



International Pacific Halibut Commission Fishery-Independent Setline Survey Sampling Manual (2022)

Commissioners

Canada	United States of America
Paul Ryall	Glenn Merrill
Neil Davis	Robert Alverson
Peter DeGreef	Richard Yamada

Executive Director

David T. Wilson, Ph.D.

DISTRIBUTION:
IPHC Secretariat

BIBLIOGRAPHIC ENTRY
IPHC 2022. IPHC Fishery-Independent Setline Survey
Sampling Manual (2022) *IPHC-2022-VSM01*, 38 pp.



The designations employed and the presentation of material in this publication and its lists do not imply the expression of any opinion whatsoever on the part of the International Pacific Halibut Commission (IPHC) concerning the legal or development status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

This work is protected by copyright. Fair use of this material for scholarship, research, news reporting, criticism or commentary is permitted. Selected passages, tables or diagrams may be reproduced for such purposes provided acknowledgment of the source is included. Major extracts or the entire document may not be reproduced by any process without the written permission of the Executive Director, IPHC.

The IPHC has exercised due care and skill in the preparation and compilation of the information and data set out in this publication. Notwithstanding, the IPHC, its employees and advisers, assert all rights and immunities, and disclaim all liability, including liability for negligence, for any loss, damage, injury, expense or cost incurred by any person as a result of accessing, using or relying upon any of the information or data set out in this publication, to the maximum extent permitted by law including the International Organizations Immunities Act.

Contact details:

International Pacific Halibut Commission
2320 W. Commodore Way, Suite 300
Seattle, WA, 98199-1287, U.S.A.
Phone: +1 206 634 1838
Fax: +1 206 632 2983
Email: secretariat@iphc.int
Website: <https://www.iphc.int/>



TABLE OF CONTENTS

INTERNATIONAL PACIFIC HALIBUT COMMISSION..... 1

FISHERY-INDEPENDENT SETLINE SURVEY 1

SAMPLING MANUAL (2022) 1

TABLE OF CONTENTS 3

DEFINITIONS 4

1. FISS OVERVIEW..... 5

 1.1 FISHING STANDARDS..... 5

 1.2 RETAINING PACIFIC HALIBUT AND INCIDENTAL CATCH 5

 1.3 STATIONS WITH SPECIAL CONSIDERATIONS 6

2. GEAR..... 7

 2.1 GEAR SPECIFICATIONS 7

 2.2 VERIFYING STANDARDS..... 7

3. BAIT..... 7

 3.1 BAIT SPECIFICATIONS 7

 3.2 PREDICTING BAIT USAGE AND NEEDS..... 7

 3.3 VERIFYING BAIT WEIGHTS..... 8

 3.4 STORING CUT BAIT 8

4. PROTECTED SPECIES AVOIDANCE..... 8

 4.1 REQUIREMENTS DURING RUNNING 8

 4.2 REQUIREMENTS DURING SETTING..... 8

 4.3 REQUIREMENTS DURING HAULING 9

 4.4 AVOIDANCE AND MONITORING GUIDELINES 9

5. BIRD AVOIDANCE DEVICES..... 10

 5.1 BAD COMPLIANCE IN THE U.S.A..... 10

 5.2 BAD COMPLIANCE IN CANADA 11

 5.3 PREPARING TO EVALUATE BAD PERFORMANCE..... 11

6. SETTING PROCEDURES..... 12

 6.1 SOAKING THE GEAR..... 12

 6.2 SETTING DATA 12

 6.3 HOOK COUNTS 13

 6.4 MISSING BAIT COUNTS 14

 6.5 VERIFY ALL SETTING DATA. 14

7. CAPTAIN SET FORM..... 15

 7.1 FORM INSTRUCTIONS 15

8. SUCCESSFULNESS & EFFECTIVENESS..... 16

 8.1 SUCCESSFULNESS..... 16

 8.2 EFFECTIVENESS 17

 8.3 SUCCESSFUL, INEFFECTIVE SETS..... 17

 8.4 DATA RECORDING INSTRUCTIONS 17

9. MARINE MAMMAL DEPREDATION 18

 9.1 TRACKING DEPREDATION 19

 9.2 MARINE MAMMAL DEPREDATION RECORDING INSTRUCTIONS..... 19

10. 20-HOOK COUNT SUBSAMPLE..... 21



10.1	COLLECTING THE SUBSAMPLE	21
11.	WHOLE-HAUL FOR GEAR DAMAGE, BIRDS AND MAMMALS.....	22
11.1	MARINE MAMMALS	22
11.2	BIRDS.....	22
11.3	BROKEN, BENT AND MISSING (BBM) HOOKS.....	22
12.	PACIFIC HALIBUT SAMPLING	23
12.1	MEASURING PACIFIC HALIBUT	23
12.2	WEIGHING PACIFIC HALIBUT	25
12.3	ASSESSING PACIFIC HALIBUT SEX AND MATURITY	25
12.4	ASSESSING PRIOR HOOKING INJURIES.....	27
13.	OTOLITH AND FIN CLIP SAMPLING	29
13.1	COLLECTING OTOLITHS FOR AGING	30
13.2	OTO-ODDITIES	32
13.3	CLEAN OTOLITH ARCHIVE COLLECTION.....	34
13.4	FIN CLIP SAMPLING.....	34
14.	TAG RECOVERIES	37
14.1	SAMPLING TAGGED PACIFIC HALIBUT	37
14.2	TAG RECOVERY ENVELOPE.....	37

DEFINITIONS

A set of working definitions are provided in the IPHC Glossary of Terms and abbreviations:
<https://www.iphc.int/the-commission/glossary-of-terms-and-abbreviations>



1. FISS OVERVIEW

The FISS covers a randomly selected subset of stations from the full grid of 1890 stations, ranging from California to the Northern Bering Sea including the Aleutian Islands. A maximum of four (4) stations will be permitted per day. Generally, each FISS region will require between 12 and 22 fishing days, with the total duration for most regions expected to take 7 to 36 days. Maps of each FISS region are provided:

<https://www.iphc.int/uploads/pdf/fiss/2022/iphc-2022-fiss-stations.pdf>

Each IPHC Regulatory Area consists of a regular distribution of stations on an 18.52 km by 18.52 km (10 M by 10 M) grid (Figure 1.1). The center of each station is within the FISS depth range of 18 m to 732 m (10 to 400 fathoms). The ends of some sets may extend shallower or deeper than the standard range.

1.1 Fishing Standards

Each station is baited with semi-bright chum salmon. The choice of where to begin and the number of stations to fish each day should be coordinated between the vessel Captain and the lead IPHC Secretariat in advance. The vessel Captain will consider the logistics of setting and hauling, weather and tide conditions, encounters with Protected Species and distance between sets when planning. The stations do not have to be hauled in the order they were set. Certain rules about setting and hauling, however, must be strictly followed.

Under no circumstances should the setting requirement (e.g. Direction of set) be altered to increase or decrease the potential catch.

A single coordinate indicating the center of the station is given for each location. **The gear must be set through the center position in either a North-South (NS) or East-West (EW) orientation.** Only if protected areas (e.g., Steller sea lion (*Eumetopias jubatus*) rookeries), weather, or tide conditions do not permit setting directly NS or EW, the Captain may set in the direction necessary. Any change in location must be within 3 M of the original coordinates and must be thoroughly documented in the FISS Logbook.

Set gear no earlier than 5:00 AM. Setting commences each morning at first light but not before 5:00 AM Local Time. Stations set earlier will be rated unsuccessful and must be reset.

Haul gear after it has soaked at least 5 hours. Soak time begins when the first flag of that set enters the water. Typically, after setting three or four stations, the vessel will return to the first set after five hours has passed and can begin hauling immediately. If fewer stations are set, or the vessel has a fast running speed, it is necessary to wait until the minimum soak time has passed. Stations hauled sooner will be rated unsuccessful and must be reset. A set will be rated unsuccessful if hauled as little as 5 minutes too soon and the data excluded.

1.2 Retaining Pacific Halibut and Incidental Catch

1. All Pacific halibut (*Hippoglossus stenolepis*) 82 cm or longer in marketable condition are retained for sale.
2. All Pacific halibut under 82 cm and selected for otolith sampling must also be retained for sale.
3. Rockfish (*Sebastes spp.*) and Pacific cod (*Gadus macrocephalus*) are the only incidentally caught species that may be retained and sold.
 - These species are retained because they are injured by barotrauma (expansion of the fish's swim bladder) when brought to the surface.
 - By law, all rockfish must be retained in the Yakutat charter region and southward.
 - Shortspine (*Sebastolobus alascamus*) and Longspine (*Sebastolobus altivelis*) Thornyheads will not be retained, as they are not killed by barotrauma.

