2013 IPHC Research Report for TSC

Review of 2012 Projects and Proposals for 2013

International Pacific Halibut Commission Staff

Introduction

This report reviews research conducted by the IPHC staff in the past year as well as research proposed for the upcoming year. The report is divided into three sections: the first section briefly reviews staff changes over the past and upcoming year(s), the second section reviews the status of research conducted in 2012, and the third section presents the preliminary staff research proposals for 2013 and a summary of ongoing projects. This report does not include annual staff tasks such as data collection and processing that are necessary for the management of the fishery.

SECTION I: STAFFING UPDATES

In 2012 the IPHC hired Dr. Ian Stewart (lead Stock Assessment Scientist), Dr. Steve Martell (Quantitative Scientist), Jim Traub (Database Administrator), Ed Henry (Survey Operations Technician), and Eva Luna (Administrative Assistant). Currently, the IPHC is hiring for an Age Technician after the departure of Stephen Wischniowski. These are in addition to some standard turnover seen in both the port and sea sampling seasonal positions.

SECTION II:

Review of 2012 - Project summaries

This section provides a brief recap of projects conducted in 2012. Full reports on each project can be found in the 2013 RARA.

Project 604.00:Monitoring juvenile halibut abundance via NMFS trawl surveysStart Date: 1996Anticipated ending: ContinuingPersonnel: L. Sadorus, A. Ranta, I. Stewart

The NMFS trawl survey data series on halibut, parallel to our assessment survey data, is extremely valuable as a second fishery-independent data source for stock assessment. Trawl data are particularly useful because they include large numbers of juveniles (ages 3-7) that do not appear in large numbers in the setline survey. Otoliths have been collected on the NMFS trawl surveys since 1996 and provide relevant age information. These data are incorporated into and stored in IPHC's database, and expanded to estimates of relative abundance and age/size composition by IPHC area (NMFS calculates estimates by INPFC area). For 2012, samplers were deployed in the Bering Sea and Aleutian Island surveys.

Project 610.13: Oceanographic monitoring of the north Pacific and Bering Sea continental shelf with water column profilers

Start date: 2009 Anticipated ending: Continuing Personnel: L. Sadorus, P. Stabeno (NMFS PMEL)

The IPHC maintains one of the most extensive sampling platforms in the north Pacific. This platform provides enormous potential for collection of valuable oceanographic data. In particular, understanding the dynamics of the structure of the mixed layer depth – a major GLOBEC goal - requires *in situ* vertical profiling. Since 2001, IPHC has successfully deployed a SeaBird SBE-19 water column profiler during the annual stock assessment survey. A second profiler was added to the program in 2007. In 2009, a NOAA grant provided for the complete outfitting of all chartered survey vessels, resulting in a complete coastwide deployment. Annual costs are directed towards maintenance and calibration of the profilers, and data preparation necessary for submission to the National Ocean Data Center. Over 1,200 casts were made in 2012.

Project 618.00: Undergraduate Internship

Start Date: 2002 Anticipated duration: Continuing Personnel: L. Sadorus, other staff support as needed

One undergraduate will be selected through the intern/co-op programs at regional universities and colleges to do a combination of office and at-sea work based out of the Commission offices during the summer months. The program includes various pre-determined office tasks as well as being assigned a research project. The intern is tasked with designing and executing said project. A final report and presentation are given at the conclusion of the employment term. The report is usually included in the RARA. Unfortunately, in 2012 we were unsuccessful in hiring an intern to develop an image-based technology solution for fish sampling.

Project 636.00: Evaluation of Pacific halibut macroscopic maturity stage assignments Start: 2004 Anticipated Ending: Continuing

Personnel: K. MacTavish, other staff as needed

The staff believes it is necessary to re-evaluate our classification criteria for female gonad maturity stage. The method currently used on the assessment surveys is based on visual criteria established in the early 1990s and modified in 1995. These survey data combined with the age data are important components in the stock assessment model. Four maturity stages are presently assigned to female halibut; immature (F1), maturing (F2), spawning (F3) and resting (F4). Once a female halibut has spawned, the gonad transitions to a resting phase, back to maturing, and then to spawning again. Our criteria for classification also assume that the immature (F1) stage is only seen in immature fish but we are seeing anomalies during the survey that question this

assumption. Gonad samples were collected in 2004 from which to base this study. In 2012, work was undertaken to look for a size gradient for oocytes dependent on their location within the gonad to begin the design of a sampling protocol for measurement of oocyte diameters.

