFCatchAll" as a comprehensive database that will include all known sources of groundfish catch (1900-present) is still on hold but work will be initiated in 2014 on the documentation of various fishery sectors.

APPENDIX 1. REVIEW OF CANADIAN GROUNDFISH FISHERIES

1. Commercial fisheries

All catch figures for the 2013 calendar year are preliminary. Canadian domestic trawl landings of groundfish (excluding halibut) in 2013 were 89,761 t, a decrease of 12% from the 2012 catch. The major species in the trawl landings were Pacific Hake (60%), Arrowtooth Flounder (9%), Pacific Ocean Perch (5%), Yellowtail Rockfish (4%), and Walleye Pollock (4%). Trawl production was distributed amongst areas 3C (35%), 3D (26%), 5A (16%), 5B (6%), 4B (6%), 5D (4%), 5E (4%), and 5C (1%).

Canadian landings of groundfish caught by gear other than trawl in 2012 totalled 5,746 t. Landings of Sablefish by trap and longline gear accounted for 2,212 t, approximately 58% by trap gear, 40% by longline gear and 2% by unspecified. Landings of species other than Sablefish by trap, longline, handline and troll gear accounted for 3,266 t (49% rockfish, 27% Lingcod, 12% North Pacific Spiny Dogfish, and 11% skates).

2. Recreational fisheries

Each year, Fisheries Management Branch of DFO conducts creel surveys and collects fishing lodge logbooks for the recreational angling fishery in the four south coast regions.

For the Strait of Georgia, in 2013, the estimates were generated from a combination of creel surveys and fishing lodge reports and covered the months of March to October. Provisional estimates of 2013 catches, landings and releases, for this 8-month period were 17,312 fish for Lingcod, 18,856 fish for all rockfish species, 581 fish for Pacific Halibut, 3,814 fish for Rock Sole, 1,511 fish for Starry Flounder, 2,057 fish for other flatfish species, 25,404 fish for North Pacific Spiny Dogfish, 2,231 fish for greenlings, 1,364 fish for Pacific Cod and 1,710 fish for other groundfish species.

For the Strait of Juan de Fuca catch estimates have been generated from creel surveys and fishing lodge reports for the months of March to October. Provisional estimates for this 8-month period are 7,750 fish for Lingcod, 14,689 for all rockfish species, 8,108 fish for Pacific Halibut, 3,039 fish for all flatfish species, 17,248 fish for North Pacific Spiny Dogfish, 4,481 fish for greenlings, and 3,324 fish for other groundfish species.

Along the west coast of Vancouver Island catch estimates have been generated from creel surveys and fishing lodge reports. Data are available for June to September. Provisional estimates of 2013 catches were 14,826 fish for Lingcod, 19,307 fish for all rockfish species, 27,583 fish for Pacific Halibut, 1,313 fish for North Pacific Spiny Dogfish, 172 fish for greenlings, 1,136 for all flatfish species, and 495 fish for other groundfish species.

Fisheries and Oceans Canada (DFO) has also implemented an internet survey (iRec) of people who hold a Tidal Waters Sport Fishing Licence to collect data on recreational fishing activity and catch in the tidal waters of British Columbia. The information collected will be used, in combination with data from other sources, to provide estimates of catch and effort in recreational

fisheries. Random samples of people with Tidal Waters Sport Fishing Licences will be selected monthly. Selected licence holders will be asked to summarize all of their fishing activity and catch during that month.

The estimates from the iREC surveys won't be used for management purposes until two specific actions have been completed:

1.) Independent science review of the survey design, analysis methods and results to date.
2.) A review of iREC results against local knowledge in the recreational sector.

3. Joint-venture fisheries

There were no joint-venture fisheries conducted off British Columbia in 2013.

4. Foreign fisheries

There were no national or supplemental fisheries for Pacific Hake off British Columbia in 2013.

APPENDIX 2. SUMMARY OF BOTTOM TRAWL SURVEYS IN 2013

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## 1. Multi-Species Small mesh (SHRIMP) bottom trawl Survey

An annual fixed-station survey of commercially important shrimp grounds off the West Coast of Vancouver Island was initiated in 1973. In 1998, areas in Eastern Queen Charlotte Sound were added to the survey. The survey is conducted using a shrimp bottom trawl without an excluder device. As a result, groundfish can make up a significant portion of the catch in many of the tows. Catch rate indices generated by the survey have been used to track the abundances of several groundfish stocks. Catch rates are useful indicators of stock status but additional information such as the size and age composition of the catch improves the usefulness of the index. Consequently, a program was initiated in 2003 to collect biological samples from all groundfish species caught during the survey. Groundfish staff provide assistance in catch sorting and species identification and also collect biological samples from selected species. Since 2010 the goal has been to collect a small subset of information from as many different species in each tow as possible, as opposed to detailed information from only a few species. As such, most of the biological sampling effort has been focused on length by sex data as opposed to collecting ageing structures. Nonetheless, ageing structures and tissue samples were collected from Rougheye/ Blackspotted Rockfish in 2013.

The 2013 survey included locations in Barkley Sound that were surveyed by the CCGS Neocaligus in previous years. Groundfish staff have typically not participated in surveys on board the Neocaligus due to limited bunk space but were able to participate this year as the survey was on the W.E. Ricker.

The groundfish section routinely places two staff on board for the duration of the survey. Due to staffing shortages, only one groundfish staffer was on board for the Queen Charlotte Sound portion of the survey. This resulted in marked decrease in the number of biological samples that were collected as compared to previous years. A total of four different groundfish staff and one volunteer participated in the Multi-species Small Mesh Bottom Trawl Survey in 2013.

The 2013 survey was conducted onboard the W.E. Ricker and ran from May 2 to 26. A total of 200 tows were completed. The total catch weight of all species was 70,702 kg. The mean catch per tow was 353 kg, averaging 21 different species of fish and invertebrates in each. The most abundant fish species encountered was and Eulachon (*Thaleichthys pacificus*) followed by Arrowtooth Flounder (*Reinhardtius stomias*) and Pink Shrimp (*Pandalus jordani*). The number of tows where the species was captured, total catch weight, estimated biomass, and relative survey error for the top 25 species are shown in Table 1~~Table 1~~ and Table 2~~Table 2~~ for the West

Coast Vancouver Island and Queen Charlotte Sound portions of the survey, respectively. Biological data were collected from a total of 21,019 individual fish from 36 different groundfish species (Table 3~~Table 3~~).