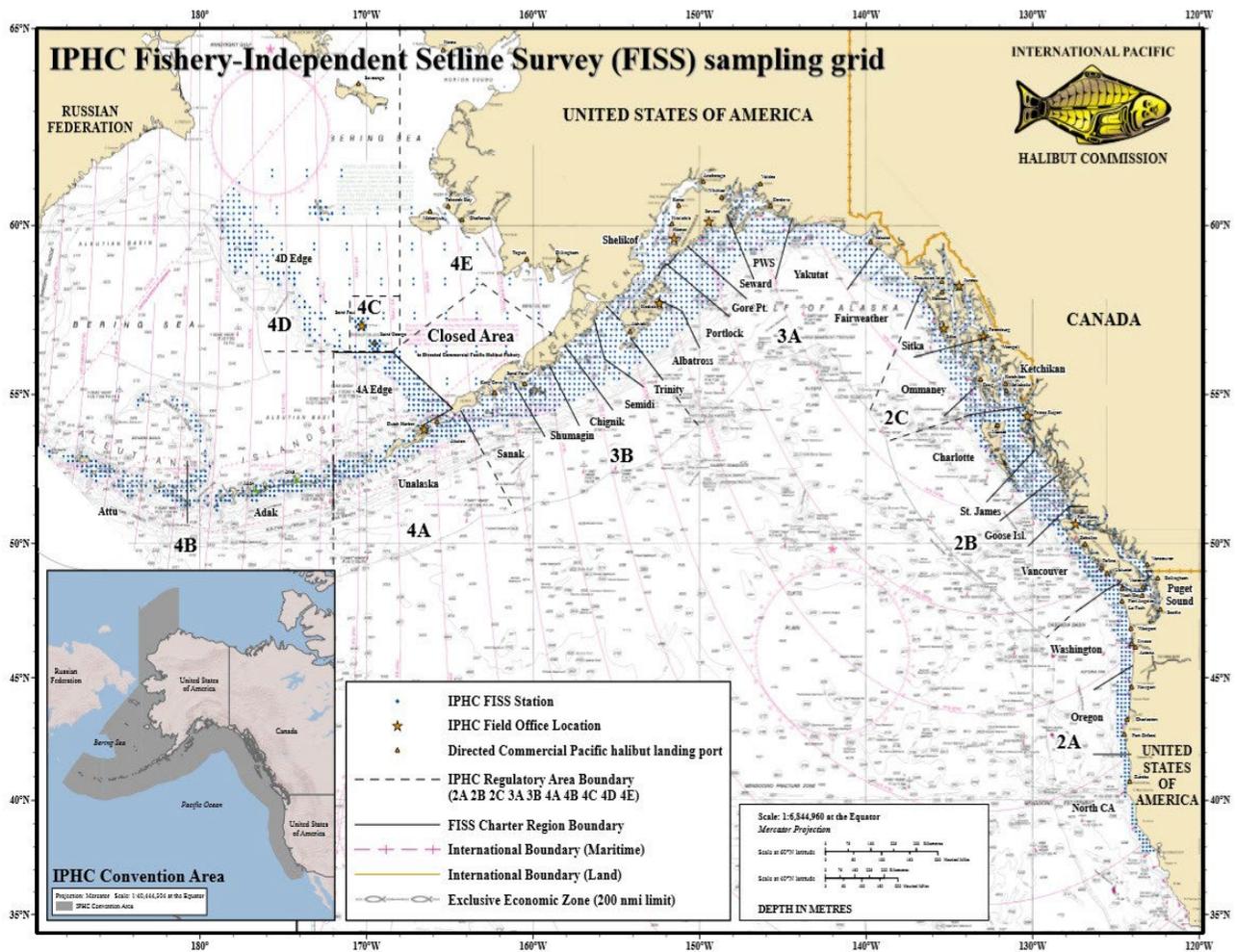


Figure 1.1. IPHC FISS station map

1.3 Stations with Special Considerations

Use the following tables to determine if the station you plan to fish requires additional considerations (<https://www.iphc.int/uploads/pdf/fiss/2022/iphc-2022-fiss-projections.pdf>).



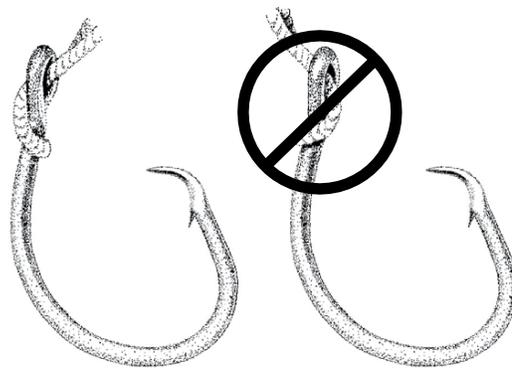
2. GEAR

This section provides gear specifications. Meeting the discussed standards below is key. Crucifiers **MUST NOT BE USED** or **PRESENT** on any vessel conducting work for the IPHC.

2.1 Gear Specifications

1. 549 m (1800 ft) skates with 100 hooks per skate (must be within 5%, i.e. no more than 104 hooks, no less than 96 hooks)
2. 0.61-1.22 m (24-48 in) gangions with 5.5 m (18 ft) spacing between gangions; use 5.5 m (18 ft) piece of line in gear kit
3. 3.2-4.5 kg (7-10 lb) groundline or sash weight snapped or tied between each full skate.
4. No. 3 (16/0) Mustad model 39965 or equivalent circle hooks threaded through the front.

Figure 2.1. Figure 2.1 A fixed hook threaded correctly (left) and incorrectly (right).



2.2 Verifying Standards

Use the orange 5.5 m (18 ft) segment of line included in the gear pack. The gear may be stowed as full skates, or broken up into half, third, or quarter skates coiled either in tubs or on skate bottoms. For example, if eight skates are to be fished and the gear is provided as 274.5 m (900 ft) tubs, two of these units will compose one standard skate of 549 m (1800 ft) gear, so sixteen tubs must be set at each station.

3. BAIT

3.1 Bait Specifications

Frozen chum salmon (*Oncorhynchus keta*), #2 semi-bright or better with “meat” coloured flesh (Alaska Seafood Marketing Institute (ASMI) grade A to E) will be used as bait. This is food-grade salmon, so it should look and smell fresh. Inspect the bait when loaded and before setting. Do not set and contact FISS-HQ immediately if the bait does not meet standards.

Each hook should be baited with a 1/10 to 1/6 kg (1/4 to 1/3 lb) piece of chum salmon.

3.2 Predicting Bait Usage and Needs

The vessel Captain and lead IPHC Secretariat will monitor bait and determine the amount needed for each



trip. Record the amount of bait loaded, used, and leftover at the end of the trip in the FISS Logbook and on the *End of Trip Form*. Also record any bait transferred to or loaded from another vessel or offloaded at a storage facility.

Use the following formula to calculate the amount of bait needed for your trip:

(number of stations to be set) x (number of skates per station) x (100 hooks) x (0.17 kg [0.37 lb] of chum salmon per hook) = Total kilogram (pounds) of bait needed

The 0.17 kg (0.37 lb) per hook accounts for some wastage while cutting. Most of the bait will be dressed head off. If using head-on bait, use 0.18 kg (0.40 lb) instead. It is better to have too much bait on board than for the vessel to have to return to port for more bait.

3.3 *Verifying Bait Weights*

Each hook should be baited with 1/10 - 1/6 kg (1/4 - 1/3 lb) pieces of chum salmon. Bait must be weighed (weight verified):

1. At least three times per day during the first trip (20 to 50 pieces of bait per sample).
2. At least once per trip, thereafter (at least three samples of 20 to 50 pieces of bait).
3. Weigh bait samples while the crew is cutting it and record weights.
4. Use only the body and tail of the chum salmon; do not use the heads and entrails.

3.4 *Storing Cut Bait*

Bait must **NOT** be salted. If the crew wants to bait several days' worth of gear ahead of time, it must be stored in the hold or a freezer to prevent rotting. If bad or soured bait is set, the string is considered unsuccessful and ineffective and must be hauled and set again.

4. PROTECTED SPECIES AVOIDANCE

When a protected species (PS) is present, avoidance action will be guided by the professional experience of the vessel Captain and the IPHC Secretariat.

4.1 *Requirements During Running*

The vessel Captain is responsible for avoiding collisions, slowing vessel speed when appropriate, avoiding no-transit zones and alerting the IPHC Secretariat to sightings of PS.

4.2 *Requirements During Setting*

NO offal discharge before or during setting; time bait cutting appropriately. Monitor for PS for 15 minutes as the vessel approaches the station and make the following considerations:

1. Were PS observed during the 15-minute observation period prior to setting?
 - No → Set gear
 - Yes → Go to 2
2. Is it likely that animals will leave area?
 - No → Move on



Yes or unsure → Wait 15 minutes minimum before deciding to set, move-on, or continue waiting

4.3 Requirements During Hauling

Monitor for PS for a total of 15 minutes as the boat approaches the station and the SeaCat is being deployed. Prior to commencing gear retrieval, make the following considerations:

1. Were PS observed during the observation prior hauling?
 - No → Haul gear
 - Yes → Exercise professional judgement and document

4.4 Avoidance and Monitoring Guidelines

The following guidelines will direct your actions.

1. There must always be a designated PS monitor on watch.
 - While in transit and during setting, the vessel Captain will avoid collisions with PS as well as remain offshore of haulouts to avoid causing stampedes (1 km).
 - While working on deck, everyone, crew included, should look for whales and report any observations to the IPHC Secretariat.
2. Implement the “Move-on Rule” if marine mammals are observed within the area around the vessel and may be at risk of interacting with the vessel or gear. Use professional judgement to determine if stopping hauling and sinking the gear will stop the depredation encounter. This may allow the set to be effective.
3. If clear of PS, deploy gear as soon as possible upon arrival on station.
4. Have the designated PS monitor and vessel Captain use best professional judgment to minimize the risk to marine mammals from potential gear interactions during deployment and retrieval of gear.
5. Immediately take precautionary action or suspend operations if marine mammals or short-tailed albatross are detected during setting operations and are considered to be at risk.
6. If operations have been suspended because of the presence of marine mammals, the vessel will resume setting (when practicable) only when the animals are believed to have departed the area.
7. Have PS Monitor immediately alert the lead IPHC Secretariat as to their best estimate of the species and number of animals observed and any observed animals’ distance, bearing, and direction of travel relative to the vessel.
8. If PS are observed at or near the station, the designated PS monitor and the vessel Captain will determine the best strategy to avoid potential takes based on the species encountered, their numbers and behaviour, their position and vector relative to the vessel, and other factors. For example, a whale transiting through the area and heading away from the vessel may not require any move or wait, while a group of orcas gathered around the vessel may require a longer move from the initial sampling site or possibly cancellation of the station if the whales follow the vessel.
9. After moving on, if PS are still visible from the vessel and appear to be at risk, the designated PS monitor may decide, in consultation with the vessel Captain, to move again or to skip the station.
10. During nighttime or other periods of limited visibility, although operational lighting from the vessel



illuminates the water in the immediate vicinity of the vessel during gear setting and retrieval, sight is limited. In these cases, it is again the judgment of the designated PS monitor as based on experience and in consultation with the vessel Captain to exercise due diligence and to decide on appropriate course of action to avoid unintentional interactions.

5. BIRD AVOIDANCE DEVICES

Bird avoidance device (BAD) requirements are based on vessel size and fishing location (See [Table 5.1](#) for quick guide). Tori lines are streamers (BADs) that help prevent birds from being hooked during setting. All IPHC chartered vessels are required to provide and use approved BADs while setting gear on FISS. If the BADs are lost or broken, the vessel must supply another set.

5.1 *BAD Compliance in the U.S.A.*

All vessels over 17 m (55 ft) in US waters must comply with the following BADs:

1. Use hooks that, when baited, sink as soon as they are put in the water.
2. Must not discharge offal while gear is being set.
3. Make effort to ensure that birds brought on board alive are released alive and that wherever possible, hooks are removed without jeopardizing the life of the birds.
4. The operator of that vessel must employ one or more of the following BADs:

5.1.1 *Single Streamer Standard for Inside Waters*

A single streamer line must be deployed in such a way that streamers are in the air for a minimum of 40 m aft of the stern and within 2 m horizontally of the point where the main groundline enters the water.

The minimum single streamer line specifications are as follows:

1. Length: 91.4 m (300 ft)
2. Spacing of streamers: Every 5 metres until performance standard (40 m) is achieved.
3. Material: Brightly coloured, UV-protected plastic tubing or 1 cm (3/8 in) polyester line or material of equivalent density. An individual streamer must hang from the mainline to within 0.25 m (10 in) of the water in the absence of wind.