Project 642.00: Assessment of mercury and contaminants in Pacific halibut

Start Date: 2002 Anticipated ending: Continuing Personnel: C. Dykstra, B. Gerlach (ADEC)

The staff continued in our collaboration with the Alaska Department of Environmental Conservation (ADEC) in 2012, collecting halibut tissue samples for analysis of heavy metal and organic pollutant loading. Results from a 2002 collection of halibut samples led the Alaska Division of Public Health, in 2003, to conclude that the concentrations of heavy metals in Alaskan Pacific halibut were not a public health concern. In 2004, the first results regarding organic pollutants (PCB's, pesticides) were released demonstrating that halibut had the lowest concentrations of the five species (including salmon and sablefish) examined. The Alaska Division of Public Health updated their advice on fish consumption in 2007 with some restrictions on the number of meals of halibut for women of child bearing age and young children. The IPHC and ADEC are continuing to qualify the data with physical parameters (age, size, and weight) and additional analyses will be done on the samples. ADEC and EPA planned on going ahead with this study regardless of IPHC input. Our involvement in the project has allowed us to provide input on study design, sampling protocols in the field, etc., which will make the resultant information much more robust. Sampling continued in 2012 with a targeted collection of 70 samples (15 fish between 10-20 lbs., 15 fish between 20-40 lbs., 30 fish between 40-100 lbs., and 10 fish greater than 100 lbs.) from each of four sites. Fifty-five (55) samples were obtained from Semidi, 67 from Seward, 56 from northern Washington, and 50 from southern Oregon. Since 2002, the IPHC has submitted 1,894 samples for testing by ADEC. The average total mercury content to date has been 0.30 ppm, with a maximum of 1.9 ppm.

Project 650.13: Archival tags: tag mounting protocols (OCA)

Start Date: 2009 Anticipated ending: 2014 Personnel: T. Loher

In 2012, halibut continued to be held in tanks at the Oregon Coast Aquarium (OCA) in Newport, OR to investigate alternate mounting protocols for the externally-mounted archival tags. The 2008 releases in Area 2B were our first experience with using an external mount, and that process suggested some revisions and improvements could be possible which would reduce any effect the tags may have on the fish's behavior. Additional improvements to tag design may also be helpful in creating a different mounting device. A total of 30 halibut were captured via hook-and-line and transported live to the OCA. The fish are treated for parasites, examined regularly to assess healing and/or relative infection rates among mounting types, and behavior monitored. At the end of the holding period, fish will be measured to assess relative growth among treatment groups, and tags will be removed to examine the effects of the tag mounts on the tissue and

musculature at the attachment site, or internal interactions in the case of an internal-externalstreamer modification. The results will support the anticipated use of this type of technology in subsequent years.

Project 650.14: Archival tags: tag attachment protocols

Start Date: 2009 Anticipated ending: 2014 Personnel: T. Loher

External and internal tag recovery rates are being tested in the field release of archival test tags. In August-September 2009, 200 fish were tagged off southern Kodiak Island (in Areas 3A and 3B), half with external tags and half with internal implants. Fish were also tagged with a bright pink cheek tag, and rewards of \$100 will be given for all tags recovered. Three of these fish were recovered in 2012.

Project 650.16: Archival tags: Area 4B site selection

Start date: 2010 Anticipated ending: 2014 Personnel: T. Loher, J. Forsberg, survey team

In 2009, 773 fish were tagged in Area 4B to evaluate tag recovery rates in preparation of a future release of archival tags in the area. Recovery rates of PIT tags released in the Aleutians were quite low, without evidence of recovery hotspots. This suggests that if archival tags were deployed in the Aleutians, we would likely recover relatively few of those tags. This would result in either too few data to draw any conclusions or require that a very large number of tags be initially deployed. Given that archival tags cost \$500-1200 each, resorting to a very large deployment would be financially prohibitive and problematic. Our goal is to locate at least two release sites which will yield a sufficient number of recoveries. Eleven tags were recovered in 2011. In 2012, only five tags were recovered.

