International Pacific Halibut Commission

Manual for Sampling Directed Commercial Landings (2022)

DISTRIBUTION:
IPHC Secretariat

BIBLIOGRAPHIC ENTRY
IPHC 2022. IPHC manual for sampling directed commercial landings (2022) *IPHC–2022–PSM01, 35 pp.*

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

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. SAMPLING DIRECTED COMMERCIAL LANDINGS

The sampling procedure for collecting otoliths, tissue samples, and associated length-weight data from directed commercial landings (also called Market Sample) is the responsibility of IPHC Secretariat. A sampling rate is determined for each port by IPHC Regulatory Area. The applicable sampling rate is calculated from the current year's fishery limits and estimated percentages of pounds landed in that port to allow for collection of the target number of otoliths/tissues and associated length-weight by IPHC Regulatory Area. The sampling rates are used to obtain representative and proportional samples to hailed weights.

IPHC Secretariat cooperate with plant personnel to ensure that sampling does not interfere with plant operations.

1.1 Canadian Landings

Canadian vessels fish under an Individual Quota (IQ) system. The captain is required to hail a port 24 hours before unloading Pacific halibut. Unloading of IQ fish in Canada may occur between 5:45 am and 9:30 pm. However, the majority (80%) of the landings occur between 7:45 am and 2:30 pm.

Archipelago Marine Research (AMR) port supervisors or validators are a valuable source of landings information, including landings not previously listed in Fishery Operations System (FOS). IPHC Secretariat should get to know and have a good rapport with AMR and work closely with them to be notified anytime a landing is comprised of Pacific halibut. If unsure that landing contains Pacific halibut, the Secretariat must be at the dock for the landing and ask the captain if any commercial Pacific halibut will be landed. An AMR validator validates the weight of the catch as Pacific halibut are unloaded. IPHC Secretariat also works closely with AMR and the processing plant to successfully obtain a representative sample of the landed catch. If there are problems with lack of landing notifications or sampling logistics, contact your supervisor at the IPHC Headquarters' (HQ) office.

1.2 U.S.A. Landings

Alaskan vessels fish under an Individual Fishing Quota (IFQ) system. Vessel operators in Alaska are required to notify National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement (OLE) three hours prior to unloading by completing a Prior Notice of Landing (PNOL). The landing must then occur within two hours of the time of landing given on the PNOL. The IPHC Secretariat is notified via email and text message regarding pending landings. The NOAA OLE may grant waivers allowing vessels to unload without waiting the required three hours. The IPHC Secretariat should work closely with NOAA OLE concerning notification when these waivers are given. If waivers occur frequently, inform your supervisor. Unloading of IFQ fish in Alaska may only occur between 6 am and 6 pm, under IFQ regulations.

1.2.1 IPHC Regulatory Area 2A Landings

Vessels in this IPHC Regulatory Area are not required to provide prior notice of a landing. However, the fisheries are often of shorter duration with multiple landings occurring in close proximity to each other. The Secretariat must work with plant personnel to know when landings are expected to occur.

1.3 Sampling Objectives

It is very important that samples be representative of total directed commercial Pacific halibut landed removals and random sampling techniques are followed. The Secretariat must adhere to the objectives listed:

1. Take samples from as many landings as possible on designated sampling days throughout

the season.

2. Sample at an equal proportion, throughout the season, by using sampling rates.
3. Sample at an equal proportion from week to week such that, if a sample day is missed in a given week, it should be made up in that same week if possible.
4. Aim to sample throughout the landing as it is most representative.
5. By following the sampling procedures in this manual, work toward achieving each port's share of the target otoliths-tissues and length-weight measurements by IPHC Regulatory Area.

1.4 Sampling Rates by IPHC Regulatory Area

The sampling percentages are calculated for each IPHC Regulatory Area by port to ensure the samples are evenly distributed over the landings from all ports where sampling occurs. The target is to collect 1,500 biological structures (otolith and tissue samples) and associated length-weight measurements from each of the IPHC Regulatory Areas 2B, 2C, 3A, 3B, 4A, 4B, and 4CD. For IPHC Regulatory Area 2A, the target is 650 otoliths from Tribal Indian Commercial landings and 350 otoliths from Non-tribal Directed Commercial landings. Depending on the need, extra samples may be requested for the Clean Otolith Archive Collection.

The sampling goal is to sample a percentage of the total weight landed. The number of fish in the sample will depend on the average size of fish in the landing. For two landings with equal landing weights, a landing where fish are larger than average will be represented by a few otoliths and a landing where fish are smaller than average will be represented by many otoliths, consistent with the relative numerical abundance of those sizes in the combined landings.

To achieve the prescribed sample weight, the Secretariat must obtain (from the captain or the PNOL/FOS hails) an estimate of the total landing weight by IPHC Regulatory Area. This will be an estimate of the net weight of Pacific halibut being landed, such that the realized sampling rate for individual trips may vary from landing to landing. This is acceptable as long as the deviations from the target rate are unrelated to the size composition of the landings.

In IPHC Regulatory Area 2A, landings are smaller and the captain may not have an accurate estimate of the total weight. Therefore, obtain a sample from these landings by using a ratio rather than a percentage.

Table 1. Sampling rates by port and IPHC Regulatory Area, displayed as percentages.

Port	2B	2C	3A	3B	4A	4B	4CD
Dutch Harbor/Akutan	2	5	1	3	7.5	7.5	7.5
Homer	2	5	1	3	7.5	7.5	7.5
Juneau	2	5	1	3	7.5	7.5	7.5
Kodiak	2	5	1	3	7.5	7.5	7.5
Petersburg	2	5	1.5	3	7.5	7.5	7.5
Port Hardy	2	5	1	3	7.5	7.5	7.5
Prince Rupert	2.5	5	1	3	7.5	7.5	7.5
Seward	2	5	1	3	7.5	7.5	7.5
Sitka	2	5	1	3	7.5	7.5	7.5
St. Paul	2	5	1	3	7.5	7.5	7.5
Bellingham	2	5	1	3	7.5	7.5	7.5
Vancouver	2.5	5	1	3	7.5	7.5	7.5

Table 2. IPHC Regulatory Area 2A sampling rates by fishery.

Fishery	Sampling Rate (%)	Sampling Rate (Ratio)
directed commercial	10	1 in 10
incidental to longline sablefish fishery	10	1 in 10

Table 3. IPHC Regulatory Area 2A Tribal Indian commercial sampling rates by percentage and ratio.

Tribe	Sampling Rate (%)	Sampling Rate (Ratio)
Hoh	10	1 in 10
Jamestown S'Klallam	5	1 in 20
Lower Elwha Klallam	5	1 in 20
Lummi	15	1 in 7
Makah	11	1 in 9
Nooksack	10	1 in 10
Port Gamble S'Klallam	5	1 in 20
Quileute	5	1 in 20
Quinault	7	1 in 14
Skokomish	10	1 in 10
Suquamish	10	1 in 10
Swinomish	5	1 in 20
Tulalip	10	1 in 10

Table 4. Average Pacific halibut gross weight by IPHC Regulatory Area

IPHC Regulatory Area	Average Weight (kg)	Average Weight (lb)
2A	7.3	16
2B	12.7	28
2C	13.1	29
3A	10.0	22
3B	11.3	25
4A	10.9	24
4B	10.4	22
4C	12.7	28
4D	12.2	27

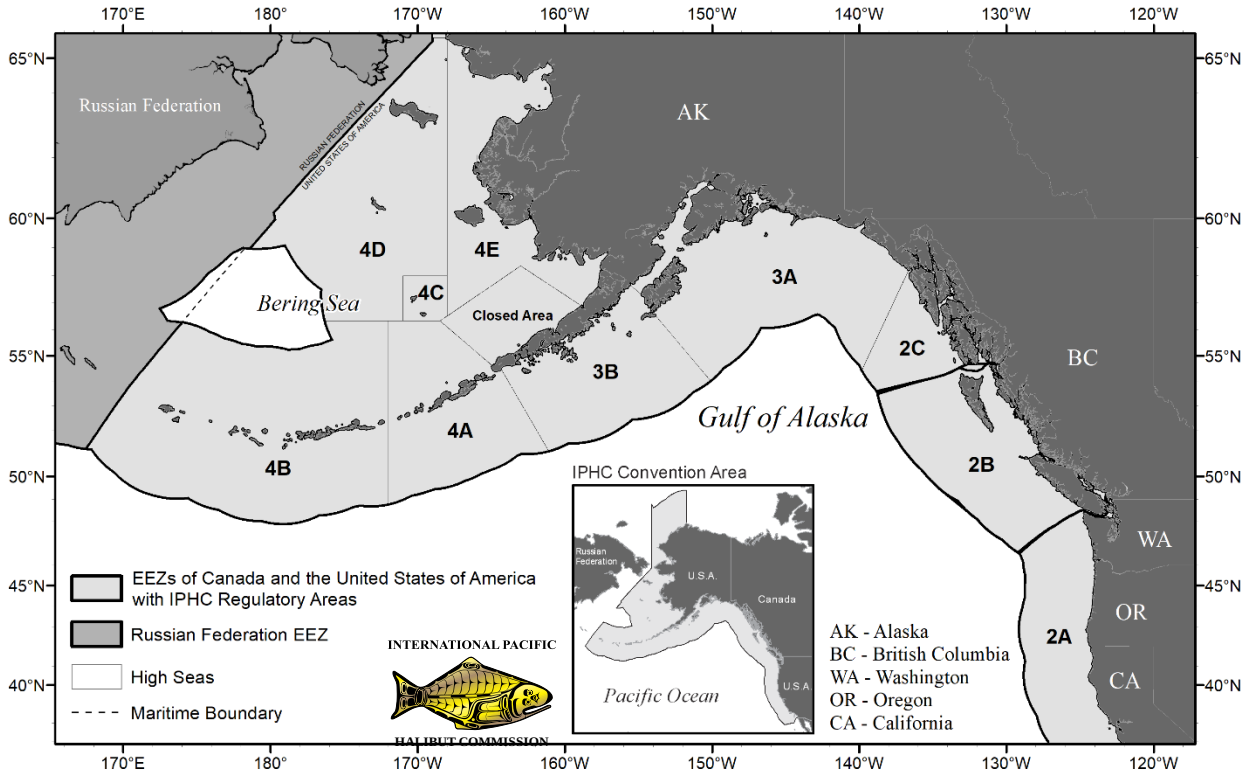


Figure 1.1. IPHC Convention Area and Regulatory Areas.