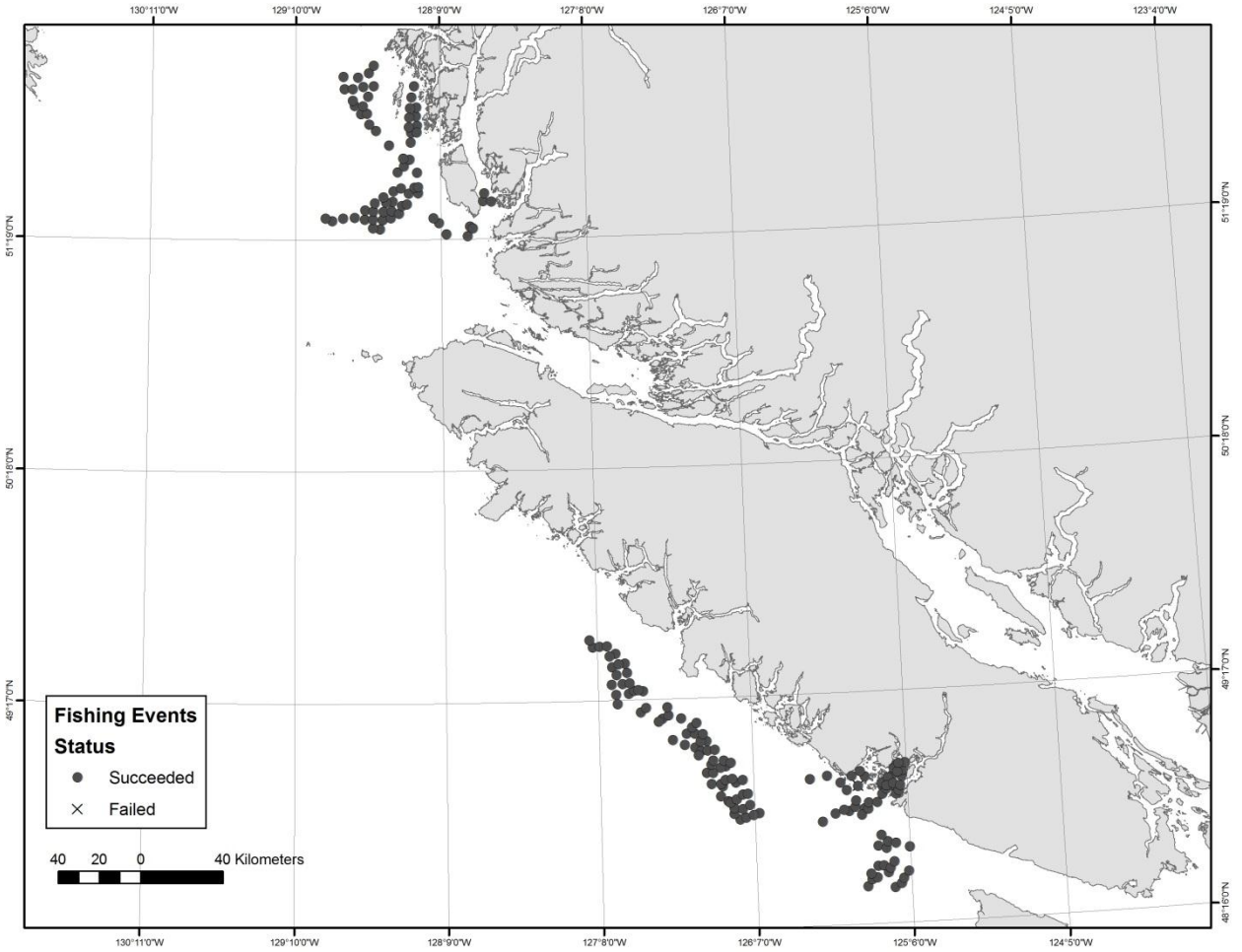


Figure 2~~1~~. Barkley Sound, West Coast Vancouver Island and Eastern Queen Charlotte Sound set locations of the 2013 Multi-species Small Mesh Bottom Trawl Survey

Table 1. Number of tows, catch weight, estimated biomass, and relative survey error for the top 25 species (by weight) captured in the West Coast Vancouver Island set locations of the 2013 Multi-species Small Mesh Bottom Trawl Survey.

| Species | Num. Tows | Catch (kg) | Biomass (t) | Rel. Error |
|---|---|---|---|---|
| Eulachon | 61 | 4891 | 3355 | 0.13 |
| Arrowtooth Flounder | 71 | 3577 | 2314 | 0.14 |
| Pacific Ocean Perch | 10 | 1894 | 944 | 0.99 |
| Pacific Cod | 38 | 1250 | 804 | 0.49 |
| North Pacific Spiny Dogfish | 30 | 1174 | 1037 | 0.83 |
| Rex Sole | 71 | 822 | 594 | 0.08 |
| Dover Sole | 67 | 346 | 237 | 0.14 |
| Flathead Sole | 53 | 331 | 222 | 0.19 |
| Slender Sole | 71 | 220 | 150 | 0.09 |
| Spotted Ratfish | 55 | 132 | 89 | 0.13 |
| Longnose Skate | 36 | 122 | 87 | 0.2 |
| Lingcod | 28 | 113 | 88 | 0.19 |
| Pacific Halibut | 17 | 93 | 61 | 0.27 |
| Redstripe Rockfish | 6 | 91 | 55 | 0.7 |
| Sablefish | 21 | 90 | 49 | 0.36 |
| Walleye Pollock | 33 | 61 | 48 | 0.3 |
| Greenstriped Rockfish | 22 | 60 | 54 | 0.69 |
| English Sole | 20 | 44 | 30 | 0.3 |
| Big Skate | 1 | 44 | 23 | 1.02 |
| Petrale Sole | 27 | 40 | 29 | 0.18 |
| Yellowtail Rockfish | 16 | 38 | 22 | 0.25 |
| Blackbelly Eelpout | 49 | 32 | 19 | 0.18 |
| Canary Rockfish | 7 | 16 | 15 | 0.42 |
| Sandpaper Skate | 12 | 10 | 7 | 0.31 |
| Pacific Herring | 5 | 7 | 3 | 0.78 |

Table 2. Number of tows, catch weight, estimated biomass, and relative survey error for the top 25 species (by weight) captured in the eastern Queen Charlotte Sound set locations of the 2013 Multi-species Small Mesh Bottom Trawl Survey.