Project 650.17: Archival tags: geomag tag performance

Start Date: 2011 Anticipated ending: 2012 Personnel: T. Loher, J. Nielsen (UAF Juneau)

In 2011 we deployed both Desert Star and Lotek geomagnetic tags on 30 halibut in two regions of the Gulf of Alaska: in Area 2C, just offshore of southern Prince of Wales Island; and in Area 3A, offshore of southern Kodiak Island. Tagging was restricted to large fish (110-150 cm FL), most likely to be mature females and likely to conduct a spawning migration shortly after tagging, and was divided into two deployment locations because the coastline and bathymetry of the areas are largely perpendicular to one another with respect to the magnetic environment. In Area 2C, total magnetic field gradients run largely parallel to shore, whereas in Area 3A around Kodiak that gradient runs perpendicular to shore. As such, we hypothesized that geomagnetic positioning based on total field strength would more accurately detect onshore-offshore movement in 2C and alongshore migration around Kodiak. Only one tag has been recovered to

date.

Project 661.11: *Ichthyophonus* prevalence in halibut

Start Date: 2012 Anticipated ending: 2012 Personnel: C. Dykstra, G. Williams, J. Gregg (USGS), P. Hershberger (USGS)

In 2012, tissue samples were collected in all survey areas to further describe the spatial nature of the prevalence. In addition, samples were collected from smaller juveniles caught on the NMFS trawl survey in the Bering Sea. Prevalence of infection measured at ten longline survey sites ranged from 15% near Attu Island to over 70% in Prince William Sound, with a mean overall prevalence (Bering Sea to Oregon Coast) of 47%. Prevalence in smaller halibut (<60 cm) captured by trawl in the Bering Sea and Aleutian Island was 2.4%, indicating infections establish after some ontogenetic shift in diet, habitat, or behavior. The prevalence of infection reported here is higher than that which has been observed in studies of other sympatric fish species, including other pleuronectids, suggesting that either susceptibility and/or infection pressures are higher in halibut. While ichthyophoniasis has been shown to reduce growth rate, decrease swimming stamina, and cause mortality in other fish hosts, its effects on Pacific halibut are unknown.

Project 421.11:Examination of potential alternative bait for the assessment surveyStart Date: 2012

Anticipated ending: 2012 Personnel: R. Webster, S. Kaimmer, C. Dykstra, survey team

A coastwide comparison of alternative baits for the assessment survey was conducted in 2012. A 2011 pilot study conducted to refine the experimental design also led to the decision to examine pollock and pink salmon as alternatives to the standard #2 chum salmon, in this year's study. There were significant differences in O32 WPUE between chum salmon and the two alternative baits that varied by regulatory area. Most notably, WPUE for pollock was somewhat higher in general than WPUE for the two salmon baits in the Gulf of Alaska, but much lower in parts of Area 4. There was also evidence for differences in catch rates of U32 halibut and bycatch species among the three baits. We also compared the length and age distributions of halibut caught using the three baits. The results will be further analyzed in 2013, with the expectation that any change would not be implemented until 2014, at the earliest.

Project 02.11: Hook modification study to reduce rockfish bycatch on circle hooks

Start date: 2012 Anticipated ending: 2012 Personnel: S. Kaimmer, S. Wischniowski

A pilot study was conducted to see if circle hooks could be modified to reduce rockfish bycatch. Spring wires were attached across the gap of the hook, hypothesizing that fish with less aggressive hook attacks might not hook as readily due to the wires. Although previous camera work showed hesitant hook attacks by rockfish, this study encountered larger individuals, and their attacks were aggressive enough that they could easily bend the wires across the hook gaps to become hooked.

Section III: Research Proposed for 2013 - Overview

Projects to be carried out in 2013 consist of new research as well as the continuation of several projects currently underway.