1.5 Sampling Landings with Pacific halibut from more than one IPHC Regulatory Area

Pacific halibut retained from more than one IPHC Regulatory Area during a single trip must be sampled separately. IPHC Fishery Regulations require Pacific halibut to be separated by IPHC Regulatory Area in the hold (either physically, by storing fish in separate pens in the hold, or by marking the fish in some way, e.g., rubber banding the tail to distinguish fish from different areas). Confirm with the captain and unloading crew whether the fish really are separated by IPHC Regulatory Area. If the Pacific halibut are not separated, do not sample the landing, unless from IPHC Regulatory Area 4CD. IPHC Regulatory Area 4CDE/Closed is considered one area for management purposes.

When a vessel lands catch from more than one IPHC Regulatory Area, it is important to query the captain as to how much of the landing is from each IPHC Regulatory Area and how the catch is separated. For example, a vessel landing 18.1 t (40,000 lb) of Pacific halibut from IPHC Regulatory Area 3A and 3B into Homer, has 11.3 t (25,000 lb) of Pacific halibut from IPHC Regulatory Area 3A and 6.8 t (15,000 lb) from IPHC Regulatory Area 3B. This is determined after querying the captain. You would sample this as two landings, one for each IPHC Regulatory Area.

1.6 Selection of Sample Days

It is important that as many landings as possible have a probability of being sampled so that the sampled Pacific halibut are representative of the population of retained Pacific halibut. To ensure representativeness, the weekly sampling schedule is randomized so that landings on any day have an equal chance of being selected for sampling. **Any changes to the sampling calendar must first be approved by the Fisheries Data Services Branch Manager.**

1.7 Sampling Priorities

Use judgment when you have conflicts with more than one vessel landing at a specific time. For example, if two IPHC Regulatory Area 3A vessels are unloading at the same time, sample the one with the greatest poundage except on small landing days. On small landing days, small landings take priority. When there are no small landings, sample large landings.

Alternatively, if you have several vessels at different plants, but the plant where you are working has a constant unloading schedule, you should stay at that plant and sample rather than dash around. Below are the priorities by IPHC Regulatory Area for Canada and U.S.A.

In Canada, the sampling priorities by IPHC Regulatory Area are:

1. Area 4B
2. Area 4CD
3. Area 4A
4. Areas 2A, 2B & 2C
5. Areas 3A & 3B

In U.S.A., the sampling priorities by IPHC Regulatory Area are:

1. Area 2A
2. Area 4B
3. Area 4CD
4. Area 4A
5. Area 2C
6. Area 3B
7. Area 3A

1.8 Sampling Procedures

1. Assess the most likely and appropriate approved sampling method to be used (line, table, strap, tote, etc. – see below).
2. Prior to sampling a landing, be sure to check with the captain regarding which IPHC Regulatory Area(s) were fished and the accompanying hail by IPHC Regulatory Area.

   Pacific halibut retained from multiple IPHC Regulatory Areas during a single trip must be sampled separately (**see section 1.5 above:** Sampling Landings with Pacific halibut from more than one IPHC Regulatory Area**).**
3. Convert the hail weight from net weight to head-on weight by multiplying by 1.1.

   hail weight *1.1 = gross weight of fish being landed
4. Apply the applicable sampling rate(s) to the gross weight to arrive at the weight of fish to sample.

   gross weight of fish being landed * sampling rate = Target Sample Weight
5. Now that you have your sample size, you will find your sampling frequency (*n*) and collect fish until you reach your target sample size. This step will be different dependent on the sampling situation, many of which are covered below.

6. To determine when the target sample weight is obtained, use a running total of the real weight of fish in your samples rounded to the nearest whole pound. A good practice is to add up each column of four fish corresponding to the otolith box, and then add that across as multiple columns are filled.
7. Stop sampling when you are within half the average weight of a Pacific halibut for that IPHC Regulatory Area (Table 4) from your target sample weight. For example, if your target sample size is 205 kg (451 lbs) for a landing from IPHC Regulatory Area 3A you would stop sampling when you reach 200 kg (440 lbs) because 5 kg (11 lbs) is half of the average weight of a Pacific halibut in that IPHC Regulatory Area.
8. For each sampled fish, measure fork length and weight (both unwashed and washed preferred), extract the blind-side otolith, and obtain a fin clip.

Samples must be obtained throughout the entire landing as this allows for the most representative sample. **Obtain a fishing log for each trip sampled. Logs should either be copied or physically collected whichever is appropriate for the given situation.**

The aim of the following sections is to explain what qualifies as a good sampling strategy so that when faced with various and changing conditions, you can devise procedures appropriate to each unloading site.

The basic sampling challenge is how to draw a "representative" sample of a certain size (i.e. weight) from a landing. The guiding principle in designing a sampling procedure is that every fish in a sampled landing has an equal chance of appearing in the sample. Stated another way, there should be nothing that makes one fish more likely to appear in the sample than another fish.

Achieving this objective in practice requires a procedure that can be performed mechanically, with no opportunity whatsoever for choosing fish arbitrarily. A more casual approach to selecting the sample will often result in a bias by providing opportunities to exercise some degree of choice in which fish to sample.

Each sampling procedure detailed below provides a "mechanical" sampling method to ensure that a random sample is taken. However, landing procedures may vary at the various ports and plants from year to year. To comply with one of the approved sampling methods, at the beginning of the season, the IPHC Secretariat visits each port to assist with establishing and refining sampling procedures. The approved procedures by port are documented within the first month following an internal review and approval process. Sampling methods and procedures are discussed below and listed in order of preferred method.

1.8.1 Sampling off the Line

The best approach is to sample at a point where all the fish pass by singly and may be sequenced. A conveyor belt on the way to the header is ideal, but a plant worker feeding fish to the header or to boxes or totes may also be viewed as a sequencer.

1. Pick a sampling frequency; every n^{th} fish (e.g. every fifth fish, or every tenth fish) that will ensure the sample is spread throughout the landing.
    a. Sample weight/average weight of a fish (Table 4) = number of fish in your sample
    b. Number of fish in the landing / number of fish in your sample = approximate sample frequency (*n*)

    This *n*, you would adjust as you do not count fish that go by as you are actively sampling one, so it would be a little lower. If about 10 fish go by while you are sampling, you can try multiplying the number of fish in your sample by 10 and subtracting that number from the number of fish in the landing in step b. You should become adept at choosing an appropriate *n* such that reaching the end of the landings and obtaining the required target weight occur at the same time.

2. Randomly choose a starting fish from the numbers between one and *n* inclusively. For example, if your *n* is 5, choose from one to five.
3. Sample this n^{th} fish by removing the otolith and obtaining a fin clip, fork length, and weight.
4. Return the sampled fish to the line.
5. Count the passing fish until you reach *n* and sample this fish. Note, that you do not count the fish passing while you are sampling your previously selected fish.
6. Repeat steps 4-6 until you have reached the end of the landing, or the target sample weight has been obtained.

Table 5. Average gross weight (kg) of Pacific halibut for length intervals.

Length (cm)	2A	2B	2C	3A	3B	4A	4B	4CDE
0 - 81	10	10	10	10	10	10	10	10
82 - 98	15	15	15	15	15	15	15	15
99 - 114	30	30	25	25	30	25	25	30
115 - 131	45	45	45	40	45	45	40	45
132 - 146	70	70	60	60	70	60	60	60
147 - 156	90	90	80	80	90	80	80	90
157 - 168	110	110	110	100	110	100	100	110
169 - 175	130	130	130	120	130	120	120	130
176 - 185	160	150	150	140	160	140	140	150
186 - 199	190	190	180	170	190	180	170	180
200 - 209	230	230	220	200	240	210	210	220
210 - 219	270	270	260	240	280	250	240	260

Table 6. Average gross weight (lb) of Pacific halibut for length intervals.

Length (cm)	2A	2B	2C	3A	3B	4A	4B	4CDE
0 - 81	22	22	22	22	22	22	10	10
82 - 98	33	33	33	33	33	33	33	33
99 - 114	66	66	55	55	66	55	55	66
115 - 131	99	99	99	88	99	99	88	99
132 - 146	154	154	132	132	154	132	132	132
147 - 156	198	198	176	176	198	176	176	198
157 - 168	243	243	243	220	243	220	220	243
169 - 175	287	287	287	265	287	265	265	287
176 - 185	353	331	331	309	353	309	309	331
186 - 199	419	419	397	375	419	397	375	397
200 - 209	507	507	485	441	529	463	463	485
210 - 219	595	595	573	529	617	551	529	573

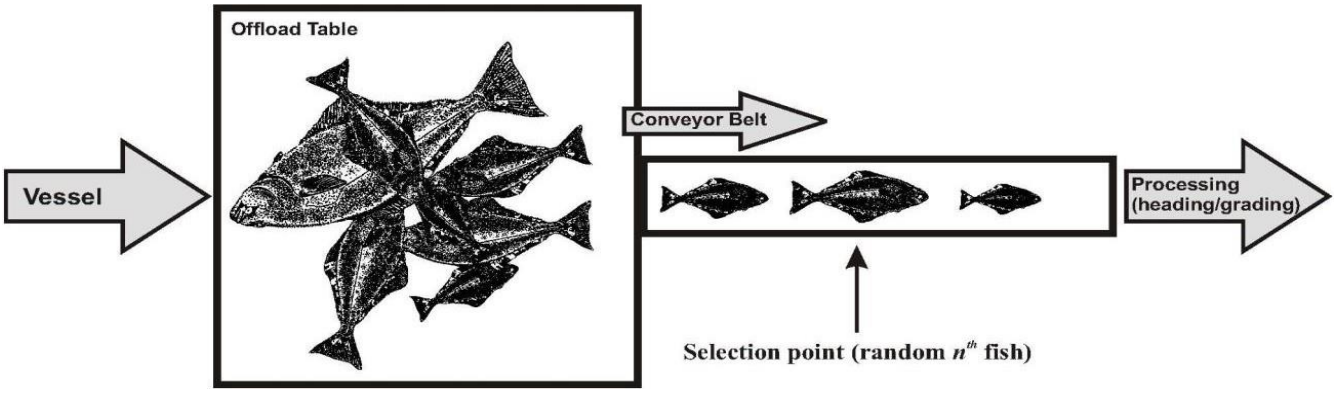


Figure 1.2. Depiction of line sampling.