| Species | Num. Tows | Catch (kg) | Biomass (t) | Rel. Error |
|---|---|---|---|---|
| Arrowtooth Flounder | 67 | 6310 | 3050 | 0.23 |
| Eulachon | 59 | 4274 | 1981 | 0.16 |
| Flathead Sole | 54 | 861 | 409 | 0.21 |
| Dover Sole | 61 | 592 | 280 | 0.18 |
| Blackbelly Eelpout | 51 | 475 | 205 | 0.24 |
| North Pacific Spiny Dogfish | 30 | 450 | 212 | 0.53 |
| Spotted Ratfish | 65 | 358 | 166 | 0.12 |
| Rex Sole | 64 | 280 | 127 | 0.17 |
| Pacific Ocean Perch | 34 | 230 | 112 | 0.49 |
| Longnose Skate | 32 | 193 | 93 | 0.27 |
| Redbanded Rockfish | 18 | 162 | 78 | 0.51 |
| Slender Sole | 54 | 161 | 75 | 0.2 |
| Pacific Hake | 9 | 148 | 79 | 0.6 |
| Pacific Halibut | 17 | 104 | 47 | 0.26 |
| Yellowtail Rockfish | 17 | 82 | 39 | 0.42 |
| Big Skate | 4 | 72 | 32 | 0.55 |
| Walleye Pollock | 26 | 63 | 26 | 0.31 |
| Splitnose Rockfish | 16 | 49 | 24 | 0.67 |
| Silvergray Rockfish | 8 | 34 | 16 | 0.51 |
| Pacific Cod | 10 | 33 | 14 | 0.39 |
| Sablefish | 20 | 30 | 13 | 0.32 |
| Lingcod | 7 | 29 | 14 | 0.43 |
| English Sole | 8 | 27 | 11 | 0.37 |
| Petrale Sole | 14 | 20 | 9 | 0.27 |
| Sandpaper Skate | 14 | 15 | 7 | 0.37 |

Table 3. Number of fish sampled for biological data during the 2013 Multi-species Small Mesh Bottom Trawl Survey showing the number of lengths anc age structures that were collected by species.

| **Species** | | **Lengths Collected** | **Age Structures Collected** |
|---|---|---|---|
| North Pacific Spiny Dogfish | *Squalus suckleyi* | 255 | 0 |
| Big Skate | *Raja binoculata* | 22 | 0 |
| Sandpaper Skate | *Bathyraja interrupta* | 17 | 0 |
| Longnose Skate | *Raja rhina* | 255 | 0 |
| Spotted Ratfish | *Hydrolagus colliei* | 1059 | 0 |
| American Shad | *Alosa sapidissima* | 41 | 0 |
| Eulachon | *Thaleichthys pacificus* | 7388 | 0 |
| Pacific Cod | *Gadus macrocephalus* | 294 | 0 |
| Pacific Hake | *Merluccius productus* | 543 | 0 |
| Pacific Tomcod | *Microgadus proximus* | 58 | 0 |
| Walleye Pollock | *Theragra chalcogramma* | 1087 | 0 |
| Blackbelly Eelpout | *Lycodes pacificus* | 635 | 0 |
| Rougheye Rockfish | *Sebastes aleutianus* | 63 | 63 |
| Pacific Ocean Perch | *Sebastes alutus* | 168 | 0 |
| Darkblotched Rockfish | *Sebastes crameri* | 31 | 0 |
| Splitnose Rockfish | *Sebastes diploproa* | 76 | 0 |
| Greenstriped Rockfish | *Sebastes elongatus* | 132 | 0 |
| Yellowtail Rockfish | *Sebastes flavidus* | 48 | 0 |
| Shortbelly Rockfish | *Sebastes jordani* | 4 | 0 |
| Redstripe Rockfish | *Sebastes proriger* | 79 | 0 |
| Pygmy Rockfish | *Sebastes wilsoni* | 26 | 0 |
| Sharpchin Rockfish | *Sebastes zacentrus* | 51 | 0 |
| Sablefish | *Anoplopoma fimbria* | 107 | 0 |
| Lingcod | *Ophiodon elongatus* | 49 | 0 |
| Blacktip Poacher | *Xeneretmus latifrons* | 39 | 0 |
| Pacific Sanddab | *Citharichthys sordidus* | 228 | 0 |
| Arrowtooth Flounder | *Reinhardtius stomias* | 1771 | 0 |
| Petrale Sole | *Eopsetta jordani* | 245 | 0 |
| Rex Sole | *Glyptocephalus zachirus* | 1840 | 0 |
| Flathead Sole | *Hippoglossoides elassodon* | 1476 | 0 |
| Pacific Halibut | *Hippoglossus stenolepis* | 34 | 0 |
| Southern Rock Sole | *Lepidopsetta bilineata* | 81 | 0 |
| Slender Sole | *Lyopsetta exilis* | 1538 | 0 |
| Dover Sole | *Microstomus pacificus* | 662 | 0 |
| English Sole | *Parophrys vetulus* | 610 | 0 |
| Sand Sole | *Psettichthys melanostictus* | 7 | 0 |

## 2. Multi-species Synoptic bottom trawl surveys

Fisheries and Oceans, Canada (DFO) together with the Canadian Groundfish Research and Conservation Society (CGRCS) have implemented a comprehensive multi-species bottom trawl survey strategy that covers most of the BC Coast. The objectives of these surveys are to provide fishery independent abundance indices of as many benthic and near benthic fish species available to bottom trawling as is reasonable while obtaining supporting biological samples from selected species. The abundance indices and biological information are incorporated into stock assessments, status reports, and research publications.

The surveys follow a random depth stratified design. Fishing sites are predetermined by randomly selecting survey blocks (2 km x 2 km) within each depth strata. If a survey block is not fishable for any reason it will be abandoned and the vessel will proceed to the next block.

There are four surveys, two of which are conducted each year. The Hecate Strait survey and the Queen Charlotte Sound survey are conducted in odd-numbered years while the West Coast Vancouver Island survey and the West Coast Haida Gwaii (formerly Queen Charlotte Islands) survey are conducted on even-numbered years. Surveys are conducted on both chartered commercial vessels and government research vessels. The Hecate Strait survey and the West Coast Vancouver Island survey are conducted on a Canadian Coastguard research trawler while the Queen Charlotte Sound survey and the West Coast Haida Gwaii are conducted on chartered commercial fishing vessels.

In 2013 the Hecate Strait and Queen Charlotte Sound surveys were conducted.

## 2.1. Hecate Strait Synoptic Bottom Trawl Survey

The Hecate Strait Multi-Species Synoptic Bottom Trawl Survey was conducted on the Canadian Coast Guard Ship W. E. Ricker between May 28 and June 23. We assessed a total of 195 blocks (Table 4~~Table 4~~). We conducted a total of 185 tows; 175 were successful survey sets and 10 were failures due to hang ups or insufficient bottom time. Note that some blocks are only successfully fished following more than one attempt.

A total of 12 different DFO staff and two volunteers participated in the survey.

The total catch weight of all species was 82,322 kg. The mean catch per tow was 450 kg, averaging 22 different species of fish and invertebrates in each. The most abundant fish species encountered were Arrowtooth Flounder (R*einhardtius stomias*), Spotted Ratfish (*Hyrolagus colliei*), English Sole (*Parophyrs vetulus*), Dover Sole (*Microstomus pacificus*) and Southern Rock Sole (*Lepidopsetta bilineata*). The number of tows where the species was captured, total catch weight, estimated biomass, and relative survey error for the top 25 species are shown in Table 5~~Table 5~~. Biological data, including individual length, weight, sex, maturity, and age structure were collected from a total of 30,672 individual fish of 68 different species (Table 6~~Table 6~~). Oceanographic data, including water temperature, depth, salinity, and dissolve oxygen were also recorded for most tows.