Exceptions: In winds exceeding 45 knots, the safety of the crew supersedes deployment of the streamer lines.

5.1.2 *Double Streamer Standard for Outside Waters*

Vessels must deploy a minimum of two streamer lines while setting hook-and-line gear. If both streamer lines cannot be deployed prior to the first hook, at least one streamer line must be deployed before the first hook and both streamers must be fully deployed within 90 seconds. Paired streamer lines must be deployed on each side of the main groundline and are in the air for a minimum of 40 m aft of the stern for vessels under 31 m (100 ft).

The minimum double streamer line specifications are as follows:

1. Length: 91.4 m (300 ft)
2. Spacing of streamers: Every 5 metres until performance standard (40 m) is achieved.



3. Material: Brightly coloured, UV-protected plastic tubing or 1 cm (3/8 in) polyester line or material of equivalent density. An individual streamer must hang from the mainline to within 0.25 m (10 in) of the water in the absence of wind.

Exceptions: In conditions of wind speeds exceeding 30 knots, it is acceptable to fly a single streamer from the windward side of the vessel. In winds exceeding 45 knots, the safety of the crew supersedes deployment of the streamer lines.

5.2 *BAD Compliance in Canada*

All IPHC charter vessels fishing outside waters (DFO Areas 101 to 111, 121, 123 to 127, 130 and 142) need to deploy paired streamer lines when setting longline gear. The streamers need to be in the air at least 30 metres beyond the point at which the groundline enters the water and towed as close to the groundline as is practical under the prevailing conditions of wind and sea. There is also no towing allowed at twilight.

Exceptions:

1. During the period between 30 minutes after sunset and 30 minutes before sunrise; or
2. When the current wind speeds, at the nearest marine weather station, are reported as greater than 35 knots; or
3. When current wind speeds, at the nearest marine weather station, are reported as between 25 and 35 knots the vessel Captain shall deploy only a single streamer line; or
4. Vessels less than 9 m, either a single streamer line or a single towed buoy.

Table 5.1. Country specific quick reference for BAD standards

Country	Vessel Length	Inside Waters	Outside Waters	Exceptions
U.S.A.	17 to 31 m (55 to 100 ft)	Single streamer (PWS, SE inside, and Cook Inlet) 40 metres aft of stern	Double streamers: 40 metres aft of stern	Wind speeds > 30 knots: one streamer allowed Wind speeds > 45 knots: safety of crew supersedes deployment of streamers
Canada	All	N/A	Double streamers: 30 metres aft of stern	Wind speeds > 25 and < 35 knots: one streamer allowed Wind speeds > 35 knots: safety of crew supersedes deployment of streamers

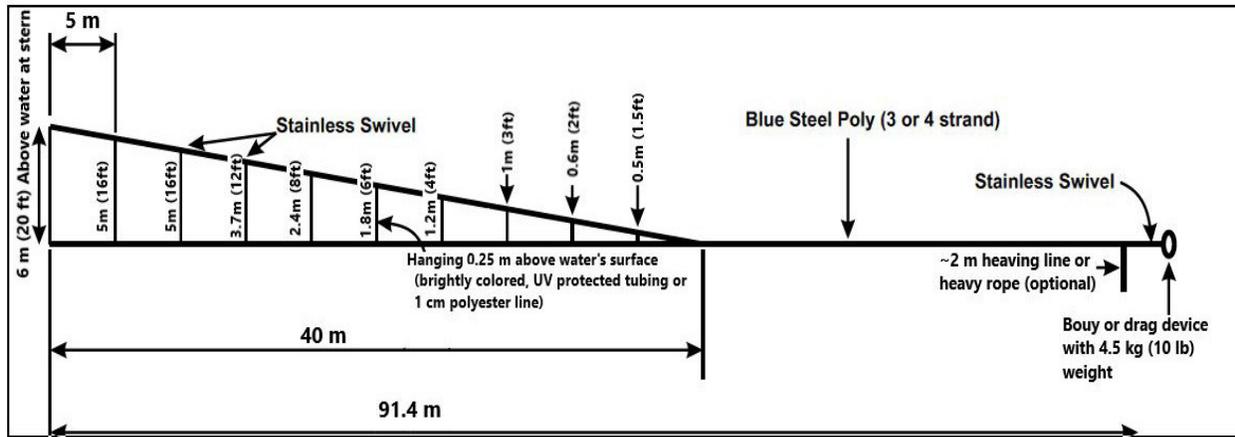
5.3 *Preparing to Evaluate BAD Performance*

Before leaving port, verify that the distance between streamers is 5 m. This spacing will be used to measure BAD performance. If different spacing between streamers is used, mark the appropriate increments with flagging tape. In the FISS logbook, describe the bird avoidance device and how it is deployed. Also detail the performance evaluation and how you marked the streamer to facilitate estimates.

Tip: To make it easier to ensure compliance, tie surveyor's tape at the 30 m, 35 m, 40 m, 45 m, and 50 m marks. Also, the higher the BAD point of attachment, the less interference with gear and the larger the coverage area. Some vessels have improved the performance of their BADs by tying a fathom of heaving line or heavy rope to the end of the streamer to increase drag and minimize tangles with gear.



Seabird Streamer Line Schematic



Tubing can be doubled over to create a paired streamer. Tubing is passed through the twist of the rope and knotted or taped (or both).

6. SETTING PROCEDURES

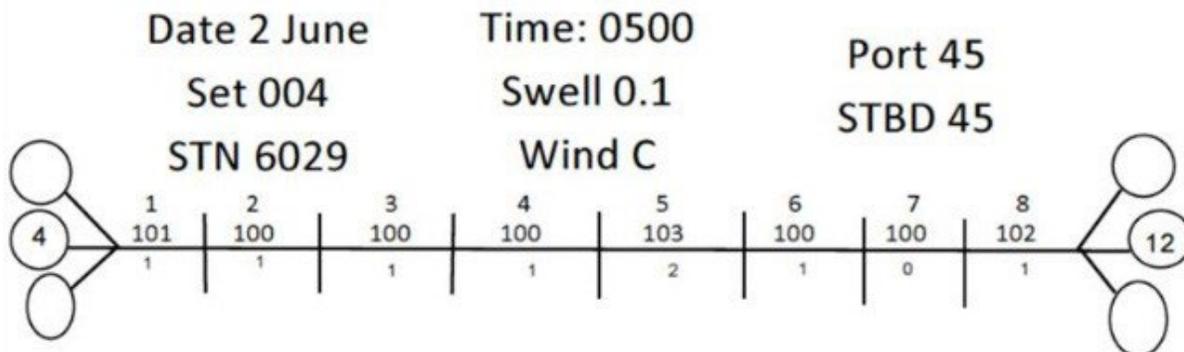
During setting, count hooks and missing baits, evaluate BAD performance and wind direction, and record these data and details.

6.1 Soaking The Gear

The gear must soak for at least 5 hours and not more than 24 hours, from when the first flag is set to when it is hauled. If the gear does not soak the full 5 hours, the set is considered ineffective and unsuccessful, and must be set again. Typically, three or four sets of gear will be set before the boat returns to the first set and begins hauling gear. If the boat hauls gear in a different order than it was set, ensure it has soaked the prescribed amount of time.

6.2 Setting Data

Before setting, create a table like the one below. Use this diagram to record all data detailed in this



section.

Figure 6.1 Example of data collected during setting.



6.2.1 Evaluating BAD Performance

Record the distance behind the vessel where the body of the Tori line (not streamers) touches the water. Use the 5m spacing of the streamer as a reference but record performance to the nearest one (1) metre. Estimate the distance three times for both port and starboard Tori lines. Calculate the average distance and record the numbers in metres. Do not use decimals - round up. If Tori lines were not used, record NU.

6.2.2 Wind Direction

During setting, stand at the stern of the vessel and face aft. Consider a clock: directly in front of you is 12 o'clock, to the right is 3 o'clock, left is 9 o'clock, etc.

Wind Direction Codes:

H = Headwind: If the wind is in your face (11 o'clock to 1 o'clock).

T = Tailwind: If the wind is at your back (5 o'clock to 7 o'clock).

C = Crosswind: If the wind is on your left- or right-hand side (1:01 to 4:59 and 7:01 to 10:59).

V = Variable: If the wind changes direction constantly during the setting.

N = None: If no wind is present during setting, enter N for none (and nice day).

Note: the direction is relative to the stern, not the bow of the vessel. For example: a head wind to the bow of the vessel is a tail wind to the IPHC Secretariat standing on the stern.

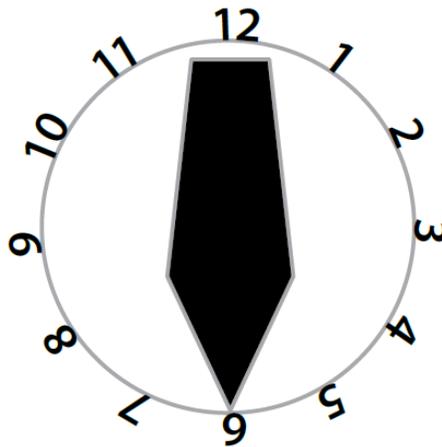


Figure 6.2 Wind direction diagram for easy reference.

6.3 Hook Counts

6.3.1 Record Hooks Set by Skate

Skate-by-skate recording is essential for maintaining gear to specifications.

1. Record the number of hooks per skate.
2. Confirm the number of hooks per skate by counting them ahead of time or, if need be, while they



leave the chute during setting.

3. Make sure to count hooks on every skate. If you lose track, disregard your count by using a dash and provide details on what happened.

6.3.2 Choose a safe position

Stand out of the way of crewmembers and near the setting chute where you can see the hooks as they leave the boat and enter the water.

6.3.3 Use a signal

The IPHC Secretariat must signal the vessel Captain at each skate junction to ensure the Captain records the correct depths on the Captain Set Form. Signaling methods have included blowing a whistle (included in gear kit) or speaking into the loud hailer.

6.3.4 Snarls

If more than 10 hooks in a skate snarl while setting, do not try to estimate the number of hooks in the snarl for that skate. In this case, leave the field blank. The estimate will be computer generated post data entry.

Have the crew repair the gear if there are hook deviations of 5 percent or more (i.e. more than 104 or less than 96 hooks per skate). Flag any skates that fall outside the prescribed standards with surveyor's tape (found in gear kit) so they may be easily spotted for repair when they are brought on board.

6.4 Missing Bait Counts

Count bait loss on all skates. Bait pieces often fly off hooks during setting. Record bait loss for each skate. Significant bait loss may indicate low-quality bait.