1.8.1.1 IPHC Regulatory Area 2A Sampling off the line

Many IPHC Regulatory Area 2A landings are small and may consist of less than 10 fish. Therefore, follow these steps:

1. Use the applicable sampling ratio listed in Table 2 or Table 3. This assumes the presence of a sampling partner to count passing Pacific halibut while a fish is being processed. If sampling alone, select a lower sampling frequency that will ensure enough fish are sampled throughout the landing to reach your prescribed target sampling weight.
2. Randomly choose a starting fish from the numbers between one and *n* inclusively.
3. Maintain a tally of the fish from every landing, sampling your n^{th} fish throughout the season until you are done with sampling for the season. This requires you to keep tally throughout the season. Only include trips where you would be available to sample.

1.8.2 Sampling off the table

If the fish cannot be sequenced, the sample must be drawn from the table when the fish are dumped from slings. One drawback to sampling off the table is that a variable and unpredictable proportion of large fish is unloaded with straps rather than in slings. The method is to obtain randomly selected fish off the table from each sling as well as randomly selected strap fish until the required sample weight is obtained. It is very important to sample strap and sling fish at the same rate. The goal is to ensure target sample weight is reached while also spreading the sample throughout the landing.

1.8.2.1 Sling fish

1. Determine the number of fish to be sampled from each sling (*n*).
    a. Weight of a sling / Average weight if a fish listed in Table 4 = Number of fish in a sling
    b. You can ask the dock/plant worker how much a typical sling weighs if they give you a range, like 454 - 544 kg (1000-1200 lbs), go with 454 kg (1000 lbs) to ensure you don't under sample, and adjust overtime to ensure you sample throughout the landing.
    c. Gross weight of landing (net hail weight * 1.1) / Average weight if a fish listed in Table 4 = number fish in the landing
    d. Number of fish in the landing / Number of fish in a sling = Number of slings
    e. Sample size / Average weight if a fish listed in Table 4 = Number of fish in your

sample

f. Number of fish in your sample / Number of slings = Number of fish to sample in each sling (*n*).

2. For each sling, pick a point on the table and select *n* fish to be sampled whose noses are closest to the chosen point. Do not choose a point that is close to the edge of the table as the large fish tend to spread/extend out to the edge of the table and choosing a spot here would favour the larger fish.

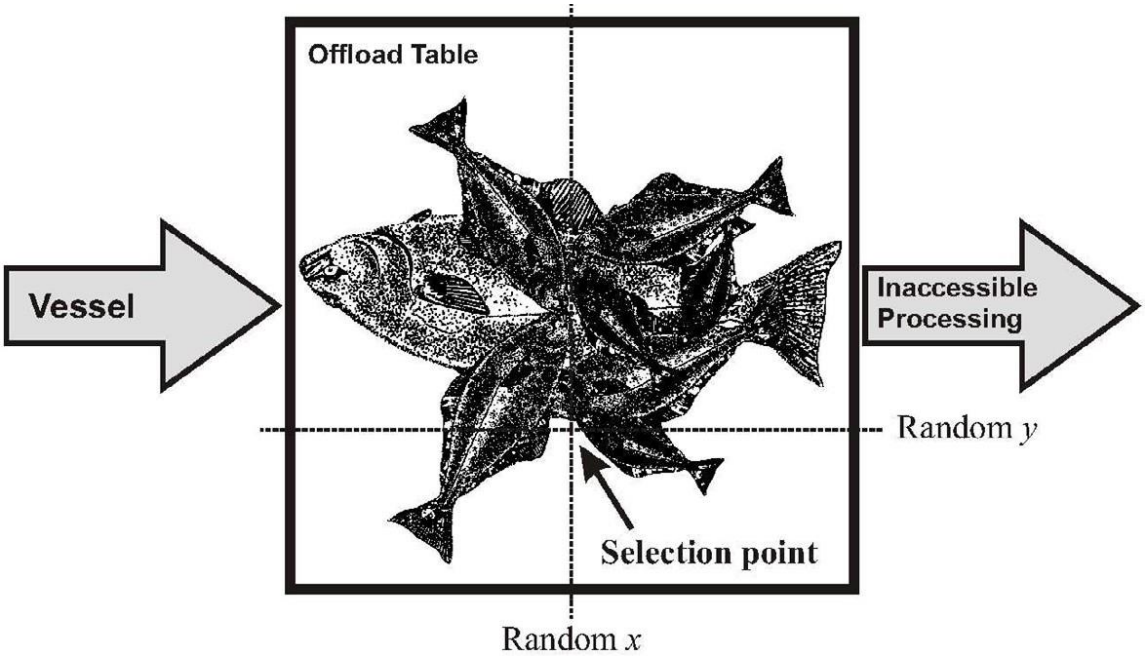


Figure 1.3. Depiction of table sampling

1.8.2.2 Strap Fish

1. Estimate the numerical sampling rate for sling fish and take a systematic sample of strap fish at the same rate as your sling fish.

   Number of fish you are sampling from each sling/number of fish in a sling = numerical sampling rate for sling fish

   For example, if at a particular plant a sling holds about 454 kg (1,000 lb) and you are selecting 2 fish averaging 13.6 kg (30 lb) from each sling, the numerical sampling rate for sling fish is 2 fish out of every 33 (1,000 lb ÷ 30 lb) or about 1 in 16.

2. Sample strap fish at the numerical sampling rate.
3. Keep a running tally of the number of strap fish unloaded.
4. Pick a random number between 1 and n (between 1 and 16 in the above example).
5. Select the corresponding strap fish and every nth strap fish thereafter.
6. Continue sampling both sling and strap fish until the sample weight has been obtained.

If the target or the last part of the landing is consistently not being reached, the judgment that is being used to arrive at the number of fish that is removed from each sling/strap should be reviewed

Figure 1.4. Strap fish

1.8.3 Sampling from Totes

When tote sampling, choose a sampling frequency, i.e., every n^{th} sling or tote, which will ensure the sample is spread throughout the landing. A critical step in all sampling, whether sling, tote, or individual fish, is to ensure you get the unit that is selected. Failure to secure a selected sample is a serious matter. It has the same effect as choosing the sample arbitrarily. For example, should the random number table return the number 5, ask the forklift driver to bring you the fifth tote or sling from the landing.

Unacceptable ways of choosing your tote would include: having a forklift driver simply drop off whichever tote he decides to drop off; arbitrarily pointing at one tote and having the forklift driver drop it off.

Some landings are unloaded sling by sling. At most plants, slings are emptied into single totes or an array of totes, and the totes are trucked to the processing line. In these cases, either slings or totes could serve as the sampling unit.

The steps below outline how to choose your random sampled tote(s) or sling(s) and what to do when you do not need to sample a whole tote.

1. Weight of a tote / Average weight if a fish listed in Table 4 = Number of fish in a tote.

   You can ask the dock/plant worker how much a typical tote weighs (you will get better at this on your on over time) if they give you a range, like 454 - 544 kg (1000-1200 lbs), go with 454 kg (1000 lbs) to ensure you don't under sample, and adjust over time to ensure you sample throughout the landing. Keep in mind the weight of the fish in the tote will vary with the amount of ice in the tote. With practice, weight estimates for totes will become quite accurate. The weight of the final sample may not be precise every time, but on average, it should come close with some actual weights being over and some under.

2. Sample size / Average weight if a fish listed in Table 4 = Number of fish in your sample
3. Number of fish in a tote / Number of fish in your sample = Number of totes to sample
4. Gross weight of landing (net hail weight * 1.1) / Weight of a tote = Number of totes in the landing.

5. Number of totes in the landing / Number of totes to sample rounded to the nearest whole number = your sampling frequency (n).
6. Randomly choose a starting sling or tote from the numbers between one and n inclusively, obtain that tote/sling. For example, if you have a landing with 10 totes, and you need to sample 1.9 totes, you would choose a random number between one and five inclusively.
7. Obtain and sample every nth sling or tote until you reach the end of the landing, or the required sample weight has been obtained.

Ideally, all fish in a selected sling or tote will be sampled. However, where a full sling or tote is not needed to get the desired poundage or number of fish for the sample, a method for selecting sampled fish is needed.

8. Estimate the weight, in the tote (or sling) you have randomly selected.
9. Determine the proportion of fish in the tote needed for the sample. For example, if a tote holds 454 kg (1,000 lb) but only 136 kg (300 lb) are needed for the sample, you will need to sample 1 in every 3 fish:
10. Use the "watch method" to select fish.
11. Divide the seconds on a watch into the proportion of fish needed for the sample.
12. Line up that number of fish and number each fish.
13. Look at the watch and select the fish that corresponds to the section where the seconds hand falls.
14. For example, if 1/3 of a tote is needed, count three fish from the top of the tote. Then look at the watch, if the seconds hand falls between 1-20 seconds, select that fish to sample. The remaining two fish are not sampled.
15. Continue using the "watch method" to select fish throughout the entire tote to ensure all fish have an equal chance of being included in the sample.