Table 4. 2013 Hecate Strait Multi-Species Synoptic Bottom Trawl Survey final block summary showing the number of blocks rejected based on fishing master's knowledge or by on-ground inspection, number of failed blocks (due to hang-ups or insufficient bottom time), number of successful tows, and number of un-fished blocks (due to other reasons such as tide, weather, or other vessels) per survey stratum.

| Depth Stratum (m) | Rejected Prior | Rejected Inspected | Failed | Success | Not Fished | Total |
|---|---|---|---|---|---|---|
| 10 - 70 | 0 | 7 | 0 | 74 | 0 | 83 |
| 70 - 130 | 0 | 7 | 1 | 42 | 0 | 50 |
| 130 - 220 | 0 | 3 | 0 | 43 | 0 | 46 |
| 220 - 500 | 0 | 0 | 0 | 16 | 1 | 16 |
| **Total** | **0** | **17** | **3** | **175** | **2** | **195** |

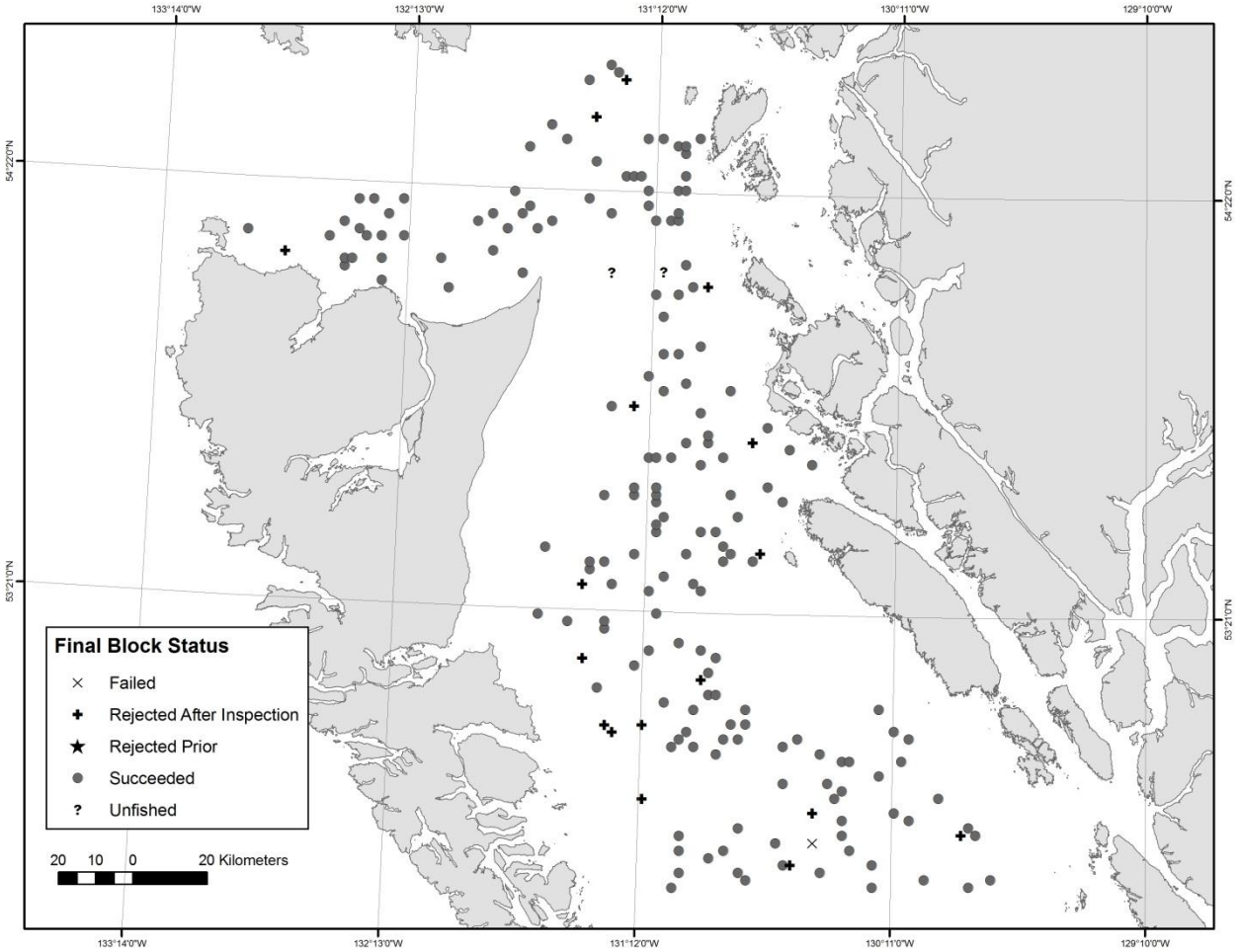


Figure 3~~2~~. Final status of the allocated blocks for the 2013 Hecate Strait Multi-Species Synoptic Bottom Trawl Survey.

Table 5. Number of tows, catch weight, estimated biomass, and relative survey error for the top 25 species (by weight) captured in the 2013 Hecate Strait Multi-Species Synoptic Bottom Trawl Survey.

| Species | Num. Tows | Catch (kg) | Biomass (t) | Rel. Error |
|---|---|---|---|---|
| Arrowtooth Flounder | 133 | 19336 | 14593 | 0.18 |
| Spotted Ratfish | 172 | 15507 | 16107 | 0.26 |
| English Sole | 113 | 8259 | 8402 | 0.19 |
| Dover Sole | 107 | 6199 | 4495 | 0.19 |
| Southern Rock Sole | 94 | 4049 | 4484 | 0.21 |
| Rex Sole | 116 | 3845 | 2709 | 0.16 |
| Pacific Halibut | 124 | 3577 | 3368 | 0.10 |
| Pacific Cod | 132 | 2624 | 2351 | 0.24 |
| Walleye Pollock | 101 | 2276 | 1853 | 0.24 |
| North Pacific Spiny Dogfish | 128 | 2089 | 1607 | 0.15 |
| Pacific Ocean Perch | 60 | 1251 | 792 | 0.32 |
| Big Skate | 38 | 1078 | 1167 | 0.21 |
| Flathead Sole | 61 | 856 | 568 | 0.30 |
| Sand Sole | 53 | 757 | 903 | 0.31 |
| Silvergray Rockfish | 47 | 592 | 356 | 0.22 |
| Sablefish | 58 | 566 | 529 | 0.30 |
| Petrale Sole | 79 | 547 | 429 | 0.17 |
| Redstripe Rockfish | 9 | 535 | 407 | 0.60 |
| Quillback Rockfish | 44 | 522 | 446 | 0.31 |
| Yellowtail Rockfish | 25 | 458 | 338 | 0.47 |
| Pacific Sanddab | 29 | 451 | 406 | 0.58 |
| Shortspine Thornyhead | 37 | 428 | 407 | 0.25 |
| Redbanded Rockfish | 42 | 400 | 319 | 0.19 |
| Longnose Skate | 37 | 326 | 259 | 0.19 |
| Pacific Herring | 65 | 315 | 350 | 0.20 |