6.5 Verify all Setting Data.

1. Starboard and port side BAD performance values
2. Swell height (in metres) and wind direction
3. Buoy ID letter and/or number (start and end). During retrieval of the gear, use this information to determine which end you are hauling first.
4. Number of missing baits per skate
5. Number of hooks set per skate
6. Skates with significant snarls
7. Start time indicating when the first flag is released
8. Set and station number
9. End time indicating when the last flag is released

Note the gear needs to be set through the center position in either a North-South (NS) or East-West (EW) orientation. If not, an explanation must be recorded. If the vessel Captain sets more than 10 degrees off the NS or EW standard, an alert will appear when inputting the setting data.



7. CAPTAIN SET FORM

The vessel Captain will fill out the station information while setting the gear. The same page may be used for more than one day. The IPHC Secretariat will transcribe these details. Send the Captain Set Form back to FISS-HQ via scanned images at the end of your trip. The hard copies may be sent to HQ at the end of the charter.

All information on the Captain Set Form will be collected during setting except for the Seacat location and the number of skates hauled. Seacat location will be recorded when it is deployed immediately prior to hauling. Skates hauled will be determined and recorded when the hauling event is completed.

Be skeptical when station positions are too exact (e.g. always end with .00, or are always set in exactly a straight north-south or east-west line). Always double check your numbers for transcription errors.

7.1 *Form Instructions*

Set: Each year, every vessel begins at Set #1 and continues sequentially. Never repeat a set number in the same year. If an unsuccessful station is reset, continue with the next set number in the series.

Vessel: Use the three-letter vessel codes provided.

DD Month YYYY: Day month and year in which the gear is set.

Trip: Each year, every vessel begins at Trip #1 and continues sequentially. Never repeat a trip number in the same year. A trip ends when Pacific halibut is offloaded.

Station No.: The station number is four digits long and identifies individual stations. These numbers are not necessarily sequential and should not be confused with the set number.

Skts Set: The number of skates set at the station.

Skts Hauled: The number of skates hauled at the station.

Time Set: The time of the first flag release. Use 24-hour clock.

Latitude and Longitude: Record the lat/lon position at the first anchor. This is the Start position. Record the lat/lon at the last anchor, this is the End position. Use degrees and minutes to two decimal places.

West longitudes are written as they appear on the charts, e.g. 178:30:00. West of the 180-degree line is an east longitude. Adding 100 denotes east longitudes, e.g. 178:30:00 E would be denoted as 278:30:00.

Seacat: Record the coordinates at the exact location that the Seacat is deployed.

Experimental Y / N: Indicate whether set is experimental.

Seacat Depth: Depth in fathoms where the Seacat was deployed.

Station Moved Y / N: If the station position was moved to avoid interference by another vessel or for any other reason (e.g. protected areas and rookeries), enter a "Y" in the box indicating a position change. Any change in location must be within 3 M of the original coordinates and must be thoroughly documented.

Depth: Record depth in fathoms when the first anchor is released, and then at each subsequent skate junction, and finally as the last anchor is released. The End Anchor depth is depth where the last anchor is released. The IPHC Secretariat will signal the captain at the beginning of each skate so that the appropriate depth is recorded.

Notes: Include comments, such as a description of the grounds (e.g., poor, too rocky or sandy, steep, or



flat). Also include comments that affect the catch such as gear drift, depredation by dogfish, sea lions, sand fleas, presence of other vessels, etc.

Bait Condition Verified: Have the Captain confirm bait quality for every set. If a station is ever marked “No”, contact FISS-HQ immediately, the station may need to be reset.



Captain Set Form

Set	Vessel	DD	Month	YYYY	Trip	Station no.	Skts. Set	Skts. Hauled	Time Set
							.	.	
	North Latitude			West Longitude				Experimental set? (y/n)	
	Degrees	Minutes (decimal)		Degrees	Minutes (decimal)		Seacat Depth (fm)		
Start 1st anchor									
End anchor							Str. moved? (y/n)		
SeaCat									
Start of skate	1	2	3	4	5	6	7	8	End anchor
Depth (fm)									
Notes								Bait Condition Verified	Yes No

Figure 7.1 Captain Set Form.

8. SUCCESSFULNESS & EFFECTIVENESS

Every set is assessed for successfulness and effectiveness. A set is effective when it is assessed to have fished properly and was not impacted by depredators or weather. Sets may be ineffective for reasons beyond a vessel Captain’s control, such as depredation, lost gear, or bad weather. Successfulness depends on the vessel Captain’s adherence to defined parameters. This section outlines criteria for rating the effectiveness and successfulness of a given set.

8.1 Successfulness

1. The center of the set is within 5.6 km (3 M) of station coordinates.
2. It is hauled between five (5) and 24 hours after setting gear.
3. The gear and bait meet standards.

Chartered vessels agree to successfully complete all stations in their charter region(s). If the gear is not set correctly (e.g. if there was no end anchor, incorrect number of skates, bad bait, etc.) or if the vessel was not successful as per the description above, the unsuccessful station must be set again in order for the vessel to receive payment for that station.

An unsuccessful station may be reset within 24 hours as long as the center of the gear is more than 2.8 km (1.5 M) away from the failed site but is still within 5.6 km (3 M) of the intended coordinate. After a 24-hour period, the gear should be set on station coordinates.

If you suspect a set is not successful, speak with the FISS-HQ immediately. The IPHC Secretariat can help prevent unsuccessful sets by monitoring soak time, gear condition, bait weights and providing timely



feedback.

An unsuccessful set is always an ineffective set.

8.2 *Effectiveness*

The IPHC Secretariat plays a vital role in assessing a set's effectiveness.

A set is deemed ineffective due to certain circumstances such as severe sand flea predation or foul weather causing fish to fall off the line before reaching the vessel.

By keeping excellent records of field conditions, the IPHC Secretariat provides vital details allowing accurate assessment of a set's effectiveness. Quantifying marine mammal and shark depredation requires detailed record keeping. Data from sets deemed ineffective may still be useful and informative.

8.3 *Successful, Ineffective Sets*

If an entire set of gear is lost after setting through no fault of the vessel (e.g. excessive currents, heavy vessel traffic, poor weather, etc.) the set is ineffective, but successful, and the vessel will not be required to reset the station.

Any station that is coded as ineffective may be reset if:

1. The Captain is willing.
2. The IPHC Secretariat agrees that the original problem will not reoccur.
3. It will not slow the progress of the charter.
4. The possibility of gear loss is minimal.

When any station is reset:

1. Do not use the same set number; continue with the next number in the series.
2. Collect all data (including otoliths, samples, etc.) from both sets.

Resetting stations can be expensive and time-consuming. Contact FISS-HQ prior to resetting. The IPHC Secretariat must thoroughly document the circumstance of a missing set. These details are necessary for HQ to determine whether the station must be reset.

8.4 *Data recording instructions*

1. Record "Y" if effective and "N" if ineffective.
2. If the set is suspected to be ineffective, record it as ineffective and explain the situation so that it may be reviewed by HQ. Record a detailed description of the event.
3. For sets that are deemed ineffective, assign the applicable Reason Code according to the definitions below (Tables 8.1 and 8.2).



Table 8.1. Reason codes for unsuccessful sets that must be set again.

Reason Code	Scenario
ST	Soak Time – The set exceeded the 24-hour maximum soak time or did not soak for 5 hours before hauling began.
MS	Moved Station – The center of the set was moved more than 3 M from the station coordinates.
BA	Bad Bait – The bait soured or rotted before being set, or the wrong bait type or size was set.
GI	Gear Issues - The gear did not meet the standardized parameters or if too few skates or anchors are on the set, the gear must be repaired and set correctly.

Table 8.2. Reason codes for ineffective sets. Consult FISS-HQ when these situations arise.

Reason Code	Scenario
GI	Gear Issues – If more than 33% of the gear is badly snarled, fewer than 200 hooks are retrieved, gear is set across or otherwise entangled with gear from another vessel that is actively fishing (not old, lost gear).
PS	Depredation by sharks – A sleeper shark is present on the gear at any point, and greater than 10 percent of the gear is damaged (missing or straightened hooks).
DO	Depredation by orcas - Any set with more than 1 lips-only Pacific halibut is assumed to have been depredated by orca, regardless of orca sighting. Document the event well.
DS	Depredation by sperm whales – A sperm whale is spotted within 3 M of the boat while hauling gear.
PP	Depredation by pinnipeds – Pinnipeds are present during haul back and sum of gear and catch damage is greater than 10% of hooks set.
PU	Depredation unknown – Sum of damaged fish and hooks is greater than 10% of hooks set, but no predator is present during haul back.
SF	Sand flea predation is severe, causing fish to fall off hooks before breaking the surface of the water.
WE	Weather – Typically > 40 knots. The weather conditions cause fish to fall off the line.
OT	Other – Please detail circumstances in the Haul Notes

9. MARINE MAMMAL DEPREDATION

Marine mammal depredation affects the catch per unit effort and is defined as the removal of hooked fish by a predator. Because depredation affects the catch per unit effort, documentation of any depredation



event is paramount in determining the effectiveness of a set.

9.1 *Tracking Depredation*

Track all potential depredation events.

9.1.1 *Criteria for ineffective stations caused by whale depredation*

Evaluate every set using the dichotomous key below:

1. Were orca whales present at the station (or strongly suspected – e.g., pod seen in vicinity)?
 - Yes, and observed feeding on Pacific halibut → Ineffective.
 - Yes, but no observations of interacting with gear → Go to 2.
 - Unsure if sighted → Go to 2.
 - Not sighted → Go to 2.
2. Is the count of lips-only fish >1 ?
 - Yes → Depredation assumed, and set is ineffective.
 - No → Go to 3.
3. Was a sperm whale spotted within 3 M of stations during hauling?
 - Yes → Ineffective
 - No → Effective

9.2 *Marine Mammal Depredation Recording Instructions*

Record when:

Toothed whales or pinnipeds are within sight of the vessel during hauling, regardless of whether depredation is suspected.

Any time you suspect a marine mammal may be interacting with the gear, even if it was not sighted.

9.2.1 *Depredation Observations*

Species: Record the common name and species code of all suspected depredators sighted.

Sector: Indicate the areas around the vessel predators were present during the haul. Also record sector information for gear and offal.

Number sighted: Estimate the number of predators sighted.

Closest approach: Estimate the closest approach of the predator in metres.

Time of first sighting: Record the time depredators are first observed within 100 metres. If mammals are initially sighted more than 100 metres away, do not record time sighted until they are within 100 metres.

Visibility: Record visibility when mammals are first sighted. Different species may have different visibility scores. 1= <50 m; 2= 50 to 100 m; 3= 100 m to 1 km; 4= >1 km; 5= Night.