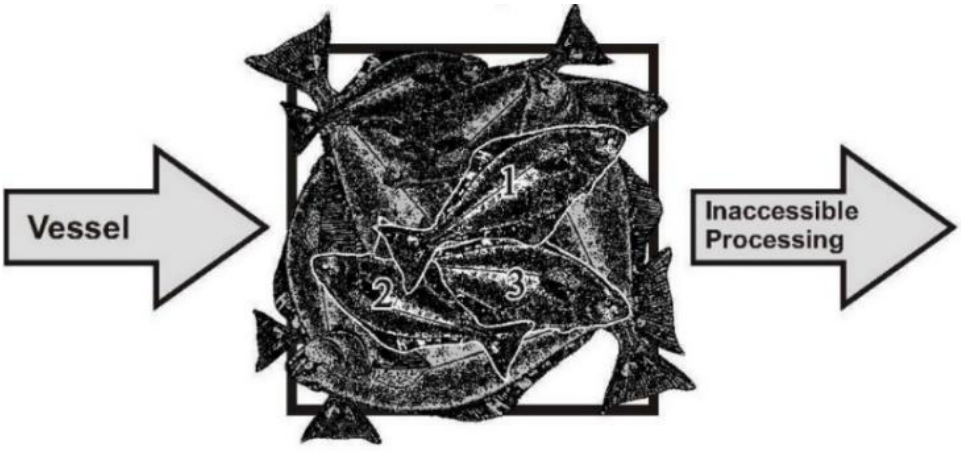


Figure 1.5. Depiction of tote sampling.

1.9 Pooling Landings for Sampling

It is important to sample all landings at the same rate. To decrease the number of possible conflicts (two or

more landings occurring at the same time) and to create a more practical sampling schedule, the requirement of sampling as many individual landings as possible may be relaxed by a system called pooling. Pooling requires the Secretariat to sum the hail weights of specific landings, based on the weight parameters listed in Table 7, and sample the vessel that brings the weight over that port's prescribed threshold for pooling. To be objective about the choice of vessel to sample, the FDS(F) must maintain a running total of the pooled landings by vessels available for sampling.

Table 7. Weights included and excluded from pool by location.

Ports	Exclude from Pool	Include in Pool
Port Hardy	<0.5 t and ≥2.3 t (<1000 lb and ≥5000 lb)	≥0.5 t and <2.3 t (≥1000 lb and <5000 lb)
Prince Rupert	<0.5 t and ≥2.3 t (<1000 lb and ≥5000 lb)	≥0.5 t and <2.3 t (≥1000 lb and <5000 lb)
Dutch Harbor	<0.5 t and ≥2.3 t (<1000 lb and ≥5000 lb)	≥0.5 t and <2.3 t (≥1000 lb and <5000 lb)
Homer	<0.9 t and ≥9.1 t (<2000 lb and ≥20000 lb)	≥0.9 t and <9.1 t (≥2000 lb and <20000 lb)
Juneau	<0.9 t and ≥2.7 t (<2000 lb and ≥6000 lb)	≥0.9 t and <2.7 t (≥2000 lb and <6000 lb)
Kodiak*	<0.5 t and ≥11.3 t (<1000 lb and ≥25000 lb)	≥0.5 t and <11.3 t (≥1000 lb and <25000 lb)
Petersburg	<0.9 t and ≥4.5 t (<2000 lb and ≥6000 lb)	≥0.9 t and <4.5 t (≥2000 lb and <6000 lb)
Sitka	<0.9 t and ≥2.7 t (<2000 lb and ≥6000 lb)	≥0.9 t and <2.7 t (≥2000 lb and <6000 lb)
St. Paul	<0.5 t and ≥2.3 t (<1000 lb and ≥5000 lb)	≥0.5 t and <2.3 t (≥1000 lb and <5000 lb)

***IPHC Regulatory Area 4 landings must be pooled to 2.3 t (5,000 lb) in all ports.**

**IPHC Regulatory Area 2A landings are not pooled.

1.9.1 Pooling Procedures

A running tally of vessels that fit the port's specific pooling weight parameters should be maintained. Only include vessels that could have been sampled in your pooling scheme. DO NOT include vessels that unloaded at a facility where sampling is physically impossible or vessels that were missed for any reason. Similarly, do not include vessels that unloaded on days that you did not work. Once the pooling threshold for your port is reached, the last vessel in the tally should be sampled to represent the total hail weight for all vessels in the pool.

Note: A separate pool (running tally) must be kept for each IPHC Regulatory Area. If a vessel lands Pacific halibut from two IPHC Regulatory areas, they should be pooled into each area respectively.

1. Pool vessels: chronological tally of all vessels for a given port and IPHC Regulatory Area.

   Example of pooled vessels for IPHC Regulatory Area 3A in Kodiak, Alaska

Date	Vessel Name	Hail
11 Apr	Misty Sea	2.3 t (5,000 lb)
11 Apr	Stormy	4.5 t (10,000 lb)
13 Apr	Lucky	3.6 t (8,000 lb)
15 Apr	St. Patrick	3.2 t (7,000 lb)

2. Pooled hail: total hail weight for all vessels in a pool.

   Above example: 13.6 t (30,000 lb)

3. Gross pooled hail: total hail weight for all vessels in pool multiple by the conversion factor.

   Above example: 13.6 t (30,000 lb) * 1.1 = 15.0 t (33,000 lb)

4. Sample weight: apply sample rate for the IPHC Regulatory Area to the gross pooled hail.

   Above example: 15.0 t x 0.01 = 0.2 t = 200 kg (33,000 lb x 0.01 = 330 lb)

5. Sample weight: sample weight to obtain from the last vessel (landing) in the pool.

   Above example: sample 200 kg (330 lb) from the fish landed by the St. Patrick on 15 Apr using the sampling methods approved for the plant where the vessel is landing.

1.9.2 Pooling with Totes

When sampling from totes or slings, the pool size should be such that your sample weight corresponds to at least one-quarter of the weight that the tote or sling holds. For example, for a tote holding 454 kg (1,000 lb) of Pacific halibut (net weight) the sample weight should be at least 113 kg (250 lb). Therefore, when sampling from totes, the sample rate for the IPHC Regulatory Area you are sampling must be at least 2.5% to allow you to pool to 4.5 t (10,000 lb). Pool size may vary from port to port, depending on trip sizes, sampling rate, and prevalence of tote-sampling.

1.10 Small Landings

Small landings are those that cannot be sampled as part of a pool because the sampling rate leads to more fish than the landing has available for sampling, or because of difficulties in selecting a representative sample.

For example, Sitka has a sampling rate of 5% for IPHC Regulatory Area 2C. If a 454 kg (1,000 lb) landing increases a pool's total in Sitka to 2.9 t (6,400 lb), then we wish to sample 145 kg (5% of 2.9 t, 5% of 6400 lb is 320 lb), which is difficult to do in some random manner from such a small landing and without impeding plant operations.

The five ports that must sample small landings are Bellingham, Juneau, Petersburg, Sitka and St. Paul. Small landings are to be sampled only on designated small landing days, specified in your sampling calendars and take priority over larger landings on these days.

Small landings should be sampled in the same way as large landings, except when the target sample weight for the landing is less than the average weight for one fish from that IPHC Regulatory Area.

1. If the target weight is $\geq$50% of the average weight of a fish from that area, randomly sample one fish from the landings.
2. If the target weight is <50% of the average weight of a fish, sample one fish from the landing with probability equal to the ***target weight divided by the average weight of a fish for that IPHC Regulatory Area.***

For example, you have landing of 30 lb from 2C. The sampling rate is 10%, so you need 3 lb. The average weight of a fish for 2C is 26 lb. 3/26 = 0.2. Therefore, you sample a single fish with probability 0.2 (or a 2 in 10 chance of sampling one fish).

In this example, you should use a random number table (0-9). If the number is either 1 or 2, sample a fish; if it is greater than 2, or is zero, do not sample.

Sampling one or two fish from a full tote can be very challenging. The simplest and easiest way to do this is to sequence the fish whether it is as they come out of the tote or go into the tote. This can either be done as the Pacific halibut are loaded into the brailer, on the vessel, or as the fish are taken out of the tote to be funneled down the processing line. In either situation, line-sampling procedures should be followed. This may impact the plant's processing procedures. However, collecting samples from small landings where tote

sampling is normally conducted is rare.

1.10.1 Sampling Small Landings

Small landings are defined to be those under 0.9 t (2,000 lb) in Bellingham, Homer, Juneau, Petersburg, and Sitka and under 454 kg (1,000 lb) in all other British Columbia and Alaska ports. Small landings contribute a significant proportion of the total landed catch. For recent years of sampling (2016-21), the following table gives the proportion of small landings. Data are only shown if there were at least ten small landings in one of the five years

Table 8. Proportions of small landings by port.

Port	IPHC Regulatory Area	2016	2017	2018	2019	2020	2021
Port Hardy	2B	1.0%	1.1%	1.3%	1.9%	0.8%	1.3%
Prince Rupert	2B	0.6%	0.5%	0.3%	0.5%	0.5%	0.5%
Dutch Harbor	4A	1.0%	0.5%	1.1%	0.9%	1.1%	0.6%
Petersburg	2C	12.4%	10.9%	10.9%	15.5%	15.6%	13.4%
	3A	0.8%	0.8%	0.5%	5.2%	10.7%	5.9%
Sitka	2C	14.8%	16.4%	18.7%	19.7%	20.6%	21.4%
	3A	6.3%	3.4%	7.4%	6.9%	5.7%	5.6%
Juneau	2C	13.5%	9.2%	6.4%	8.3%	6.1%	5.8%
	3A	4.0%	3.3%	5.4%	3.6%	3.9%	3.6%
Seward	3A	2.6%	2.0%	1.4%	1.3%	2.2%	2.0%
Homer	3A	5.0%	5.9%	5.3%	3.6%	3.3%	3.1%
	3B	1.3%	0.5%	0.3%	0.9%	0.3%	0.7%
Kodiak	3A	0.9%	0.6%	0.6%	0.7%	0.5%	1.1%
	3B	2.8%	2.5%	4.4%	4.0%	2.6%	3.2%
St Paul	4C	26.9%	10.7%	14.5%	16.1%	0.4%	NA

Ideally, we would sample small landings in proportion to their share of commercial landings. In practice, this can be difficult to achieve because of their infrequency in many ports, or due to multiple conflicts in ports such as Sitka. Small landings in IPHC Regulatory Area 2C ports and St. Paul only are sampled at a rate of 10% on 20% of the sampling days; one small landing day is randomly selected in each five-day sampling week. In shorter sampling weeks, as in St. Paul, which has four sampling days per week, a single small landing day is selected with probability $d/5$, where d is the number of sampling days in that week. Ports that receive less frequent small landings will not sample small landings.