Table 6. Number of fish sampled for biological data during the 2013 Hecate Strait Multi-Species Synoptic Bottom Trawl Survey showing the number of lengths and age structures that were collected by species.

| **Species** | | **Lengths Collected** | **Age Structures Collected** |
|---|---|---|---|
| North Pacific Spiny Dogfish | *Squalus suckleyi* | 961 | 25 |
| Aleutian Skate | *Bathyraja aleutica* | 2 | 0 |
| Big Skate | *Raja binoculata* | 127 | 0 |
| Sandpaper Skate | *Bathyraja interrupta* | 16 | 0 |
| Longnose Skate | *Raja rhina* | 57 | 0 |
| Spotted Ratfish | *Hydrolagus colliei* | 3901 | 0 |
| Pacific Herring | *Clupea pallasii* | 889 | 0 |
| Chinook Salmon | *Oncorhynchus tshawytscha* | 2 | 0 |
| Eulachon | *Thaleichthys pacificus* | 802 | 0 |
| Northern Smoothtongue | *Leuroglossus schmidti* | 27 | 0 |
| Pacific Cod | *Gadus macrocephalus* | 1755 | 910 |
| Pacific Tomcod | *Microgadus proximus* | 439 | 0 |
| Walleye Pollock | *Theragra chalcogramma* | 1341 | 136 |
| Black Eelpout | *Lycodes diapterus* | 10 | 0 |
| Blackbelly Eelpout | *Lycodes pacificus* | 19 | 0 |
| Northern Ronquil | *Ronquilus jordani* | 3 | 0 |
| Snake Prickleback | *Lumpenus sagitta* | 23 | 0 |
| Prowfish | *Zaprora silenus* | 1 | 0 |
| Pacific Sand Lance | *Ammodytes hexapterus* | 592 | 0 |
| Rougheye Rockfish | *Sebastes aleutianus* | 44 | 44 |
| Pacific Ocean Perch | *Sebastes alutus* | 775 | 285 |
| Redbanded Rockfish | *Sebastes babcocki* | 272 | 217 |
| Shortraker Rockfish | *Sebastes borealis* | 1 | 1 |
| Silvergray Rockfish | *Sebastes brevispinis* | 335 | 79 |
| Copper Rockfish | *Sebastes caurinus* | 158 | 123 |
| Darkblotched Rockfish | *Sebastes crameri* | 5 | 0 |
| Splitnose Rockfish | *Sebastes diploproa* | 11 | 0 |
| Greenstriped Rockfish | *Sebastes elongatus* | 77 | 0 |
| Puget Sound Rockfish | *Sebastes emphaeus* | 34 | 34 |
| Widow Rockfish | *Sebastes entomelas* | 32 | 30 |
| Yellowtail Rockfish | *Sebastes flavidus* | 261 | 76 |
| Quillback Rockfish | *Sebastes maliger* | 397 | 272 |
| Black Rockfish | *Sebastes melanops* | 2 | 0 |
| China Rockfish | *Sebastes nebulosus* | 3 | 0 |
| Tiger Rockfish | *Sebastes nigrocinctus* | 1 | 0 |
| Bocaccio | *Sebastes paucispinis* | 3 | 3 |
| Canary Rockfish | *Sebastes pinniger* | 119 | 80 |
| Redstripe Rockfish | *Sebastes proriger* | 203 | 131 |
| Yellowmouth Rockfish | *Sebastes reedi* | 91 | 28 |
| Yelloweye Rockfish | *Sebastes ruberrimus* | 8 | 7 |
| Harlequin Rockfish | *Sebastes variegatus* | 2 | 0 |

| Species | | Lengths Collected | Age Structures Collected |
|---|---|---|---|
| Pygmy Rockfish | *Sebastes wilsoni* | 8 | 0 |
| Sharpchin Rockfish | *Sebastes zacentrus* | 69 | 0 |
| Shortspine Thornyhead | *Sebastolobus alascanus* | 585 | 237 |
| Sablefish | *Anoplopoma fimbria* | 312 | 72 |
| Kelp Greenling | *Hexagrammos decagrammus* | 245 | 0 |
| Lingcod | *Ophiodon elongatus* | 52 | 0 |
| Roughback Sculpin | *Chitonotus pugetensis* | 23 | 0 |
| Red Irish Lord | *Hemilepidotus hemilepidotus* | 3 | 0 |
| Bigmouth Sculpin | *Hemitripterus bolini* | 4 | 0 |
| Cabezon | *Scorpaenichthys marmoratus* | 1 | 0 |
| Sturgeon Poacher | *Podothecus accipenserinus* | 39 | 0 |
| Pacific Sanddab | *Citharichthys sordidus* | 327 | 28 |
| Speckled Sanddab | *Citharichthys stigmaeus* | 4 | 0 |
| Arrowtooth Flounder | *Reinhardtius stomias* | 2800 | 835 |
| Petrale Sole | *Eopsetta jordani* | 538 | 371 |
| Rex Sole | *Glyptocephalus zachirus* | 2401 | 278 |
| Flathead Sole | *Hippoglossoides elassodon* | 808 | 170 |
| Pacific Halibut | *Hippoglossus stenolepis* | 649 | 0 |
| Butter Sole | *Isopsetta isolepis* | 665 | 75 |
| Southern Rock Sole | *Lepidopsetta bilineata* | 1939 | 802 |
| Slender Sole | *Lyopsetta exilis* | 202 | 0 |
| Dover Sole | *Microstomus pacificus* | 1712 | 708 |
| English Sole | *Parophrys vetulus* | 2421 | 815 |
| Starry Flounder | *Platichthys stellatus* | 67 | 25 |
| Curlfin Sole | *Pleuronichthys decurrens* | 192 | 47 |
| Sand Sole | *Psettichthys melanostictus* | 772 | 142 |
| Schoolmaster Gonate Squid | *Berryteuthis magister* | 33 | 0 |

## 2.2. Queen Charlotte Sound Multi-species Synoptic Bottom Trawl Survey

The Queen Charlotte Sound Multi-Species Synoptic Bottom Trawl Survey was conducted on the F/V Nordic Pearl between July 2 and 28. We conducted a total of 281 tows; 241 were successful and 40 were failures due to hang ups or insufficient bottom time. We assessed a total of 287 blocks (Table 7~~Table 7~~). Note that some blocks are only successfully fished following more than one attempt.