First appearance (hook number): The first hook that comes over the rail is hook 1, regardless of the



direction of hauling. Hook numbering restarts at zero at each skate junction. Simply enter the skate number and hook number. See diagram below.

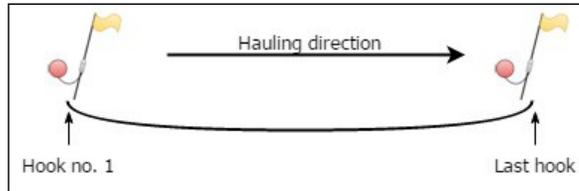


Figure 9.1 Estimating hook numbering when marine mammals are sighted.

Last appearance (hook number): Using hook number and the guidelines above, estimate when depredators left. If the gear parts, record the last hook retrieved when present. Thoroughly document the event.

Observations: y(yes), n(no), u(uncertain). Record observed behaviors and evidence of depredation. This will be somewhat subjective. We are most interested in actual observations. Rarely is more than one depredator species on a set. If this occurs, indicate which depredator is responsible for the Y, N, and U under the Observations list.

- **Damaged Pacific halibut:** Answer yes if bitten, mauled, or damaged Pacific halibut (including lips) are recovered. Do not include damage from non-marine mammals.
- **Damaged incidental catch:** Indicate damaged incidental and enter depredated species. Do not include damage from non-marine mammals.
- **Feeding on discards:** Answer yes if you see actual feeding on discards. **NO DISCARDING IS PERMITTED WHILE HAULING.**
- **Present beyond 100 metres:** Answer yes if the animals are present outside 100 m of the vessel. Note unique observations, such as large adults stay further off the vessel, or there is a different species makeup inside and outside 100 m.
- **Feeding on Pacific halibut:** Answer yes only if you saw depredators pull fish from the line.
- **Feeding on incidental catch:** Answer yes if you saw depredators pull fish from the line.
- **Drop in catch:** Document any suspicious changes in Pacific halibut catch rate and thoroughly document observations in the notes section.
- **Caught on gear:** If you catch, snag, or entangle a marine mammal, document it thoroughly according to instructions.



Code	Species	Sector	# Seen	Closest Approach	Visibility	Time	1st Skate	1st Hook	Last Skate	Last Hook
720	Killer Whale	3	12	3	4	236	2	84	3	5
666	Short-tailed Albatross									

Protected Species: Depredation Observations

Observations

Damaged halibut? Feeding on halibut? Gear Sector: 5

Damaged Bycatch? Feeding on bycatch? Offal Sector: 3

Feeding on discards? Drop in catch?

Present beyond 100m? Caught on gear?

Figure 9.2 Depredation Observations

10.20-HOOK COUNT SUBSAMPLE

The subsample observations (20-hook counts) are a record of hook occupancy on the first 20 hooks of every skate. These data provide valuable information on incidental catch (retained and discarded) and number of returning baits. Identify all specimens as accurately as possible. For specimens you have in hand, try to avoid using general species codes such as invert. unid., coral unid., etc.

10.1 Collecting the Subsample

The IPHC Secretariat on deck will go to the rail and monitor twenty consecutive hooks at or near the beginning of each skate. It is important to accurately observe and record the sampled hooks because we rely on a small subsample to represent hook status throughout the skate. The IPHC Secretariat in the shack can help keep count of twenty hooks. Target the first twenty hooks retrieved on each skate.

10.1.1 Record the status of all 20 hooks

Only consider animals (both inverts and vertebrates), empty hooks, baits (when hook contains the original bait, including the skin and part of the flesh), skins (when hook contains only the skin of the original bait, or hardly any flesh remains bait skin), and broken/bent/missing (BBM) hooks.

All hook information is recorded with the corresponding skate number.

IPHC Secretariat are expected to identify all organisms. The following ‘if’ statements help clarify frequently asked questions.

1. If an invertebrate is on a hook with a bait or skin, record the invertebrate.
2. If a bird or marine mammal is caught on a hook and observed during the sub-sampled observations,



enter the common name and species code in the Whole Haul Sample section, then enter Misc. Marine Bird (code 299), or Misc. Marine Mammal (code 298) in the Subsample section. If you catch a mammal or a bird anywhere on a set, call FISS-HQ as soon as possible.

3. If a species was lost at the roller but it was within gaffing distance and you were able to identify it, record the species code.
4. If fishing is heavy and the IPHC Secretariat on deck is overwhelmed, work with the crew to determine the best method of collecting the required hook information. This may involve the rollerman bringing aboard all items on the 20 hooks (including baits and skins). The IPHC Secretariat should feel free to experiment with different methods and procedures.
5. If gear parts early in a 20-hook count, restart that skate's 20-hook count from the other direction. The 20-hook count must always be consecutive.
6. If the gear snarls, do your best to record the appropriate number of hooks and organisms in the snarl that should be in the count.
7. If there is more than one species on a hook, record the last fish to take the hook.
8. If you are not confident you can correctly identify a discarded organism to the species level, ask the rollerman to bring it on board. Only unidentifiable escaped organisms should be recorded using an 'unidentified' code.

Note: Code thornyheads on the line as "UI, Unidentified Idiot (Thornyhead)" whenever you do not have the fish in hand to identify it to the species level.

10.1.2 Get a rough estimate of weight (lb) of an individual for each species on a set.

If possible, use the hand scale, otherwise use a visual estimate. Enter the average weight in lb.

11. WHOLE-HAUL FOR GEAR DAMAGE, BIRDS AND MAMMALS

Whole haul is meant for gear damage, marine mammals, and birds caught. No other species is recorded here.

11.1 Marine Mammals

If you encounter a marine mammal at any point on the gear, enter it as a whole haul sample and call FISS-HQ as soon as possible. If you capture a marine mammal on a hook in the 20-hook subsample, also record it in the subsample section.

11.2 Birds

If you encounter a bird on the gear at any point, enter it as a whole haul sample, call FISS-HQ, and retain it if instructed. If you capture a bird on a hook in the 20-hook subsample, also record it in the subsample section.

11.3 Broken, Bent and Missing (BBM) Hooks

Whole hauling for damaged hooks on every set will help us understand when gear damage is due to normal wear vs. depredation. If you record a broken, bent or missing hook in the 20-hook subsample, you must ALSO record it at the whole-haul level.



- Enlist the help of the rollerman and crew to get counts as the gear is hauled if needed.
- In high catch areas, do your best to get a total count of damaged gear after the set is hauled and calculate an average for each skate.

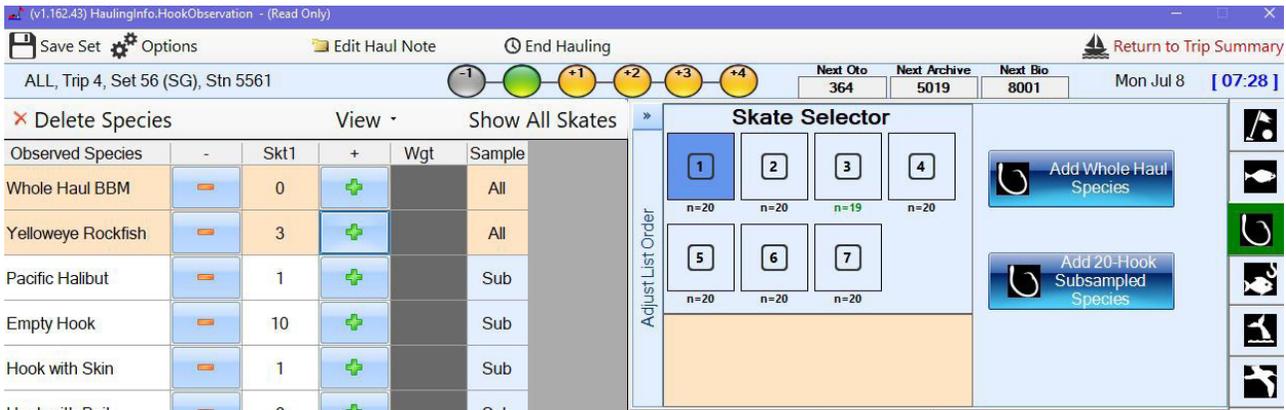


Figure 11.1 Whole-haul broken, bent, missing hook tally.

12. PACIFIC HALIBUT SAMPLING

This is what you are here for, the most significant aspect of your duties as the IPHC Secretariat. Many end-users utilize the data you collect.

12.1 Measuring Pacific Halibut

12.1.1 Separating Pacific Halibut by Skate

During gear retrieval, all Pacific halibut data must be recorded with corresponding skate number. Since the gear is often divided into half, third, or quarter skates, develop a system to denote when a gear knot represents a full (305 m (1800 ft)) skate.

One method is to mark the beginning of each full skate equivalent with coloured surveyor's tape before or during the setting of the gear. This makes it easy to determine when a skate change occurs, which skate number you are working on, and from which end of the string the vessel started hauling. Another method is to note the initials of the crewman coiling the gear above the skate number if the crew takes turns coiling between skates.

Methods to Separate Pacific Halibut

1. Place the Pacific halibut into different checkers.
2. Place a coloured rubber band around the caudal peduncle. Each colour represents a different skate.
3. Place a tarp over the fish in the checker when the skate changes.
4. Slow or stop the gear and finish processing all Pacific halibut in the main checker before hauling the next skate. You may begin hauling gear from either end.

Feel free to experiment with other methods of marking the Pacific halibut by skate as long as it does not decrease the marketability of the dressed fish. Pacific halibut do not have to be marked if catch is light and there is no possibility of mistaking which fish came from which skate.



Missing a Skate Change

Avoid missing a skate change. If you miss a skate change, do your best to assign the approximate number of Pacific halibut to the correct skates. If this occurs, note it and document details.

12.1.2 Fork Lengths

Measure every Pacific halibut caught. Dressed fish should be measured white-side-up. Sub-legal fish that may be released alive may be measured dark-side-up to protect the eyes from scratches. Position the head of the dressed fish so the operculum is correctly aligned; align the head in a position that represents the pre-dressed condition of the Pacific halibut.

Record the length where the middle fin rays of the caudal fin end. Do not round up or down; rounding is integrated in the length strip. For example, if the tail lands in the middle of the 72 cm interval it is 72 cm, not

72.5 cm or 73 cm. If the tail of a large Pacific halibut extends past the cradle, extend the “tail stick” located at the end of the cradle. Make sure the first number on the tail stick is in correct sequence with the last number on the cradle.