A sampling schedule for the entire season is prepared by the IPHC Secretariat in advance for each port. It is important to follow the calendar closely to avoid any biases. **Any changes to the sampling calendar must first be approved by the Fisheries Data Services Branch Manager.**

1.11 Sample Collection and Preparation

Before collecting the sample, prepare your workstation. Set up your sampling table and scale, knife, forceps, fin clippers, chromatography paper, plastic slate, and pillboxes.

We use pillboxes to store the otolith samples. The box consists of an outer housing with removable, sliding

cell covers, a colored plastic tray, an inner 28 cell tray (which may be painted black), and a grid card (which is provided with your sampling gear). The inner trays have numbers embossed into the bottom of each cell; (1 – 4 from top to bottom for each of the seven "days" or columns). Check to make sure the embossed number 1s on the inner tray are at the top when inserted into the outer plastic tray. It is not necessary to disassemble the box when taking your sample. Simply pull the clear plastic cover for the row you are working on and place the otolith in the appropriate cell. Notice that some pillboxes will not allow the clear plastic cover to open unless the colored button on the upper right side (near SAT 7AM-9AM) is pressed simultaneously.

Figure 1.6. Otolith sampling "pill box".

1.12 Otolith Cutting Procedure

1. Cut the top off the auditory capsule with a knife, being careful not to cut so deeply that the otolith is broken or knocked out of reach.
2. Use forceps to remove the otolith and insert it in the appropriate box cell.

REMEMBER: Take only the blind side otolith.

3. Record the fork length and weight(s) of the Pacific halibut sampled such that they correspond to the correct otolith.

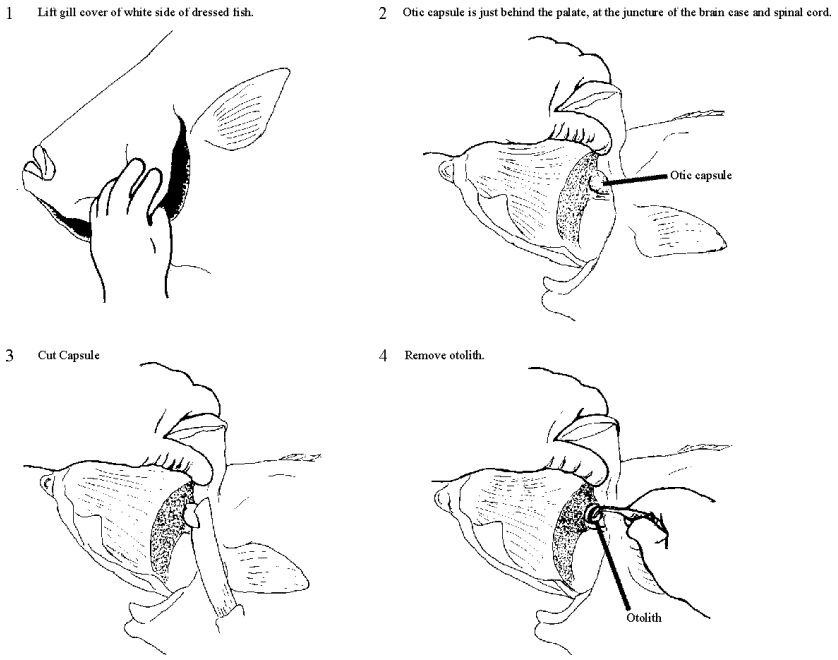


Figure 1.7. Removing a Pacific halibut otolith.

1.13 Otolith Issues

Depending on your sampling procedure, you may have to "make up" poundage for "lost" otoliths.

1. If line-sampling and a fish you selected had a crystallized otolith, an external tag, the otolith was shattered, the fish was sinistral, or you were unable to find the otolith, you would not include that fish's weight (and corresponding length) in your cumulative sample weight.

***Note if your selected fish had a crystallized otolith; keep the otolith, fin tissue and length-weight data. Enter 'TRUE' for Crystalized otolith in the PowerApp. When completing the market sample report, enter the box and cell number(s) and "Crystallized" in the comment section.**

Sample the next fish in line and then continue selecting fish until you have reached your target sample weight, if applicable.

2. If the sling or tote is your sampling unit, you would NOT replace a fish that had a damaged or unobtainable otolith by selecting an additional fish from outside the sling or tote. However, use your own judgment in this matter. If an unusually large number of fish in a sling or tote had crystallized otoliths or if you lost many otoliths, you would start over with a new sling or tote (discarding any otoliths you had collected from the unusual sling/tote). High rates of otolith loss can occur if the fish were heavily infested or eaten by sand-fleas (the membrane and fluids around the otoliths are consumed by the fleas and the otoliths disappear inside the head) or if the fluid surrounding the otolith becomes frozen, in which case the otoliths are impossible to extract or shatter when removed.

Refer **Appendix I** in this handbook for images to help you identify crystallized or right-side otoliths.

1.14 Filling Sample Otolith Boxes

1. After the otolith is extracted, remove any attached membrane from the otolith by wiping it on the back of your gloved hand or rinsing in a cup of clean water.
2. Place the otolith in the appropriate cell in the box. Boxes are filled top to bottom, left to right, starting at the top left (Sunday morning). Do not leave empty cells between samples.
3. When the row of cells is filled, cover the cells with the clear plastic strip. It is important to cover the cells before opening the next row in case the box tips or is knocked and the otoliths are either lost or dislodged.
4. Fill all 28 cells and if you run out of room for the sample, continue the sample in a new otolith box. Keep samples in consecutive order. Do not jump from box to box and back again.
5. As soon as possible, put a few drops of 50% glycerin-water solution on each otolith, just enough to cover the otolith completely.
6. Clean the outside of the boxes if they have slime on them. Slimy boxes can become moldy by the time they reach the IPHC HQ. If you wash the outside of the boxes, make sure they dry and are stored somewhere dry prior to shipping. Mold can grow on moist boxes that are sealed in bags or stacked in a box for several weeks.
7. Prior to shipping to the IPHC Headquarters office, cover the otoliths with just enough cotton to soak up the excess glycerin and keep the otoliths from rattling around in the cells.
8. DO NOT over-stuff with cotton. This makes it difficult to remove the lid without the otoliths flying out, as the cotton expands.

9. Place the boxes into ziploc plastic bags.
10. Label each box with a completed pillbox label on Rite in the Rain® paper (Fig. 1.8), record your initials and Staff ID, port name, port code, and box number, as in Figure 1.8 and Figure 1.9. Also include notes on the label if there were any issues with the otoliths (e.g. lost or jumbled otoliths). If using the pillbox forms (Fig. 1.9), ensure that the length and weight data are recorded in the same cell as the corresponding otolith. Label the starting and ending sample for each vessel with the vessel's name. Record any lost otoliths.
11. Place the label on the top (face up) of the corresponding box of otoliths and secure with rubber bands.

Figure 1.8. Pillbox label on Rite in the Rain® paper: record your initials and ID, port name and port code, and box number.

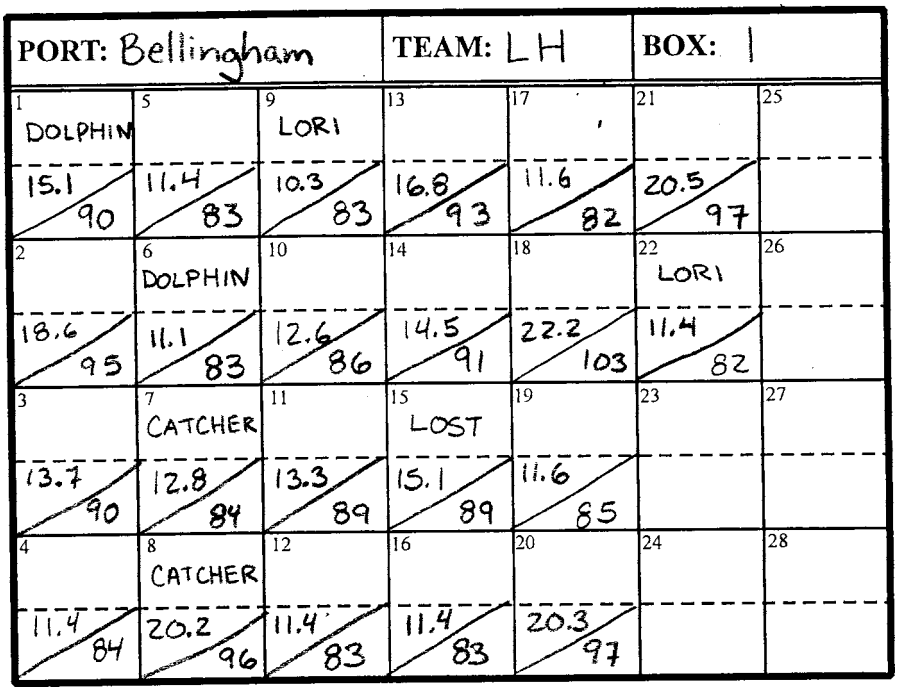


Figure 1.9. Pillbox form (used in IPHC Regulatory Area 2A and historically in all ports)

In the unfortunate event that a full pillbox spills and the contents are mixed, we can still use the ages independently from the lengths and weights. Just note which cells are mixed.

Ship otoliths and tissue samples to the IPHC HQ twice a month (on the 1st and 16th) with accompanying logs. Send complete samples, even if it means sending a partially empty otolith box. Remember to submit the Market Sample and OWL reports prior to mailing the otoliths and tissue samples.

1.15 Tissue Sample (fin clips)

For each sampled fish, a tissue sample must be taken. Tissue samples are placed on chromatography paper forms and dried.

1. Enter your Staff ID code in the header section as you prepare to use each sheet, along with the box # of the corresponding otoliths, port code, and year.
2. Tissue samples must be taken from a fin; preferably the tip of the pectoral fin (see Figure 1.10). Try to take clips that are about 1 x 1 cm to 1 x 1.5 cm (½" x ½" to ½" x ⅔") in size (see Figure 1.11). This size ensures that clips fit inside the printed cells of the tissue sample form and provides enough tissue for multiple genetic tests from each clip.