The IPHC conducts numerous projects annually to support both major mandates: stock assessment and basic halibut biology. Current projects include standardized stock assessment fishing surveys from northern California to the end of the Aleutian Islands, as well as field sampling in major fishing ports to collect scientific information from the halibut fleet. In conjunction with these ongoing programs, the IPHC conducts numerous biological and scientific experiments to further the understanding and information about Pacific halibut.

The 2012 IPHC Performance Review recommended the creation of a Five Year Research Plan and an Annual Research Plan (ARP). The plans would provide linkage to Commission objectives, with an accompanying process for input and periodic reviews by the Commission, interested stakeholders, the Research Advisory Board, and a peer review. The IPHC staff was tasked with developing the preliminary ARP for presentation to the Commission at the Interim Meeting in November 2012, where discussion of overall research priorities, individual studies and associated budgets occurred. The staff further developed the ARP following the Interim Meeting and presented a final ARP at the Annual Meeting, in January 2013, for Commission approval.

Research focus and priorities

Nearly all of the research done by the IPHC is directed toward one of three continuing objectives of the Commission: 1) improving the annual stock assessment and quota recommendations; 2) developing information on current management issues; and 3) adding to knowledge of the biology and life history of halibut. In each of these areas the work program applies the best information and methods available, and the research program aims to improve the information and methods by answering the most important outstanding questions.

IPHC research is conducted within four areas of study as identified within the Five Year Research Plan. These areas, which connect to the IPHC mission and support the assessment and management objectives of the Commission, are 1) assessment and stock identification; 2) management strategy; 3) biology; and 4) ecology.

The ARP is based on management and assessment needs as prioritized by the IPHC staff and Commission. It is the Commission's long term goal to also obtain the views and advice of its Research Advisory Board (RAB) and external scientific input in the formulation and prioritization of the ARP. For 2012, this process was still being developed, so input from those sources will be brought into the process during the 2013 research development cycle.

For the past several years, two primary topics have been at the forefront of discussions about the halibut resource. The first has been the continuing decline in size at age (SAA), with the resulting effects and impacts on the assessment, harvest policy, and stock status. The second issue has been the migratory behavior of the stock, specifically seasonal and ontogenetic migration, including sex- and age-specific differences in spawning migration timing and duration. In the following section, studies for 2013 were proposed which address both topics. Briefly, the IPHC staff proposes to begin an otolith increment study which would examine growth patterns during earlier time periods. Understanding migration patterns is the overarching goal of the archival tag program, which has several aspects examining tag type, location, tag shedding and resolution of geomagnetic location data.

Proposed for 2013

Research proposed by IPHC staff goes through an internal review process by the staff Science Board. The Board met in early October, 2012 to review staff proposals for 2013 research. For each proposal, the Board discussed the merits, objectives, design, and coherence with the Commission's research goals and objectives. The Principle Investigator (PI) subsequently joined the Board for a broad discussion of the project. Concerns, questions and need for refinements or revisions, if any, about the proposal were communicated to the PI at that time. Following a full review of all proposals, the Board assigned a priority rating to each project, based on the following criteria:

- **High** Research which has a direct bearing on the assessment or its inputs, harvest policy, or current management structure. Postponement of a high priority project would have a significant and immediate impact on management or IPHC operation.
- Medium Research which addresses an assessment issue or management question/need. Postponement will not have an immediate significant impact on fishery management or IPHC operation but may impact future analyses.
- **Low** Research which addresses current issues of any subject but is not considered having a timely need or being crucial to current IPHC management or operation.

Based on the Science Board discussions and the topics previously outlined, the IPHC staff recommends the following research studies for funding in FY2013.