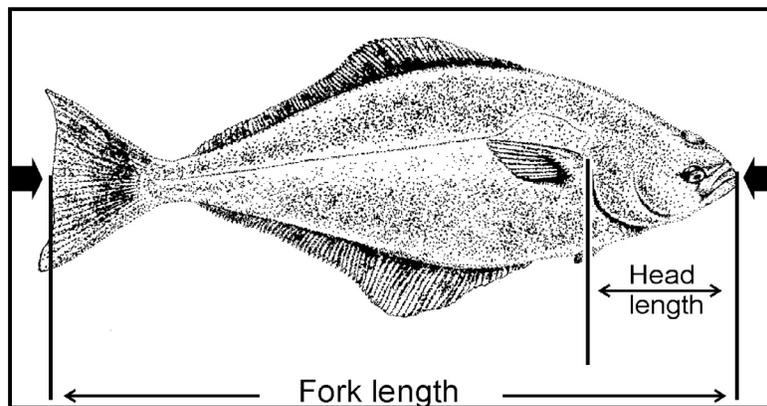


Figure 12.1 Fork and head length measurements of a Pacific halibut.

12.1.3 Measuring Very Large Pacific Halibut

Use a measuring tape for Pacific halibut that are too large or too heavy to lift onto the measuring cradle. When using the tape, hold it tight across the fish to get the straight fork length from the tip of the jaw (head positioned correctly) to the tip of the caudal fin (center). This technique works best if a stick or knife is held vertically, and the tape measure is put on top of it. This prevents the tape resting on the body of the Pacific halibut, which results in an incorrect curvilinear measurement.

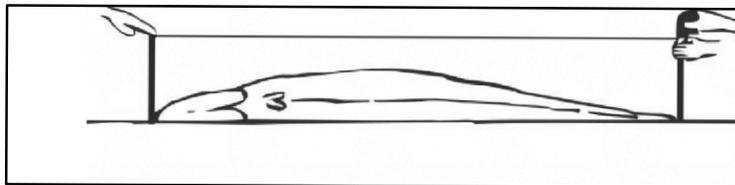


Figure 12.2 How to measure a very large Pacific halibut.



12.1.4 Head-only Pacific Halibut

If only a head is retrieved, measure from snout to the tip of the opercular bone. This length will be used to calculate the fork length.

12.2 Weighing Pacific Halibut

12.2.1 Standard Protocol - 100% Pacific halibut weights

1. O32 Pacific halibut (legal-sized) - dressed weights will be taken for all retained fish. If the fish is too large to weigh at sea, tag it for weighing during the offload.
2. U32 Pacific halibut (sublegal) - dressed weights will be taken on all sublegal fish selected for otolith extraction. If not selected for otolith extraction, round weight will be taken.

12.2.2 Exceptional Circumstance Protocol - < 100% Pacific halibut weights

In exceptional circumstances (e.g. scale malfunction), it may not be possible to weigh all Pacific halibut from a particular station. If this happens, follow procedures below.

1. Prioritize the weighing of U32 fish that have had otoliths removed.
2. Record when the entire haul has not been sampled, and detail why.
3. Convey the number of fish to be weighed at the offload as a result, when conveying haul information and see below for detailed instructions.

12.2.3 Fish that need to be weighed during offload.

Any fish not weighed at sea must be uniquely tagged so the weight can be obtained during the offload. When this happens:

1. Affix a tag to the fish. For example: Use a zip tie or flagging tape around the caudal peduncle and write a tag number on it. A good idea is to number the tag with the set number; for set 5 if you had three fish that needed to be weighed at the plant, you would have tag numbers 501, 502 and 503.
2. Record the tag number.
3. Weigh the fish at the offload and record the weight with the tag number.
4. Remove tags after weight is obtained and recorded.

12.3 Assessing Pacific Halibut Sex and Maturity

You will record the sex and determine maturity of all O32 Pacific halibut as well as all U32 Pacific halibut selected for otolith removal, or not expected to survive upon release.

Record the sex as G (girl), B (boy), or U (unknown). Unknowns should be rare.

12.3.1 Confirm G3s, B1s, and large G1s

If you encounter any B1s or G3s, note this (providing explanatory details). If you encounter any large G1s (over 90 cm), note these as well as any sex determination with unknown maturity.



12.3.2 Female Maturity Stages

Remove the gonad from the fish to assess the maturity. Only rate the maturity of U32 Pacific halibut that are dead or sacrificed for otolith collection.

Examine external characteristics (colour, capillary development, and membrane thickness) first. Female gonads are paired, cone-shaped, and attached internally to the fish by connective tissue. Connective tissue is located at the broad end of the cone and is thicker and more opaque than the rest of the gonad. Do not mistakenly assess the external characteristics of the connective tissue at the wider end of the cone. Cut open the gonad and examine the internal structure for egg development and membrane thickness. Compare your first analysis of the membrane thickness with the cross section of the gonad.

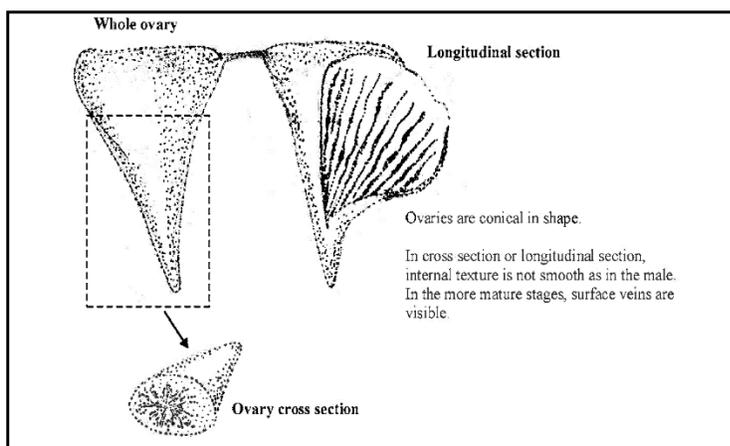


Figure 12.3 General outline of female Pacific halibut ovaries including longitudinal and cross sections.

Visual characteristics of maturation stages vary between geographic locations and season. You may see gonads that are between stages. If a gonad has multiple characteristics in different stages, choose the stage that has the most characteristics. It is also possible for the two ovaries of a pair to key out at different maturity stages. In this case you would record the maturity as follows: if one ovary is a 3, record as a 3. If one ovary is a 2 and the other is a 4, record as a 2.

Note: if the ovaries are in a transitional stage (e.g. have characteristics of more than one maturity stage) or if the ovaries within a pair have different stages. If the IPHC Secretariat do not agree on the stage, code the fish as Girl Unidentified (GU).

Table 12.1. Female Pacific halibut maturity stages.

Characteristic	Stage 1 Immature	Stage 2 Mature	Stage 3 Spawning	Stage 4 Resting
Capillaries	Slight development	Well-developed and branched, purple in colour	Thin and small	Large and deflated
Membrane Thickness	Thinnest	Thinner	Thin	Thick



Egg Development	Not visible to naked eye white dots, grainy appearance of developing eggs	Visible Egg colour is opaque. Small percent may be clear (10%)	Visible, fully developed, and large in size (3-4 mm). Large percent are clear in colour.	No eggs present Reabsorbing or developing eggs maybe present*
Membrane Color (highly variable)	Pink to red	Clear Membrane is so thin that it represents the egg colour.	Clear Membrane is so thin it represents the egg colour	Opaque

12.3.3 Male Maturity Stages

Assessing male maturity stages is very simple compared to assessing female stages. A male is either mature or immature. Using the following table and figures to help understand the defining characteristics.

Table 12.2. Male Pacific halibut maturity stages.

Stage	Characteristics
1 - Immature This Pacific halibut will not participate in the upcoming spawning season.	<ul style="list-style-type: none"> - The edges of the paired organs are smooth with no crenulations - Testes very small (usually <5 cm across)
2 - Mature This Pacific halibut will participate in the next spawning season.	<ul style="list-style-type: none"> - Testes have crenulations - Soft, plump, and swollen in appearance - Sperm may be detectable

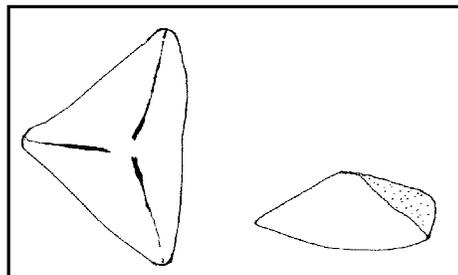


Figure 12.4 Illustration of immature male Pacific halibut testes. Left: surface view. Right: cross section.

12.4 Assessing Prior Hooking Injuries

Prior hooking injuries (PHI) are injuries that occurred when the fish was previously caught by hook and line gear. The fish may have been hooked recently, in which case the injury should be easily noticed, or it may have happened some time ago, thereby allowing the injury to heal. These latter types are the most difficult to identify. Injuries will be observed primarily to the jaw, but may occur to the eye and eye socket, either independently or with a jaw injury.

Pacific halibut with no perceptible injury at either location would be given a Code 1 (None). If fish was not examined, record Code 9. Remember to check both sides of the fish's head.

The types and severity of injuries you may observe are described in the following table. If you find



injuries in locations that represent different degrees of severity, record the code that represents the most severe. For example, a Pacific halibut that has a torn eye socket (Minor), and a split jaw (Moderate), would be recorded as Code 3 (Moderate).

Table 12.3. Description of Pacific halibut Prior Hooking Injuries.

Injury Location	Code 1 (None)	Code 2 (Minor)	Code 3 (Moderate)	Code 4 (Severe)	Code 9 (Unknown)
Jaw	No injury No evidence of PHI event. No healed scars	Jaw in one piece, not split or separated from head. Skin of lip may be torn, but jaw is intact. Healed cheek wounds.	Upper or lower jawbone may be torn through hanging from the fish or torn away on either side of the head. Lower or upper jay may be split laterally, tearing through either snout or lower mouth.	Removal of hook has torn large flap from side of head, usually originating in cheek area. Flap, part of jaw, is either hanging loosely or missing.	Did not examine fish.
Eye and eye socket	No PHI injury.	Eye socket may be torn, but eyeball is undamaged.	Eyeball punctured.	No eyeball or eye socket present.	Did not examine fish.

NOTE: Codes only apply to prior-hooking injuries. Other previous injuries should not be recorded such as those resulting from prior trawl capture (e.g. blunted tail).

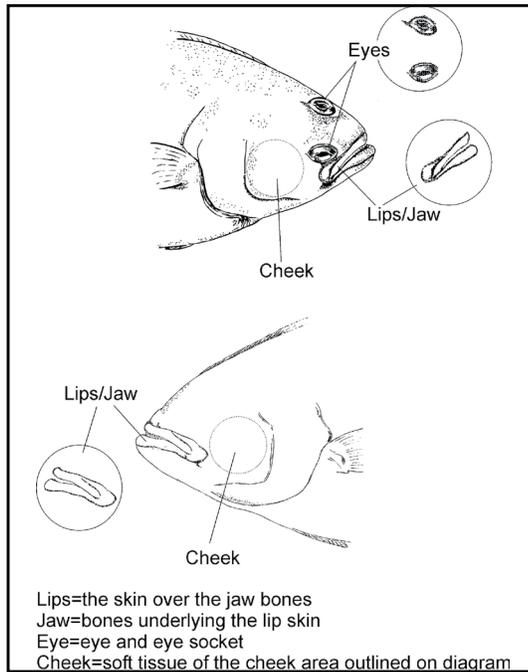


Figure 12.5 Areas of Pacific halibut to evaluate for PHI.