A total of three different DFO staff and four contractor science staff from Archipelago Marine Research participated in the survey.

The total catch weight of all species was 104,805 kg. The mean catch per tow was 387 kg, averaging 21 different species of fish and invertebrates in each. The most abundant fish species encountered were Silvergray Rockfish (*Sebastes brevispinis*), Arrowtooth Flounder (*Reinhardtius stomias*), Pacific Ocean Perch (*Sebastes alutus*), Redstripe Rockfish (*Sebastes proriger*), and Yellowtail Rockfish (*Sebastes flavidus*). The number of tows where the species was captured, total catch weight, estimated biomass, and relative survey error for the top 25 species are shown in Table 8~~Table 8~~. Biological data, including individual length, weight, sex, maturity, and age structure were collected from a total of 29,266 individual fish of 71 different species (Table 9~~Table 9~~). Oceanographic data, including water temperature, depth, salinity, and dissolve oxygen were also recorded for most tows.

Table 7. 2013 Queen Charlotte Sound Multi-Species Synoptic Bottom Trawl Survey final block summary showing the number of blocks rejected based on fishing master's knowledge or by on-ground inspection, number of failed blocks (due to hang-ups or insufficient bottom time), number of successful tows, and number of un-fished blocks (due to other reasons such as tide, weather, or other vessels) per survey stratum.

| Stratum | Rejected Prior | Rejected Inspected | Failed | Success | Not Fished | Total |
|---|---|---|---|---|---|---|
| 1: South 50 to 125 m | 0 | 4 | 4 | 32 | 0 | 40 |
| 2: South 125 to 200 m | 0 | 2 | 5 | 66 | 0 | 73 |
| 3: South 200 to 330 m | 0 | 4 | 2 | 29 | 0 | 35 |
| 4: South 330 to 500 m | 0 | 0 | 0 | 10 | 0 | 10 |
| 5: North 50 to 125 m | 0 | 3 | 0 | 9 | 0 | 12 |
| 6: North 125 to 200 m | 0 | 8 | 7 | 46 | 0 | 61 |
| 7: North 200 to 330 m | 0 | 2 | 2 | 44 | 0 | 48 |
| 8: North 330 to 500 m | 0 | 1 | 2 | 5 | 0 | 8 |
| **Total** | **0** | **24** | **22** | **241** | **0** | **287** |

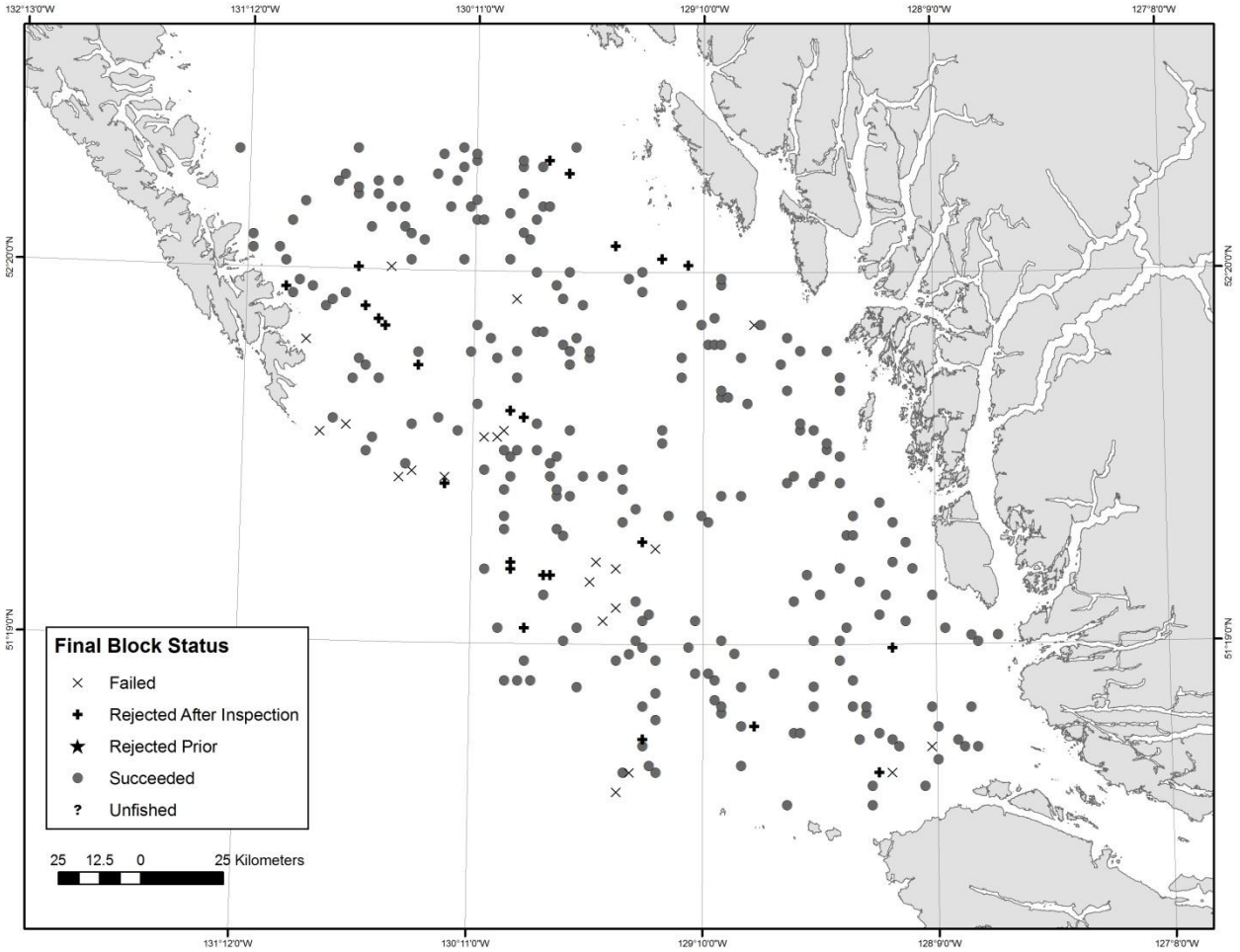


Figure ~~43~~. Final status of the allocated blocks for the 2013 Queen Charlotte Sound Multi-Species Synoptic Bottom Trawl Survey.