Many Secretariat find that it is more efficient to temporarily place the tissue samples in the pill box in the same cell as the corresponding otolith. Once the sample is complete for the vessel, the tissue samples can be transferred to the chromatography paper.

Be careful not to allow the tissue samples to dry out or the tissue will not stick to the paper. When transferring to the chromatography paper, place the tissue samples in the same order as the otoliths (match). Make sure the tissues are laid flat on the paper. This maximizes adherence to the paper and speeds drying. Use forceps to spread the tissue sample as it is being transferred.

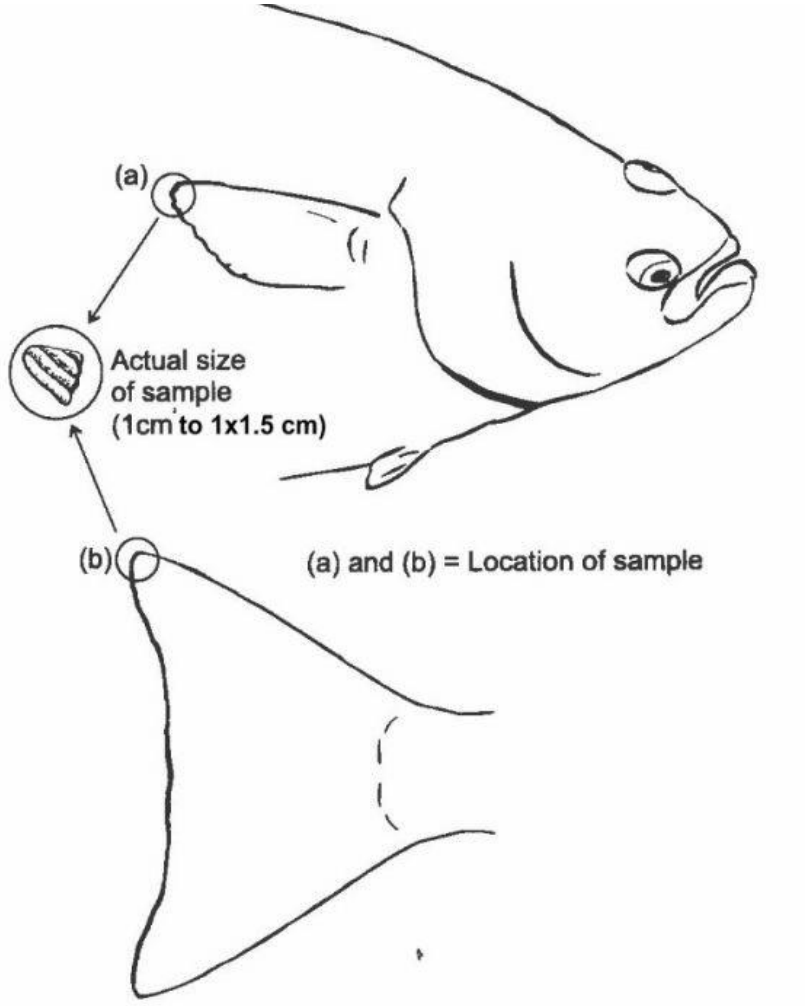


Figure 1.10. Convenient tissue collection location. Location A is preferred.

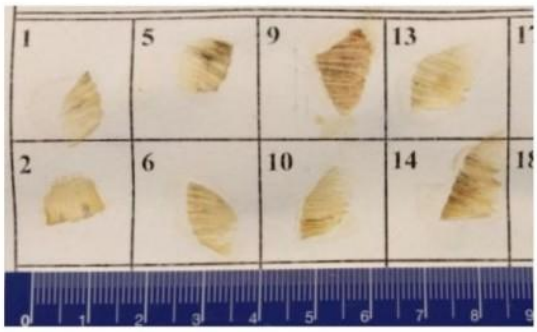


Figure 1.11. Tissue samples on paper.

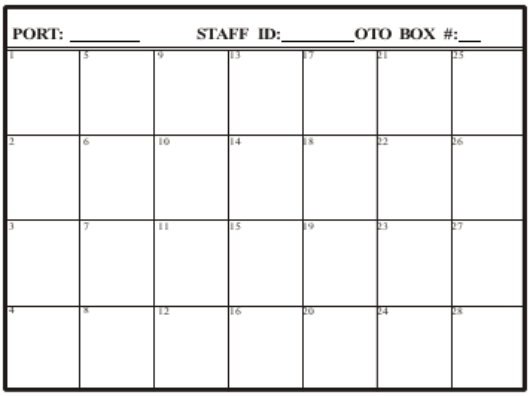


Figure 1.12. Tissue sample form .

1.16 Preserving and Shipping Tissue Samples

Upon completion of a day's sampling, allow each sheet of chromatography paper that contains a tissue sample to dry completely. Allow sheets to dry out after additional tissue samples are added. If not all of the cells on a sheet have been used for tissue samples, take a pencil and write an "x" in each of the empty cells prior to shipping. This way, we will be able to quickly distinguish cells that were not used from cells that might have their samples fall off in the future. Once the sheet is ready to mail, and completely dry, place the sheet in the resealable plastic bag, with two silica gel packets inserted on the backside of the paper (not the side with the tissue samples), then seal the bag. You will have two types of silica gel packets: smaller color-indicating packets (orange or blue) and larger non-indicating packets which are white. Use one of each.

NOTE: If the tissue samples do dry out before transferring to paper, they can be stuck with small strips of scotch tape to the appropriate cells on the paper. Similarly, if you notice a sample coming loose or one that falls off after the sheet is dry, reattach them with tape (in the case of multiple samples falling off a sheet, only re-attach if you can be sure from which cell the tissue came).

1.17 Pacific Halibut Lengths

The fork length of Pacific halibut is to be measured in centimetres, to the nearest centimetre.

1. Placed the fish on a flat surface and ensure the mouth is closed.
2. Measure the distance from the snout to the fork of the tail.

It may take a bit of engineering to find an acceptable place to measure Pacific halibut. The bookends/measuring tapes should help to do this correctly. A common mistake is not leveling the fish or

the measuring tape, or not laying the fish in a straight line. Check to make sure the bookends are not bent and that the measuring surface is flat, so that both the bookend and the measuring tape base are perpendicular to the surface. Measuring boards and the IPHC sampling cradles can be used to avoid this problem. **REMEMBER it is very important to match the Pacific halibut length, weight(s), and tissue sample with the corresponding otolith.**

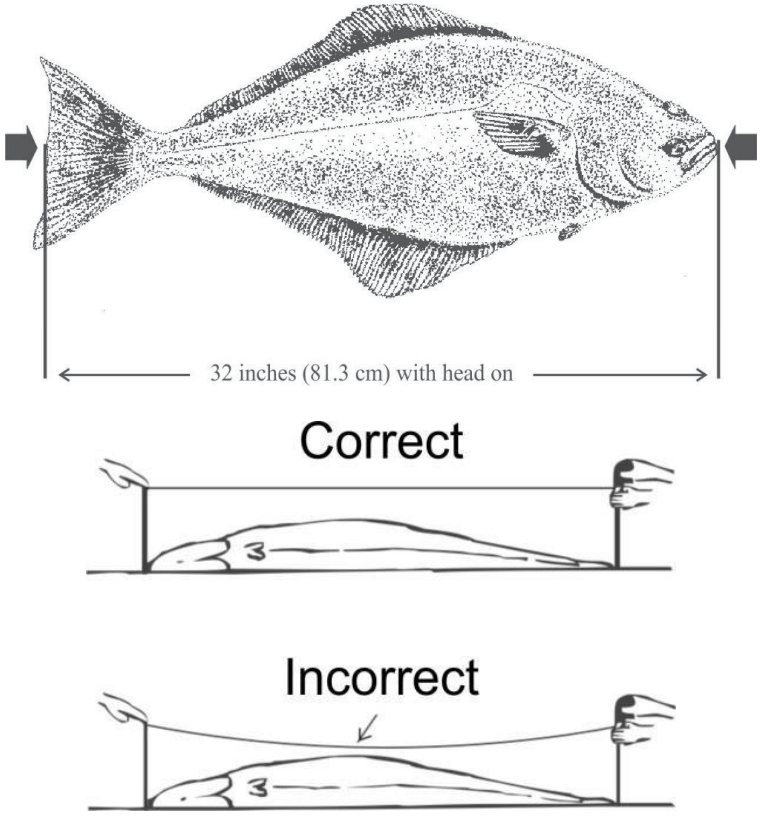


Figure 1.13. Sample Fork Length -- Total length between black arrows.

1.17.2 Length Measurement with the IPHC Sampling Cradle

Measure the Pacific halibut to the full cm mark that appears first to the right of the tail. For example, for a fish measuring 122 cm, the reading would be taken between 121 and 122 cm as it appears on the IPHC sampling cradle.

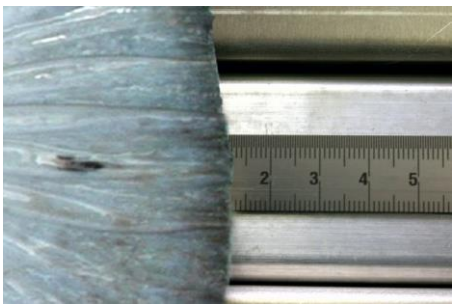


Figure 1.14. Fish measuring 122 cm.

1.17.3 Length Measurement with the Bookend

Measure the Pacific halibut to the ½ cm mark and round to the nearest whole number. For example, for a fish measuring 88 cm, the reading would be taken between 87.5cm and 88.5 cm.

Figure 1.15. Fish measuring 88 cm.

Record lengths in the field on an erasable plastic slate, directly onto the pillbox label, or in a Rite in the Rain® booklet. A slate or Rite in the Rain® booklet is easy to use in the field since it can be handled with slimy hands. It is prudent to capture an image of the data prior to erasing, should any clarifying questions come up later.