13. OTOLITH AND FIN CLIP SAMPLING

Otoliths are sensory structures found in the inner ear of bony fishes. Otoliths grow throughout the life of the fish as alternating opaque (summer) and translucent (winter) rings are deposited each year. The winter rings, called annuli, are counted to determine the age of the fish. The right and left otoliths are not mirror images as they are in many species. Right (eyed side) otoliths are harder to read and give less accurate ages. For this reason, only left otoliths are collected for age determination.

Otoliths are a record of time as well as the elemental environment. Analysis of the trace element signature of a fish's otolith can potentially tell us where it first settled as a juvenile. However, compounds in the glycerin used to clear otoliths for aging can obscure the otoliths' trace element signatures. Therefore, the clean archive otolith collection is a separate collection of otoliths not stored in glycerin. These otoliths are to be collected, cleaned, and stored whole and dry.

The goal is to collect 2000 otoliths for age determination, and 100 paired otoliths for the clean archive collection per IPHC Regulatory Area. Catch rates vary by IPHC Regulatory Area, so the otolith sampling rates also vary. When the otolith sampling rate for age determination samples is 100%, otoliths are not collected for clean archive.

A tissue sample (fin clip) will also be collected from all Pacific halibut sampled for otoliths. The goal of this collection is to provide a source of genetic material for sampled Pacific halibut. The potential use of fin clips collected from otolith-sampled Pacific halibut includes DNA analyses for population structure, estimates of population size and potentially migration. This differs from the primary purpose of the fin clip collections from Pacific halibut sampled in the commercial catch, which is sex determination. Fin clips will be collected from fish sampled for age determination and for the clean otolith archive collection.



Table 13.1. Otolith sampling rates (100% if not listed)

IPHC Regulatory Area	Sampling Rate (%)	IPHC Regulatory Area	Sampling Rate (%)
2B	28	3B	18
2C	27		
3A	9		

13.1 Collecting Otoliths for Aging

You will be prompted to collect a randomly selected otolith and place otoliths in a tray bien. Paper forms and area-specific random sampling tables are provided as backup. Always double check the starting otolith number at the beginning of each skate, set, and trip to ensure no data are lost.

13.1.1 Removing Pacific Halibut Otoliths

Access the otolith from under the left gill cover and find the otic capsule posterior to palate tissue at the anterior end of the spinal column.



Figure 13.1 Removing an otolith from a Pacific halibut.

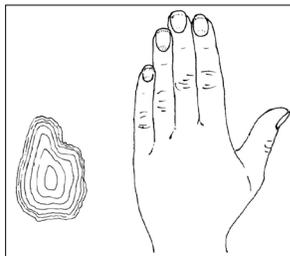


Figure 13.2 Left side otolith shown looking down on the smooth, convex side.

13.1.2 Filling the Otolith Tray

1. Otoliths are stored and transported in Tray Bien otolith trays. The trays have 100 cells with embossed numbers on the top and bottom lip that read 00 to 90. Ignore the embossed numbers on the trays and use your numbered tray holder instead.
2. Secure your Tray Bien holder to the shack table in a place where it is unlikely to spill. Orient it such



that the imprinted words “Tray Bien” are on the right.

- The trays supplied in your shack have been pre-marked at every 5th column with permanent marker to divide each row of cells into fives. This helps the age readers check that they’re on the right cell number while reading. (If you receive extra trays mid-season that aren’t marked, please add the lines yourself with a permanent marker).

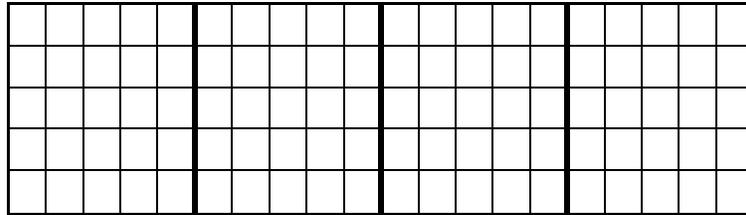


Figure 13.3 An example of an otolith tray bien pre-marked at every 5th column with permanent marker.

- Your trays should all be pre-labeled but if not, please put the label on so that it is readable with the lid in the proper orientation (with the knobbed “grip” towards you). Record the vessel code, trip dates, otolith range, and the IPHC Regulatory Area. Complete the label when the tray is full.

Vessel: <u>VNI</u>	IPHC Reg Area <u>3A</u>
Trip Number: <u>3</u>	
Start Oto # <u>251</u>	End Oto # <u>300</u>
Collection Dates: <u>19 June</u> to <u>21 June</u>	

Figure 13.4 Otolith tray label example.

- Paper stars are used to delineate where otoliths came from in the tray. Write the vessel code, trip, and otolith number on paper stars and place:
 - In the first and last cell of a Tray Bien
 - At the start and end of a trip
 - To show changes in IPHC Regulatory Areas.
 - If an otolith is missing (e.g. otoliths jumbled and couldn’t be sorted to their original cell).

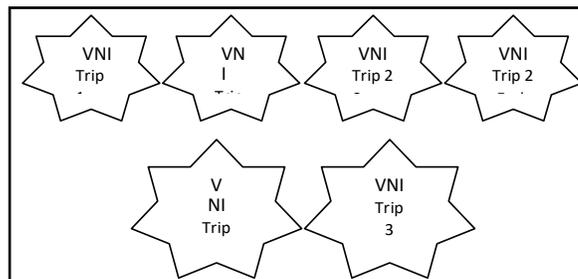


Figure 13.5 Paper stars showing the start and end of a tray bien, trip, and IPHC Regulatory Area.

- Clean and dry the otoliths as you fill the tray.



- Cover otoliths with glycerin solution (otolith juice) at the end of the set or fishing day; fill each cell containing an otolith 1/4 to 1/2 full.

13.1.3 Closing the Otolith Tray

When the tray is full, cover the cells with Parafilm or plastic wrap, and close.

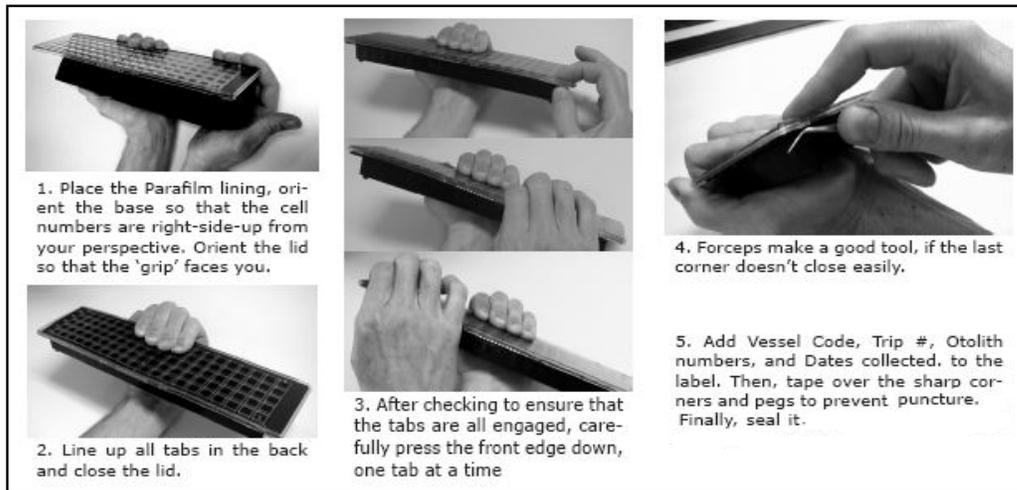


Figure 13.6 How to properly close a Tray Bien otolith tray.

13.2 Oto-Oddities

13.2.1 Spilled Trays

Make notes! You will save data if you make the partially full tray understandable to the Age Readers. Attach a note to the tray lid for the age readers to see. Leave the otoliths where they are (unless you can easily determine their original location). Write cell numbers on paper stars and use them to mark empty cells.

If a whole tray spills, do not discard the otoliths! Put them in a plastic bag and mail them with the Tray Biens.

13.2.2 Missed or Lost Otoliths

If you miss an otolith for any reason, record the applicable code. Do not leave the cell empty. Place the next randomly selected otolith in that cell. Do not attempt to replace an otolith with one from a different fish.

Table 13.2. Otolith status codes

Code	Status
L	Lost
B	Broken
M	Missing
C	Crystalized
O	Other



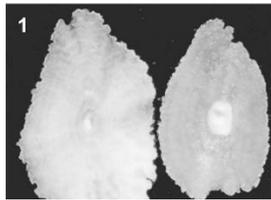
13.2.3 Broken Otoliths

When only chipped or broken in a few pieces, save the otolith. Discard when shattered and enter status code “B”.

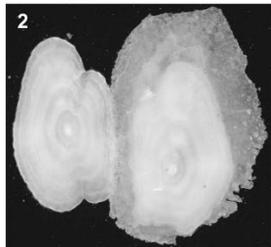
13.2.4 Crystallized Otoliths

Discard crystallized otoliths and enter status code “C”.

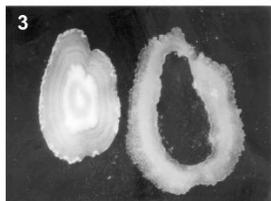
Recognizing Crystallized Otoliths: Otoliths are composed of calcium carbonate that can take one of two different crystalline forms. The form found in ‘normal’ otoliths is *aragonite* while in crystallized otoliths, the form is *vaterite*.



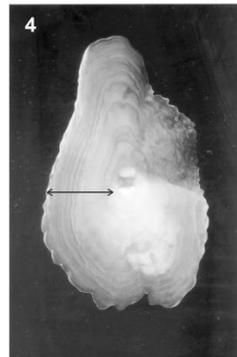
1. Fully crystallized: opaque form (left) and translucent form (right). These otoliths cannot be aged.



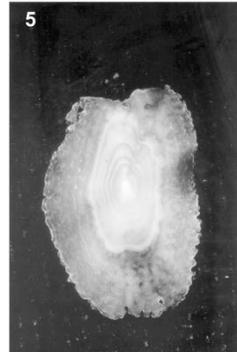
2. Pair of otoliths that began depositing vaterite after 6th year. Crystallized ring has broken off the left-side otolith. The left otolith was probably unusually small for the size of the fish. This otolith would not be aged.