Assessment and stock identification

Project 604.00: Monitoring juvenile halibut abundance via NMFS trawl surveys Priority: High

Start Date: 1996 Anticipated ending: Continuing Personnel: L. Sadorus, A. Ranta, I. Stewart

The NMFS trawl survey data series on halibut, parallel to our assessment survey data, is extremely valuable as a second fishery-independent data source for stock assessment. Trawl data are particularly useful because they include large numbers of juveniles (ages 3-7) that do not appear in large numbers in the setline survey. Otoliths have been collected on the NMFS trawl surveys since 1996 and provide relevant age information. These data are incorporated into and stored in IPHC's database, and expanded to estimates of relative abundance and age/size composition by IPHC area (NMFS calculates estimates by INPFC area). For 2013, samplers will be deployed in the Bering Sea and Gulf of Alaska surveys.

Project 636.00: Evaluation of Pacific halibut macroscopic maturity stage assignments

Priority: High Start: 2004 Anticipated Ending: Continuing Personnel: K. MacTavish, other staff as needed

The staff believes it is necessary to re-evaluate our classification criteria for female gonad maturity stage. The method currently used on the assessment surveys is based on visual criteria established in the early 1990s and modified in 1995. These survey data combined with the age data are important components in the stock assessment model. Four maturity stages are presently assigned to female halibut; immature (F1), maturing (F2), spawning (F3) and resting (F4). Once a female halibut has spawned, the gonad transitions to a resting phase, back to maturing, and then to spawning again. Our criteria for classification also assume that the immature (F1) stage is only seen with immature fish but we are seeing anomalies during the survey that question this assumption. Gonad samples were collected in 2004 from which to base this study. In 2013, work will continue on finalizing a sampling protocol for measurement of oocyte diameters, and contract slide preparation for gonads. The PI will also begin assessment of archived gonads from a set of previously-prepared slides.

Project 650.13: Archival tags: mounting protocols (OCA)

Priority: Medium Start Date: 2009 Anticipated ending: 2014 Personnel: T. Loher

For 2013, the staff intends to continue holding halibut in tanks at the Oregon Coast Aquarium (OCA) in Newport, OR to investigate alternate mounting protocols for the externally-mounted archival tags. A total of 30 halibut were captured via hook-and-line and transported live to the OCA. The fish are treated for parasites, examined regularly to assess healing and/or relative infection rates among mounting types, and behavior monitored. At the end of the holding period, fish will be measured to assess relative growth among treatment groups, and tags will be removed to examine the effects of the tag mounts on the tissue and musculature at the attachment site, or internal interactions in the case of an internal-external-streamer modification. The results will support the anticipated use of this type of technology in subsequent years.

Project 650.14: Archival tags: tag attachment protocols

Priority: High Start Date: 2009 Anticipated ending: 2014 Personnel: T. Loher

External and internal tag recovery rates are being tested in the field release of archival test tags. In August-September 2009, 200 fish were tagged off southern Kodiak Island (in Areas 3A and 3B), half with external tags and half with internal implants. Fish were also tagged with a bright pink cheek tag, and rewards of \$100 will be given for all tags recovered. Nine fish were

recovered in 2011. Note that because of a subsequent decision to focus only on an external mount protocol, this project is proposed to be redone in Area 3A in 2013.

Project 650.15: Archival tags: coastwide deployment

Priority: High Start Date: 2016 Anticipated ending: Continuing Personnel: T. Loher, B. Leaman, R. Webster, J. Forsberg

In preparation for a coastwide release of archival tags in 2016, the staff has been working with Lotek Wireless (St. John's, NL) on a specific tag design and configuration for IPHC use. Although no field activity is planned for 2013, Lotek is continuing their work on our requirements and construction. Results from the 2009 release of dummy archival tags in Area 3A and the examination of several mounting protocols on fish being held at the Oregon Coast Aquarium will feed into the design of the tag and its attachment to the fish.

Project 650.16: Archival tags: Area 4B site selection

Priority: High Start date: 2010 Anticipated ending: 2014 Personnel: T. Loher, J. Forsberg, survey team

In 2009, 773 fish were tagged in Area 4B to evaluate tag recovery rates in preparation of a future release of archival tags in the area. Recovery rates of PIT tags released in the Aleutians were quite low, without evidence of recovery hotspots. This suggests that if archival tags were deployed in the Aleutians, we would likely recover relatively few of those tags. This would result in either too few data to draw any conclusions or require that a very large number of tags be initially deployed. Given that archival tags cost \$500-1200 each, resorting to a very large deployment would be financially prohibitive and problematic. The goal is to locate at least two release sites which will yield a sufficient number of recoveries.