1.18 Pacific Halibut Weights

Each sampled fish will have its weight (head-on) recorded, as well as other condition (unwashed and washed) weights when possible. The nature of the processing operation in each plant will determine whether a fish is weighed washed or unwashed.

1. Weights must be taken to the nearest one tenth of a pound. When weighing the larger fish (i.e., >120 cm), weights to the whole pound are acceptable when using a plant's scale that does not have precision to one tenth of a pound. If weights are taken with a scale other than the IPHC provided scale, record the make and model of the scale used for each weight.
2. When more than one condition weight can be obtained for a single fish (i.e., unwashed and washed), the fish selected for measurement can be tagged around the tail using the provided colored Tyvek tags and rubber bands. You must record a unique number on each tag to track your selected fish and obtain the other condition weight. It is imperative to match each initial length-weight to any subsequent weight for a given fish. To ensure this, the same numbers must never be used at the same time during the landing. Tags should be reused in subsequent samples. The weight data must be recorded alongside the fork length data for later data entry.

If you are having difficulties obtaining weights for any large fish, contact your supervisor or the IPHC HQ immediately to discuss options.

1.19 Sinistral Pacific Halibut (Left-eyed)

If you come across (or are presented with) a sinistral Pacific halibut, collect both otoliths and all associated information. Place the otoliths inside a tag recovery envelope (NOT in an otolith box) and record as much information as possible on the tag envelope (see ***Tag Recovery***). Send the sealed and completed envelope to IPHC HQ with your package. If the sinistral fish you encountered was randomly selected for sampling, see Otolith Issues.

1.20 Clean Otolith Archive

The IPHC otolith collection consists primarily of structures collected and used for age determination for the stock assessment. The otoliths have been kept (archived) after being aged and are stored in a glycerin/thymol solution, which maintains readability; however, it renders these structures unusable for research involving some isotopic and all elemental analyses. For this reason, otoliths for the Clean Otolith

Archive Collection (COAC) are not used for age determination, and are cleaned, dried, and stored whole in climate-controlled conditions for future analysis.

Only IPHC Secretariat are required to collect COAC samples.

1.20.1 Instructions

Use the standard pillbox to collect COAC samples. However, identify this pillbox (**Clean Otolith Archive: No Oto Juice**) to ensure that market sample otoliths are not confused with COAC otoliths. Different pillboxes are provided for shipping the COAC samples. They consist of an outer case which holds seven removable inner trays of four cells, with individual snap top lids for each cell. The individual lids prevent otoliths from moving between cells, which can happen with small, dry otoliths in the regular pillboxes, even with cotton. The lids of the inner trays are numbered in the office to prevent mixing of otoliths if more than one inner tray is removed at a time. An example of a COAC "shipping" box is in Figure 1.16

Figure 1.16. Example of a COAC "shipping" box.

1. Collect both otoliths (eyed and blind side)
2. Minimize metal contact (some contact is unavoidable, since knives and forceps are metal, but, for example, try not to scratch surface of otolith with the knife and do not leave otoliths sitting on metal surfaces, etc.)
3. No broken otoliths (otoliths with exposed internal microstructures are not usable)
4. No crystallized otoliths (both otoliths of the pair must be "normal")
5. Clean all membranes and moisture thoroughly from otoliths using paper towels or a clean dry cloth
6. Do not use any fluids, including water, to clean otoliths
7. Place otolith pairs in the same cell of the box identified as the COAC
8. Under NO circumstances should glycerin, or any fluid, be added to the COAC
9. Allow otoliths to completely dry before adding cotton and closing the box
10. Store in stable environment where there are no extreme temperature or humidity fluctuations until shipping (i.e., indoors at room temperature)
11. Place COAC boxes in two resealable plastic bags (double-bag for extra protection) just prior to shipping; DO NOT put COAC and regular market sample boxes in the same bag.
12. Ship COAC otoliths with the other sampling data on the same shipping schedule.

A Market Sample and OWL report must be completed for each COAC sample. COAC samples are designated by clicking the 'Archival' box on the market sample report and a box number in the 500 series on the OWL report. Collect all standardized data (length, weight, otoliths and tissue sample) as identified in this handbook (**Note: both otoliths must be collected**).

1.20.2 Pacific Halibut Selection

Our target sample is 100 otoliths for each of IPHC Regulatory Areas 4A, 4B, and 100 for Areas 4CD combined.

1. The COAC sample number series will begin with XXX501 (XXX = three-digit port code) and the regular market sample number series will begin with XXX001.
2. The COAC box number series will begin with 501 and the regular market sample box number series will begin with 001. It is important that COAC otoliths are kept in separate box(es) from regular Market Sample otoliths.

1.20.3 IPHC Regulatory Area 4A and 4B

Collections will occur in conjunction with sampling of the commercial landings; the sampling rate has been increased to accommodate a target of 100 otolith pairs for the COAC. Collect both otoliths from every 10th fish identified for sampling, with the otolith pair going into the COAC. Regular market samples and COAC samples will be collected from the same delivery in most cases.

The COAC sample and regular market sample will each have a separate market sample report submitted, a separate sample number, and be in separate boxes. Both sample numbers must be recorded on the log.

1.20.4 IPHC Regulatory Area 4CD

Fish from IPHC Regulatory Area 4CD are to be collected for the COAC only in St. Paul. Collections occur on non-sample days; the goal is to spread the collection over the sampling period in St. Paul. The sampling protocol has been designed so that approximately 20 otoliths per week are collected for the COAC. Attempt to collect the COAC sample on the first non-sample day of the week; that way if there are no fish available to sample on that day, the COAC sample may be collected on the second non-sample day of that week. (Note: there may be some weeks when there are no fish available on the non-sample days; this is okay, since more than 20 fish may be collected in a week, depending on fish size).

Sample selection:

1. Collect the sample from a single tote. The tote does not need to be randomly chosen; however, if there are totes of fish from multiple vessels and totes from individual vessels, choose the tote from an individual vessel.
2. Totes of fish from mixed vessels may be sampled if the fish are from a single IPHC Regulatory Area.
3. Aim to sample 20 fish for each sample. Follow random sampling techniques for tote sampling.

Sample data:

1. In St. Paul, market samples and COAC samples will NOT be taken from the same delivery.
2. If the COAC sample is taken from an individual vessel, the market sample form will be filled out in the standard way with vessel name, ADF&G number, sample number, etc.
3. Enter 'N' in the Pool field of the market sample form and click the 'Archive' box to designate the sample as part of the COAC.
4. If the COAC sample is taken from a tote of mixed vessel fish, enter the vessel name and number for the vessel with the greatest amount (pounds) of Pacific halibut in the tote and enter 'Y' in the Pool field. List the names of the vessels in the mixed tote (if known) in the comments section of the market sample form.

2. TAG RECOVERY

Recovery of tagged Pacific halibut provides information on seasonal migration, rates of growth, and estimates of fishing and natural mortality rates. Asking whether any tagged Pacific halibut were caught is often an easy way to begin an interview with a captain. Tag recovery is currently an uncommon event but can occur from all IPHC Regulatory Areas. All external tags are clearly marked with the letters 'IPHC'.

Make sure you get a mailing address for the person who found the tag. IPHC will send a letter to the appropriate recipient and reward if not redeemed in the field. We only reward individuals who return sanctioned IPHC tags (see Table 9) from tagged Pacific halibut. The standard reward is a hat or $10 (most prefer the hat). Please try to issue the reward hats in the field; if finder wants $10, a check will be issued from the Seattle office. Rewards are not issued for archival or dummy archival tags. There are a few non-sanctioned or "rogue" taggers; individuals who tag Pacific halibut with their own spaghetti tags, usually with their own name printed on the tag, with some offering a reward. Collect the tag and associated data, for all tags, indicating when it is a rogue tag.

IPHC regulations allow ANY vessel at ANY time to retain tagged Pacific halibut. Therefore, people in other fisheries, such as recreational, subsistence or non-directed commercial in other fisheries (e.g. trawl) are to be encouraged to retain tagged Pacific halibut.

2.1 Tag Types

2.1.1 Plastic-coated Wire Tags (Wire Tags)

Plastic-coated wire tags have been used alone (wire-only) or along with other external and internal tag types (double-tag experiments). Figure 2.1 shows examples of the wire tag types.

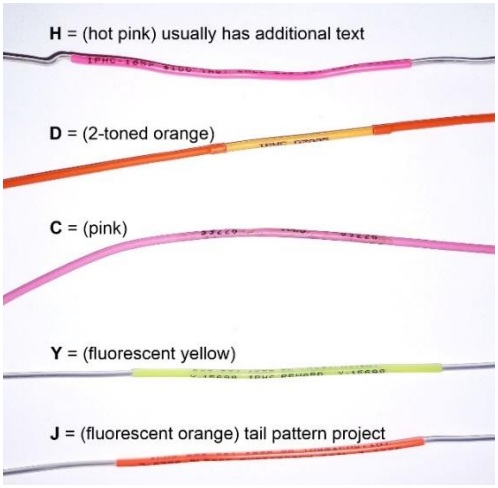


Figure 2.1. Wire tag types (only the most common/recent types are shown)

2.1.2 Wire Tag Releases

The standard reward amount for wire-only recoveries of tagged fish is $10 or a tag reward hat. Wire tags were also used by the Homer Pacific Halibut Derby and Seward Pacific Halibut Tournament and are similarly redeemed.

2.1.3 Removal from the fish

Wire spaghetti tags are twisted into the operculum cover of the cheek on the dark side and can be untwisted or cut out of the cheek of the Pacific halibut. Stainless steel and plastic tipped dart tags (used with PAT tag leaders) must be cut out of the fish.

Figure 2.2. Pacific halibut with wire spaghetti tag.

In some cases, the tag may either be discolored or have some growth of barnacle or algae attached.

NEVER discard a tag! It often looks unreadable to the naked eye but isn't under a microscope.

The otoliths and tissue samples of recovered tagged fish DO NOT become part of the market sample and should be placed in a tag envelope. Wire tags should be placed in the envelope with the otoliths and tissue sample (PAT tags are too large to fit in the tag envelope).