3. Left-side otolith with crystallized ring that broke off. This otolith cannot be aged.



4. Partially crystallized: this otolith could be aged because there is ‘normal’ growth from the nucleus to one edge (see arrow).



5. Partially crystallized. This otolith cannot be aged.

Figure 13.7 Examples of crystallized otoliths.

13.2.5 Unusual Otoliths

If you encounter an unusually formed left otolith (e.g., a small left otolith for a large fish), collect both otoliths and make a note.

13.2.6 Sinistral Fish

Collect both otoliths in a tag recovery envelope. Complete the envelope and send it with your next end of trip package. If the fish was destined for otolith removal, proceed as though the otolith were lost.

13.2.7 Tagged Pacific Halibut Otoliths

Collect both otoliths, complete tag recovery envelope with the tag number and place tag and otoliths in



the envelope. If the tagged fish was destined for otolith removal, proceed as though the otolith were lost.

13.3 Clean Otolith Archive Collection

You will collect a small number of additional otoliths for the clean archive collection. This will require a separate otolith tray and a unique otolith numbering sequence. Begin the archive otolith sequence with 5001. No archive otoliths will be collected in IPHC Regulatory Areas with a 100% sampling rate.

13.3.1 Setting up the Archive Otolith Tray

Archive tray bottoms are covered with black duct tape to visually distinguish them (some may be black rather than blue plastic). Fill out a lid label and label and place paper stars where appropriate: mark beginning and end of tray; beginning and end of trips; beginning and end of IPHC Regulatory Areas. Store the archive tray in a secure location until sealed for shipping; dry otoliths tend to bounce more if a tray is dropped.

13.3.2 Collecting Archive Otoliths

1. Collect both otoliths from selected fish.
2. Place the otoliths in a dry Tray Bien. Use one Tray Bien cell per pair.
3. Do NOT add glycerin to the archive otoliths.
4. Avoid metal contact after extraction.
5. Clean membranes and fluids thoroughly from otoliths using paper towels.
6. Discard any archive otolith pairs with a broken or crystalized otolith.

13.4 Fin Clip Sampling

A fin clip will be collected from every Pacific halibut selected for otolith sampling. Fin clips are placed on forms that correspond to the layout of the Tray Bien. A separate tray and numbering series are used for the archive otoliths; therefore, a separate fin clip form is used for the fin clips collected from clean archive fish.

13.4.1 Equipment and Equipment Maintenance

Vessels will be supplied with the following: clippers and shears for collecting fin tissue samples; desiccant packs; fin clip forms; and resealable plastic bags for storing fin clip forms. The clippers, shears, and desiccants are used for both tagged and otolithed fish fin clip collections, however, there are separate forms and plastic bags for the two collection types.

At the end of each day, spray hinged surfaces of tissue clippers and shears with WD-40 or other lubricant to prevent rust buildup. Wash the lubricant off the blades with soap and water before the first use of the day. Between fish samples, rinse clippers or shears with seawater to minimize cross-contamination.

13.4.2 Sampling Procedure

Collect a fin clip from all Pacific halibut for which an otolith is collected using clippers or shears (Figure 13.8).

1. With the clippers, snip a piece of tissue off the tip of the caudal fin (no larger than 0.5 cm by



0.5 cm, or roughly the size of your pinky fingernail (Figure 13.9). Fin clips must fit inside the cells on the paper with no overlap between cells!

2. Transfer the fin clip to the paper with forceps.
3. Clean the clippers and forceps by rinsing with seawater between fish, ensuring that any remaining material on the sampling tools is removed before using them on a new fish.*.

*See section 3 *Recording and Placing Fin Clips* below



Figure 13.8 Shears (left) for fin clip sampling

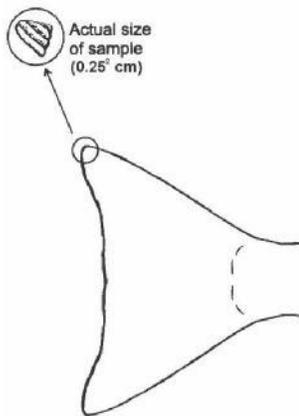


Figure 13.9 Fin clip location on caudal fin

13.4.3 *Recording and Placing Fin Clips*

The Fin Clip Form for Otolithed Fish is printed with 100 cells per form with a layout that matches that of the Tray Bien (i.e., five rows of 20 cells) (Figure 13.10). At the top of the form, record vessel code, trip, corresponding otolith number range, and date range. Place the fin clip in the cell on the Fin Clip Form that corresponds to the cell in the Tray Bien that holds that fish's otolith. Since the corresponding otolith range is recorded on the top of the Fin Clip Form, you do not need to write anything in the cells except for the following situations; if a fin clip was not collected or was lost, write "missed" or "lost" in the cell that corresponds to the otolith. It is important that the fin clip samples match the otolith samples! Fill the cells on the fin clip form from left to right, row by row (the same way otoliths are placed in the Tray



Bien), starting in the upper left cell. Make sure to spread the fin clip flat onto the form, so that it sticks to the paper, and dries faster. The intended analyses for fin clips from otolith-sampled fish require samples that have no cross-contamination. For this reason, it is important to clean sampling tools between individual fish and ensure that the fin clips are placed in the center of the cell on the form with no overlap between cells. Seawater should be used to rinse sampling tools since it is easy to replace/replenish on deck. A clean, empty soda or water bottle or jar can be used as a container and the water should be refreshed as often as possible. Care must also be taken to prevent the fin clip form from being sprayed with blood or slime, or with water which could wash material from fin clips to neighboring cells. Store fin clip sheet in a warm and dry location. Once a fin clip form is filled, allow form to dry completely.

Fin clips from otolithed fish Vessel: _____ Trip: _____ Oto range corresponding to fin clips _____ Date Range _____

Figure 13.10. Fin Clip Form for Otolithed Pacific Halibut

13.4.4 Storage and Shipping

Once a fin clip form is filled, allow form to dry completely then place in a 5” x 15” resealable plastic bag with desiccant packets. NOTE: because complete trips of otoliths must be sent to the office, this means that sometimes partially filled Tray Bienes are shipped to the office. However, fin clips are not processed in-season, so please wait until sheets are full to send fin clip forms to the office. For additional storage and shipping details, see the Mailing and Storing Data and Samples chapter in the Reference Manual.

13.4.5 Other:

In IPHC Regulatory Area 2A, without a shack, you may want to use a clean tray bien to place the fin clips in temporarily so that the clip form stays clean, and transfer fin clips to the form at the end of the haulback.



14. TAG RECOVERIES

Tagged fish may be recovered. Recovered tagged Pacific halibut will be sampled to obtain data on size, age, sex, and migration. They are not to be re-released except in a few instances (see below). In most cases, you will sample the tagged fish.

14.1 Sampling Tagged Pacific Halibut

1. Remove tag from fish and collect both otoliths from tagged Pacific halibut, regardless of otolith condition, and place them with the tag in a Tag Recovery Envelope. Instructions for filling out the Tag Recovery Envelope are detailed below. **DO NOT place tag recovery otoliths in the tray bins, even if the recovered tagged fish was selected for otolith sampling.**
2. If a Pacific halibut with a type J tag is recovered, take a photo of the white side of the tail (place the blue craft mat provided under the tail and include piece of paper with tag number in the photo). See Figure 14.2.
3. Take a tissue sample from the Pacific halibut unless re-released.

14.1.1 Instructions for re-release of tagged Pacific halibut

Pacific halibut may only be re-released if fish is viable, recently wire-tagged, and recovered by the same vessel that tagged it.

If a tagged Pacific halibut meets the criteria for re-release, leave tag on fish, but record tag number and length and return to sea as quickly as possible. Do not take a tissue sample. Record the re-release and report to FISS- HQ.

14.2 Tag Recovery Envelope

INTERNATIONAL PACIFIC HALIBUT COMMISSION TAG RECOVERY												
Tag Number				Type		Recovery Date (capture date)						
						Day		Month		Year		
Latitude / Longitude (preferred) or Recovery Location								Statistical Area				
Gear Type						Depth (fathoms)		Re-released				
Longline	Trawl	Per	Handline	Unknown				Y / N				
Fork length		Weight (circle units)		Sex		Landing Port		Port Code				
cm		kg lb		M	F							
Data collected by: (circle one)											Otolith (both preferred)	
IPHC	Observer	Enforcement	Other	Fishing crew	Plant worker	Tissue	Tail Photo	Right / Left / Both				
						Y / N	Y / N					
Na	St	Vessel Number			Vessel Name							
Name, Street Address												
City, State/Province, Zipcode/Postal Code										Hat issued		
										Y / N		

Rev. 03/2020 IPHC Form-Tag Recovery

Figure 14.1 An example of a completed IPHC tag recovery envelope.

14.2.1 Data to Record on Envelope

Tag Number: Number as printed on the tag (number of digits varies by tag type).

Type: From tag type table.



Recovery Date (capture date): Date the fish was caught - day, month, year.

Latitude/Longitude (preferred) or Recovery Location: Record the latitude and longitude, IPHC Regulatory Area, charter region and station number (ex. 58°10.01' x 148°55.42'. 3A Gore Point Stn #4196).

Statistical Area: IPHC statistical area.

Gear Type: Circle the Longline box under gear type

Depth (fathoms): Depth where the tagged Pacific halibut was caught. Recorded in fathoms. Re-released: Whether tagged Pacific halibut was re-released. Circle 'Y' for yes, or 'N' for no. Fork Length: Length from head to fork of tail in centimetres (no decimals).

Weight (circle units): Enter dressed weight and circle the units you record.

Sex: Indicate male or female.

Landing Port: Port where the Pacific halibut was sold.

Port Code: 3-digit IPHC port code. Data collected by: Circle "IPHC". Tissue: 'Y' if collected.

Tail Photo: 'Y' if photo taken of white side of tail (photo only needed for type J wire tags).

Otolith: Circle Both.

Na: Nation where the vessel is licensed (1=U.S.A., 2=Canada)

St: State where the vessel is licensed (AK=1, BC=2, WA=3, OR=4, CA=5)

Vessel Number: The identifying number from the vessel that collected the tag. ADF&G number for Alaskan vessels, and VRN number for Canadian vessels.

Vessel Name: The full name of vessel in block letters.

Name and Address: Leave blank.

Hat Issued: Circle "N". Charter vessels do not receive rewards.

NOTE: some vessels may be supplied with older versions of the Tag Recovery Envelope which have slightly different format



Figure 14.2 Example photo of recovered J-tagged Pacific halibut tail. Tail should be photographed against blue background using the craft mat provided.