Project 650.17: Archival tags: geomag tag performance

Priority: Low Start Date: 2011 Anticipated ending: 2012 Personnel: T. Loher, J. Nielsen (UAF Juneau)

In 2011 we deployed both Desert Star and Lotek geomagnetic tags on 30 halibut in two regions of the Gulf of Alaska: in Area 2C, just offshore of southern Prince of Wales Island; and in Area 3A, offshore of southern Kodiak Island. Tagging was restricted to large fish (110-150 cm FL), most likely to be mature females and likely to conduct a spawning migration shortly after tagging, and was divided into two deployment locations because the coastline and bathymetry of the areas are largely perpendicular to one another with respect to the magnetic environment. In Area 2C, total magnetic field gradients run largely parallel to shore, whereas in Area 3A around Kodiak that gradient runs perpendicular to shore. As such, we hypothesized that geomagnetic positioning based on total field strength would more accurately detect onshore-offshore

movement in 2C and alongshore migration around Kodiak. Recoveries are expected in 2013 to enable testing of the hypothesis. Note that because of a tag internal architecture redesign, this project is proposed to be redone in Area 4A in 2013.

Project 2013-03: Estimate of length/weight relationship and head/ice/slime adjustment (NEW)

Priority: Low Start: 2013 Anticipated Ending: open ended Personnel: R. Webster, L. Erickson, K. MacTavish, H. Gilroy

The purpose of this study is to collect data for use in estimating the relationship between fork length and net weight, including the estimate of adjustments necessary to convert head-on weight to net weight. Data will be collected coastwide at sampled ports throughout the season in order to estimate spatial and seasonal variation in the length to weight relationship. In the current length-weight relationship, adjustments are made for head, ice, and slime, and are used when estimating the net weight of commercial offloads. The current relationship between fork length and net weight includes adjustments for the weight of the head, and of ice and slime: gross weight is assumed to include 12% head weight and 2% ice and slime, which combine to give a multiplier of 0.8624 to convert gross to net weight. In practice, deductions of 12% in Areas 2A and 2B, and 11.8% in Alaska, are applied to commercial landings at the plants to convert from gross to net weight. These both include the 2% deduction for ice and slime assumed in the IPHC length-net weight relationship, but 10% for the head. IPHC port samplers will be tasked to collect data at plants within their port. Therefore in addition, data collected during the study will provide direct estimates of adjustment factors to compare with the currently assumed values, and will allow us to assess variability in the weight of heads and ice and slime. The end result is expected to be new adjustment factors that, if appropriate, can be applied consistently across all ports, or be allowed to vary with regulatory area.

Project 2013-04: Archival tags: tag attachment protocols (NEW)

Priority: High Start: 2013 Anticipated Ending: 2015 Personnel: Loher

This proposal is an update of 650.14, which was a 2009 release of 200 tags – half external tags, and half with internal implants. It is proposed to be redone to fully evaluate external attachment. The Board was supportive of this project, as the results are needed to evaluate three potential tag attachment sites on the fish. The release is being designed to occur from the surveys to reduce costs while still achieving a broad distribution of releases. Design issues regarding the number of tags to be deployed and shedding rates are being refined. The study was given a high priority because a suitable external tag attachment site is crucial to the success of the coastwide archival tag study.

Project 2013-05: Archival tags: geomag performance (NEW)

Priority: High

Start: 2013 Anticipated Ending: 2016 Personnel: Loher

This proposal is an update of 650.17, which was a 2011 release of 30 tags in Area 2C and 3A to examine location resolution of geomag tags. The study is proposed to be redone because an improved geomag design has recently been released, which is expected to perform better than the design used in 2011. The proposed study entails releasing ~30 fish on the Area 4A-south assessment survey.