Table 8. Number of tows, catch weight, estimated biomass, and relative survey error for the top 25 species (by weight) captured in the 2013 Queen Charlotte Sound Multi-Species Synoptic Bottom Trawl Survey.

| Species | Num. Tows | Catch (kg) | Biomass (t) | Rel. Error |
|---|---|---|---|---|
| Silvergray Rockfish | 147 | 21377 | 14793 | 0.40 |
| Arrowtooth Flounder | 223 | 15071 | 11676 | 0.17 |
| Pacific Ocean Perch | 141 | 14846 | 11462 | 0.18 |
| Redstripe Rockfish | 61 | 3627 | 2958 | 0.37 |
| North Pacific Spiny Dogfish | 142 | 3388 | 5955 | 0.53 |
| Rex Sole | 211 | 2917 | 2288 | 0.12 |
| Sharpchin Rockfish | 101 | 2619 | 1751 | 0.31 |
| Spotted Ratfish | 201 | 2532 | 2616 | 0.35 |
| Yellowtail Rockfish | 38 | 2494 | 1695 | 0.51 |
| Canary Rockfish | 54 | 2451 | 2184 | 0.35 |
| Dover Sole | 166 | 2376 | 1823 | 0.11 |
| Yellowmouth Rockfish | 72 | 2036 | 1502 | 0.31 |
| Walleye Pollock | 110 | 1930 | 1687 | 0.26 |
| Shortspine Thornyhead | 90 | 1655 | 1400 | 0.14 |
| Redbanded Rockfish | 113 | 1395 | 950 | 0.14 |
| Pacific Halibut | 76 | 1289 | 1546 | 0.26 |
| English Sole | 70 | 1243 | 1376 | 0.29 |
| Pacific Cod | 135 | 1233 | 965 | 0.15 |
| Splitnose Rockfish | 47 | 1163 | 809 | 0.68 |
| Pacific Hake | 59 | 1120 | 805 | 0.30 |
| Flathead Sole | 94 | 1070 | 929 | 0.32 |
| Rougheye Rockfish | 59 | 1066 | 593 | 0.29 |
| Sablefish | 91 | 771 | 637 | 0.23 |
| Southern Rock Sole | 33 | 537 | 812 | 0.32 |
| Petrale Sole | 104 | 531 | 428 | 0.24 |

Table 9. Number of fish sampled for biological data during the 2013 Queen Charlotte Sound Multi-Species Synoptic Bottom Trawl Survey showing the number of lengths and age structures that were collected by species.

| **Species** | | **Lengths Collected** | **Age Structures Collected** |
|---|---|---|---|
| Brown Cat Shark | *Apristurus brunneus* | 1 | 0 |
| North Pacific Spiny Dogfish | *Squalus suckleyi* | 345 | 44 |
| Aleutian Skate | *Bathyraja aleutica* | 3 | 0 |
| Big Skate | *Raja binoculata* | 7 | 0 |
| Sandpaper Skate | *Bathyraja interrupta* | 35 | 0 |
| Longnose Skate | *Raja rhina* | 117 | 0 |
| Alaska Skate | *Bathyraja parmifera* | 7 | 0 |
| Spotted Ratfish | *Hydrolagus colliei* | 2015 | 0 |
| Pacific Herring | *Clupea pallasii* | 16 | 0 |
| Pink Salmon | *Oncorhynchus gorbuscha* | 3 | 0 |
| Chum Salmon | *Oncorhynchus keta* | 1 | 0 |
| Sockeye Salmon | *Oncorhynchus nerka* | 1 | 0 |
| Chinook Salmon | *Oncorhynchus tshawytscha* | 1 | 0 |
| Eulachon | *Thaleichthys pacificus* | 582 | 0 |
| Pacific Cod | *Gadus macrocephalus* | 1040 | 616 |
| Pacific Hake | *Merluccius productus* | 177 | 100 |
| Walleye Pollock | *Theragra chalcogramma* | 882 | 256 |
| Bigfin Eelpout | *Lycodes cortezianus* | 11 | 0 |
| Shortfin Eelpout | *Lycodes brevipes* | 12 | 0 |
| Black Eelpout | *Lycodes diapterus* | 57 | 0 |
| Blackbelly Eelpout | *Lycodes pacificus* | 284 | 0 |
| Wolf Eel | *Anarrhichthys ocellatus* | 1 | 0 |
| Rougheye Rockfish | *Sebastes aleutianus* | 334 | 335 |
| Pacific Ocean Perch | *Sebastes alutus* | 2202 | 1725 |
| Aurora Rockfish | *Sebastes aurora* | 8 | 0 |
| Redbanded Rockfish | *Sebastes babcocki* | 902 | 662 |
| Shortraker Rockfish | *Sebastes borealis* | 17 | 17 |
| Silvergray Rockfish | *Sebastes brevispinis* | 1415 | 786 |
| Copper Rockfish | *Sebastes caurinus* | 2 | 0 |
| Darkblotched Rockfish | *Sebastes crameri* | 55 | 0 |
| Splitnose Rockfish | *Sebastes diploproa* | 307 | 134 |
| Greenstriped Rockfish | *Sebastes elongatus* | 627 | 93 |
| Puget Sound Rockfish | *Sebastes emphaeus* | 63 | 23 |
| Widow Rockfish | *Sebastes entomelas* | 55 | 21 |
| Yellowtail Rockfish | *Sebastes flavidus* | 210 | 134 |
| Chilipepper | *Sebastes goodei* | 3 | 0 |
| Rosethorn Rockfish | *Sebastes helvomaculatus* | 291 | 60 |
| Shortbelly Rockfish | *Sebastes jordani* | 3 | 0 |
| Quillback Rockfish | *Sebastes maliger* | 103 | 52 |

| Species | | Lengths Collected | Age Structures Collected |
|---|---|---|---|
| Vermilion Rockfish | *Sebastes miniatus* | 4 | 0 |
| China Rockfish | *Sebastes nebulosus* | 5 | 0 |
| Bocaccio | *Sebastes paucispinis* | 34 | 34 |
| Canary Rockfish | *Sebastes pinniger* | 481 | 368 |
| Redstripe Rockfish | *Sebastes proriger* | 893 | 593 |
| Yellowmouth Rockfish | *Sebastes reedi* | 686 | 439 |
| Yelloweye Rockfish | *Sebastes ruberrimus* | 79 | 78 |
| Stripetail Rockfish | *Sebastes saxicola* | 1 | 0 |
| Harlequin Rockfish | *Sebastes variegatus* | 88 | 34 |
| Pygmy Rockfish | *Sebastes wilsoni* | 95 | 0 |
| Sharpchin Rockfish | *Sebastes zacentrus* | 1078 | 255 |
| Shortspine Thornyhead | *Sebastolobus alascanus* | 1696 | 908 |
| Longspine Thornyhead | *Sebastolobus altivelis* | 94 | 79 |
| Sablefish | *Anoplopoma fimbria* | 379 | 28 |
| Kelp Greenling | *Hexagrammos decagrammus* | 18 | 0 |
| Lingcod | *Ophiodon elongatus* | 141 | 70 |
| Bigmouth Sculpin | *Hemitripterus bolini* | 1 | 0 |
| Threadfin Sculpin | *Icelinus filamentosus* | 18 | 0 |
| Sturgeon Poacher | *Podothecus accipenserinus* | 13 | 0 |
| Pacific Sanddab | *Citharichthys sordidus* | 231 | 100 |
| Arrowtooth Flounder | *Reinhardtius stomias* | 3371 | 1433 |
| Deepsea Sole | *Microstomus bathybius* | 1 | 0 |
| Petrale Sole | *Eopsetta jordani* | 490 | 215 |
| Rex Sole | *Glyptocephalus zachirus* | 2247 | 921 |
| Flathead Sole | *Hippoglossoides elassodon* | 1201 | 256 |
| Pacific Halibut | *Hippoglossus stenolepis* | 233 | 0 |
| Butter Sole | *Isopsetta isolepis* | 1 | 0 |
| Southern Rock Sole | *Lepidopsetta bilineata* | 369 | 173 |
| Slender Sole | *Lyopsetta exilis* | 673 | 0 |
| Dover Sole | *Microstomus pacificus* | 1570 | 964 |
| English Sole | *Parophrys vetulus* | 825 | 659 |
| Curlfin Sole | *Pleuronichthys decurrens* | 55 | 0 |