Project 2013-06: SSA Expansion – California pilot (NEW)

Priority: Medium Start: 2013 Anticipated Ending: unknown Personnel: C. Dykstra, survey team

The IPHC staff is considering extending the assessment survey into the waters off northern California. Currently the survey stops at the Oregon/California border, which has traditionally been the southern end of commercial fishing in recent years. However, recent reports of previously unknown but significant sport fishery harvests of halibut from northern California waters, which contributed to exceeding the catch limit for that area, have indicated the potential for a larger share of the resource in this area than has been assumed. Adding this area into the assessment requires a measure of fish density, which would be provided by the survey. This issue also has implications for the Pacific Fishery Management Council's Area 2A Catch Sharing Plan, which allocates a portion of the Area 2A catch limit to the area south of Humbug Mountain, Oregon, including California. The current staff proposal would extend the 10 x 10 nm systematic survey grid off northern California, to a terminus of 40° N., based on a review of halibut sport fishery sampling by California Fish and Game.

Management Strategy

Project 2012-01: Otolith increment analysis (New) Priority: High Start Date: 2013 Anticipated ending: 2015 Personnel: T. Loher, age room staff (TBD)

This study is an internal IPHC project but may be part of a broader, comprehensive study to examine potential causes for the recent changes in halibut size at age (SAA) as well as an integrated approach to incorporating SAA dynamics into halibut assessment and management. The broader study would be funded through a grant application to the North Pacific Research Board, in cooperation with National Marine Fisheries Service and the University of Alaska. For the internal IPHC project staff will mine the otolith archives for historical samples which were collected at prescribed time intervals and measure the otolith growth increments. The relation between otolith growth and somatic growth is not well understood in many fishes, including

halibut. But the IPHC otolith archives provide a unique opportunity to potentially examine changes in otolith growth over time and, by extension, halibut growth. Anticipated work in 2013 includes refining the study design, otolith selection, cross sectioning, and aging.

Ecology

Project 610.13: Oceanographic monitoring of the north Pacific and Bering Sea continental shelf with water column profilers

Priority: Medium Start date: 2009 Anticipated ending: Continuing Personnel: L. Sadorus, P. Stabeno (NMFS PMEL)

The IPHC maintains one of the most extensive sampling platforms in the north Pacific. This platform provides enormous potential for collection of valuable oceanographic data. In particular, understanding the dynamics of the structure of the mixed layer depth – a major GLOBEC goal - requires *in situ* vertical profiling. Since 2001, IPHC has successfully deployed a SeaBird SBE-19 water column profiler during the annual stock assessment survey. A second profiler was added to the program in 2007. In 2009, a NOAA grant provided for the complete outfitting of all chartered survey vessels, resulting in a complete coastwide deployment. Annual costs are directed towards maintenance and calibration of the profilers, and data preparation necessary for submission to the National Ocean Data Center.

Project 642.00: Assessment of mercury and contaminants in Pacific halibut

Priority: Medium Start Date: 2002 Anticipated ending: Continuing Personnel: C. Dykstra, B. Gerlach (ADEC)

The staff proposes to continue our collaboration with the Alaska Department of Environmental Conservation (ADEC) in 2013, collecting halibut tissue samples in the Ommaney, Albatross, and Sanak charter regions for analysis of heavy metal and organic pollutant loading. This work has been ongoing since 2002. Results from a 2002 collection of halibut samples led the Alaska Division of Public Health, in 2003, to conclude that the concentrations of heavy metals in Alaskan Pacific halibut were not a public health concern. In 2004, the first results regarding organic pollutants (PCB's, pesticides) were released demonstrating that halibut had the lowest concentrations of the five species (including salmon and sablefish) examined. The Alaska Division of Public Health updated their advice on fish consumption in 2007 with some restrictions on the number of meals of halibut for women of child bearing age and young children. Since 2002, the IPHC has submitted 1,894 samples for testing by ADEC. The IPHC and ADEC are continuing to qualify the data with physical parameters (age, size, and weight) and additional analyses will be done on the samples. ADEC and EPA planned on going ahead with this study regardless of IPHC input. Our involvement in the project has allowed us to provide input on study design, sampling protocols in the field, etc., which will make the resultant information much more robust.