APPENDIX 3. PARTIAL LIST OF GROUNDFISH RELATED REPORTS WITH 2013 PUBLICATION DATES.

PRIMARY

Forrest, R.E., McAllister, M.K., Martell, S.J.D., Walters, C.J. 2013. Modelling the effects of density-dependent mortality in juvenile red snapper caught as bycatch in Gulf of Mexico shrimp fisheries: implications for management. *Fisheries Research* 146: 102-120.

Mangel, M., MacCall, A.D., Brodziak, J., Dick, E.J., Forrest, R.E., Pourzand, R., and Ralston, S. 2013. A perspective on steepness and its implications for strategic fishery management and stock assessment. *Canadian Journal of Fisheries and Aquatic Sciences* 70, pg. 930-940.

Okamura, H., M. K. McAllister, M. Ichinokawa, L. Yamanaka, and K. Holt. Evaluation of the sensitivity of biological reference points to the spatio-temporal distribution of fishing effort when seasonal migrations are sex-specific. Fisheries Research (2013), http://dx.doi.org/10.1016/j.fishres.2013.10.022

Siegle, M.R., Taylor E.B., Miller K.M., Withler R.E., Yamanaka K.L. (2013) Subtle Population Genetic structure in Yelloweye Rockfish (Sebastes ruberrimus) is consistent with a major oceanographic division in British Columbia, Canada. PLoS ONE 8(8): e71083.

OTHER PUBLICATIONS

DFO (2013). Pacific Ocean Perch (*Sebastes alutus*) stock assessments for the west coast of Vancouver Island and the north and west coasts of Haida Gwaii, British Columbia. *DFO Canadian Science Advisory Secretariat, Scientific Advisory Report* **2013/038** 10p.

Edwards, A.M., Haigh, R., and Starr, P.J. 2014. Pacific Ocean Perch (*Sebastes alutus*) stock assessment for the north and west coasts of Haida Gwaii, British Columbia. *Canadian Science Advisory Secretariat, Research Document* **2013/092**: vi + 126 p.

Edwards, A.M., Haigh, R., and Starr, P.J. 2014. Pacific Ocean Perch (*Sebastes alutus*) stock assessment for the west coast of Vancouver Island, British Columbia *Canadian Science Advisory Secretariat, Research Document* **2013/093**: vi + 135 p.

Forrest, R.E., Rutherford, K.L, Lacko, L., Kronlund, A.R., Starr, P.J., McClelland, E.K. In press. Assessment of Pacific Cod (*Gadus macrocephalus*) for Hecate Strait (5CD) and Queen Charlotte Sound (5AB) in 2013. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/xxx.

King, J.R., Surry, A.M., Wyeth, M.R., Olsen, N., and Workman, G. 2013. Strait of Georgia groundfish bottom trawl survey, March 14 – 24, 2012. Can. Tech. Rep. Fish. Aquat. Sci. 3056: vii + 58 p.

JTC. 2013. Status of the Pacific hake (Whiting) stock in U.S. and Canadian Waters in 2013. Prepared for the Joint U.S.-Canada Pacific hake treaty process.

Methot, R., Workman, G., Prager, M., Forrest, R.E., Sampson, D. 2013. Joint U.S.-Canada Scientific Review Group Report. February 19-22, 2013, Vancouver, BC. Online: http://www.nwr.noaa.gov/publications/fishery_management/groundfish/whiting/draft_2013_srg_report-final.pdf

Stewart, I.J., Martell, S.J.D., Webster, R.A., Forrest, R.E., Ianelli, J., Leaman, B. 2013. Assessment review team meeting, October 24-26, 2012. International Pacific Halibut Commission Report of Assessment and Research Activities, 2012, 239-266.

## APPENDIX 3. GROUNDFISH STAFF IN 2013

| | |
|---|---|
| Greg Workman | Section Head |
| Schon Acheson | Technician, Pacific Hake, port sampling and surveys |
| Kristina Anderson | Technician, Sablefish and surveys (maternity leave until Jan 2015) |
| Karina Cooke | Technician, Database support and surveys, Inshore Rockfish |
| Andrew Edwards | Scientist, Statistical and mathematical modelling, stock assessment |
| Robyn Forrest | Scientist, Pacific Cod, Pacific Halibut, stock assessment |
| Chris Grandin | Program Head, Pacific Hake stock assessment and Port sampling |
| Rowan Haigh | Statistical and exploratory data analysis, stock assessment, R packages |
| Kendra Holt | Program Head, Lingcod, Flatfish stock assessment, ERAEF |
| Jackie King | Scientist, Elasmobranchs, Climate studies |
| Brian Krishka | Biologist, Database support and analysis, Flatfish |
| Rob Kronlund | Program Head Sablefish, Analytical programs |
| Lisa Lacko | Biologist, GIS specialist and database manager, Sablefish |
| Sandy McFarlane | Emeritus scientist |
| Wendy Mitton | Technician, Sablefish (retired April 2014) |
| Norm Olsen | Biologist, Programmer/GIS, Groundfish Statistics, Shelf Rockfish |
| Kate Rutherford | Biologist, Database manager, Groundfish Statistics, Shelf Rockfish |
| Jon Schnute | Emeritus scientist |
| Alan Sinclair | Emeritus scientist |
| Rick Stanley | Program Head, Shelf Rockfish assessment and biology, Groundfish Statistics. (retired August 2013) |
| Maria Surry | Technician, Elasmobranchs |
| Nathan Taylor | Program Head, Groundfish surveys, Shelf Rockfish, Pacific Hake stock assessment (Acting Section Head Pelagics since June 2013) |
| Malcolm Wyeth | Biologist, Groundfish surveys |
| Lynne Yamanaka | Program Head, Inshore rockfish research and stock assessment |