2.2 Data to be obtained

The numbered items in this section refer to items on the tag redemption envelope (see Figure 2.3). The envelopes are to be filled out and must be legible.

INTERNATIONAL PACIFIC HALIBUT COMMISSION TAG RECOVERY

Tag Number 1			Type 2		Recovery Date (capture date) 3 Day Month Year						
Latitude / Longitude (preferred) or Recovery Location 4							Statistical Area 5				
Gear Type 6: Longline / Troll / Trawl / Pot / Handline / Unknown							Depth (fathoms) 7		Re-released 8 Y / N		
Fork length 9 cm		Weight (circle units) 10 kg lb			Sex M 11 F		Landing Port 12			Port Code 13	
Data collected by: (circle one) 14: IPHC / Observer / Enforcement / Other / Fishing crew / Plant worker							Tissue 15 Y / N	Tail Photo 16 Y / N	Otolith (both preferred) 17 Right / Left / Both		
Na 18	St 19	Vessel Number 20			Vessel Name 21						
Name, Street Address 22											
City, State/Province, Zipcode/Postal Code 23									Hat issued 24 Y / N		

Rev. 03/2020 IPHC Form-Tag Recovery

Figure 2.3. Tag redemption envelope

1. **TAG NUMBER**: Number on the tag. If the Pacific halibut is from a double-tagging PIT

experiment, record the wire tag number and note whether or not the PIT tag was recovered.

2. **TAG TYPE:** Single digit or one letter code (capitalized). See Table 9

Table 9. Tag types.

Tag Type	Type code	Year Used
Pink wire	C	2017 FISS U32 and NOAA trawl tagging
Two-tone orange wire	D	2003 double tagging in BC (PIT tag in head) 2017—NOAA trawl tagging 2018 FISS U32 tagging 2021 recreational discard mortality
Homer Derby orange wire	E	Homer Derby tag releases (odd years)
Coffman Cove Derby orange wire	E	Coffman Cove Derby (2013 -2014)
Homer Derby yellow wire	G	Homer Derby tag releases (even years)
Hot pink wire	H	2009-2013 (wire only and double tag projects) 2016 Seward recreational Pacific halibut Tournament
Fluorescent orange wire	J	2018-present (tail pattern recognition project)
Dummy archival tag	M	
Seward Tournament blue wire	T	2012 Seward Pacific halibut Tournament
Archival	R	
Satellite (PAT) tag	S	2002-2021
Homer Derby purple wire	U	2012 Homer Derby tag releases
Green wire tag	V	2017 Homer Derby and Seward Tournament releases
Seward Tournament white wire	W	2013 Seward Pacific halibut Tournament releases
Neon yellow wire	Y	NOAA trawl tagging (2015-present) FISS U32 tagging (2016-present) 2016 Seward Tournament releases
Thin neon yellow wire	Z	2016 NOAA trawl tagging (fish<30 cm)

3. **RECOVERY DATE:** Date the fish was **caught** (month/day/year) not the day the vessel delivered. If no date is specified, use the date when the most fish was caught during the trip.

4. **LATITUDE/LONGITUDE or RECOVERY LOCATION:** Lat/lon where fish was caught as degrees, decimal minutes.

   If told the tagged fish was caught somewhere in a series of sets or when a range of locations are given, assign the tag recovery to the string where the most fish was caught (assumption is the tagged fish had the greatest probability of being caught in the set with the most fish).

   If the plasticized charts are used to provide location, record the seven-digit code in this field and it will be converted to lat/lon at the IPHC HQ.

NOTE: If the vessel fished multiple regulatory areas, you will need to use your plasticized charts to determine regulatory area for each set first, then determine the set with most catch for the regulatory area the tagged fish was caught in.

5. **STATISTICAL AREA:** IPHC statistical area where fish was caught (from nautical charts or plasticized charts).

   Stat Area is one of the fields often left blank. Must complete if you have a recovery location!

6. **GEAR TYPE:** Most vessels recovering Pacific halibut tags will have longline gear. Some tags will be from other types of fisheries. Check the appropriate box. If you know specifically what longline gear was used, write the appropriate gear code in the box (e.g., FH, SS, SN). If not, write UL = unspecified longline. If the tag recovery came from a trawl gear fishery, try and find out what type and write that beside the gear type (i.e., Bottom Trawl=BT, Shrimp Trawl= ST, Mid-water Trawl=MT).

7. **DEPTH:** Depth the fish was caught in fathoms.

8. **RE-RELEASED:** Circle "Y" for yes, "N" for no. Used to indicate whether fish was re-released with or without the tag. (NOTE: if finder has re-released fish, please remind them that IPHC-tagged Pacific halibut of any size and from any fishery or time of year may be retained and the information they provide is very valuable.)

9. **FORK LENGTH:** Length from snout to fork of tail (see Figure 2.4). Place fish on cradle, blind side up, with snout against the headboard of the cradle so that the mouth is closed. Bookends may also be used. If you get a tag from a captain or other agency staff who measured the fish in inches, **convert the length to centimetres and make sure the inch measurement isn't a guess.**

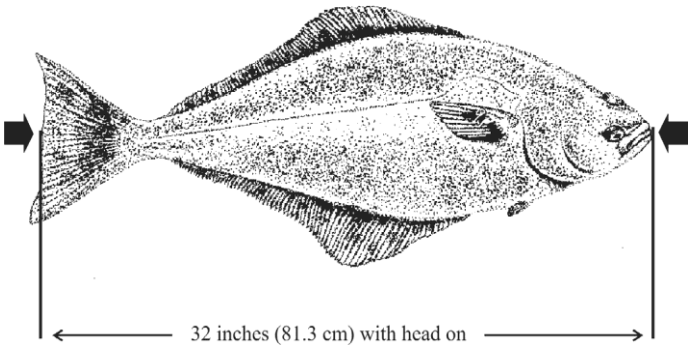


Figure 2.4. Sample Fork Length -- length between black arrows

10. **WEIGHT:** Weight of the fish. Circle units of weight.

11. **SEX:** Circle "M" for male, "F" for female, if known.

12. **LANDING PORT:** Port where the tagged fish was landed by the vessel (may be different than the port where tag is redeemed).

13. **PORT CODE**: The 3-digit port code for the port where the tagged fish was landed.

14. **DATA COLLECTED BY:** If tagged fish was collected by Secretariat, circle "IPHC" and note initials in or next to the box. If the tagged fish was collected by someone from another

agency (i.e., NOAA Enforcement, ADF&G, WDFW, ODFW, CDFW, or DFO, etc) or by fishing crew or plant worker, circle the appropriate category. If the person who collected the data falls outside of these categories, circle "other" and describe on the back of the envelope.

15. **TISSUE:** Circle "Y" for yes, "N" for no to indicate whether a tissue sample (fin clip) was collected.

    A tissue sample should be collected and dried on chromatography paper. Small pieces of chromatography paper will be provided to you to place inside the tag envelope. Record the tag number and type on the paper beside the fin clip. As soon as possible allow the envelope and chromatography paper with the fin clip to completely dry out. Return the clip on the paper to the envelope when dry.

16. **TAIL PHOTO:** Circle "Y" for yes, "N" for no to indicate whether a tail photo was taken.

    A photo of the white side of the tail should be taken for recovered fish bearing Type J wire tags imprinted with the text "Please Photograph Tail" (see Tail Photograph for Recovered Type J Tags). Place the provided blue plastic sheet under the tail as a backdrop for improved image analysis.

17. **OTOLITH:** Circle RIGHT, LEFT, or BOTH where two, one or no otolith(s) were collected.

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

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

20. **VESSEL NUMBER:** The VRN for Canadian vessels or the state number for U.S.A. vessels.

21. **VESSEL NAME:** The full name of the vessel from which the tagged fish came (capitalized).

22. **NAME, STREET ADDRESS:** Name of person to receive release data and their street address.

23. **CITY, STATE/PROVINCE, AND ZIP/POSTAL CODE:** Mailing address of person to receive reward and release data. Use the finder's mailing address and do not use c/o the plant, etc**. Remember addresses need postal or zip codes.**

24. **HAT ISSUED:** Hat rewards should be issued in the field when the tag is collected. Note whether a reward hat was issued by circling 'Y' for yes and 'N' for no.

2.3 Tail Photograph for Recovered Type J Tags

Since 2018, a subset of U32 Pacific halibut were tagged with bright orange wire tags ("J" tags) with the text "PLEASE PHOTOGRAPH TAIL" (see Figure 2.5) as part of a study investigating whether pigmentation patterns on the white side of the tail persist through life and can therefore be used as a natural tag. The IPHC would like captains recovering J-tagged fish to provide the whole fish with tag still attached.

Upon receiving a fish with a tag requesting a picture of the tail:

1. Use the blue craft mat provided as a backdrop for photographing the white side of the tail. When the tail photos are analyzed, the blue background enhances the ability of the pattern recognition software to segment the image into 'tail' and 'non-tail' components. Using the lined side of the mat will help, as we can use it for scaling.

2. Spread the tail fin rays wide.
3. Wipe any excess ice/slime/blood off the tail.
4. Include the tag number (written on a slip of paper) in the image.

See the example of a tail photo in Figure 2.6. Generally, an image that fills most of the view and is taken directly over the tail is best. To achieve an image that fills the field of view, the distance between the camera and the tail is usually around 30cm, but most important is that you focus the camera (e.g. if using a cell phone camera, tap the image before taking the photo). Images from cell phones or most standard digital cameras will suffice, just be sure when emailing or texting the messages to the office, that you send the highest quality version you have (some email and texting programs lower the quality of the image to save on data transmission time and rates).

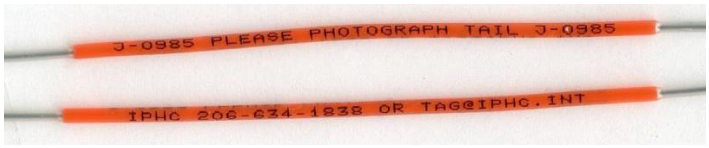


Figure 2.5. "J" type tags used for tail pattern project

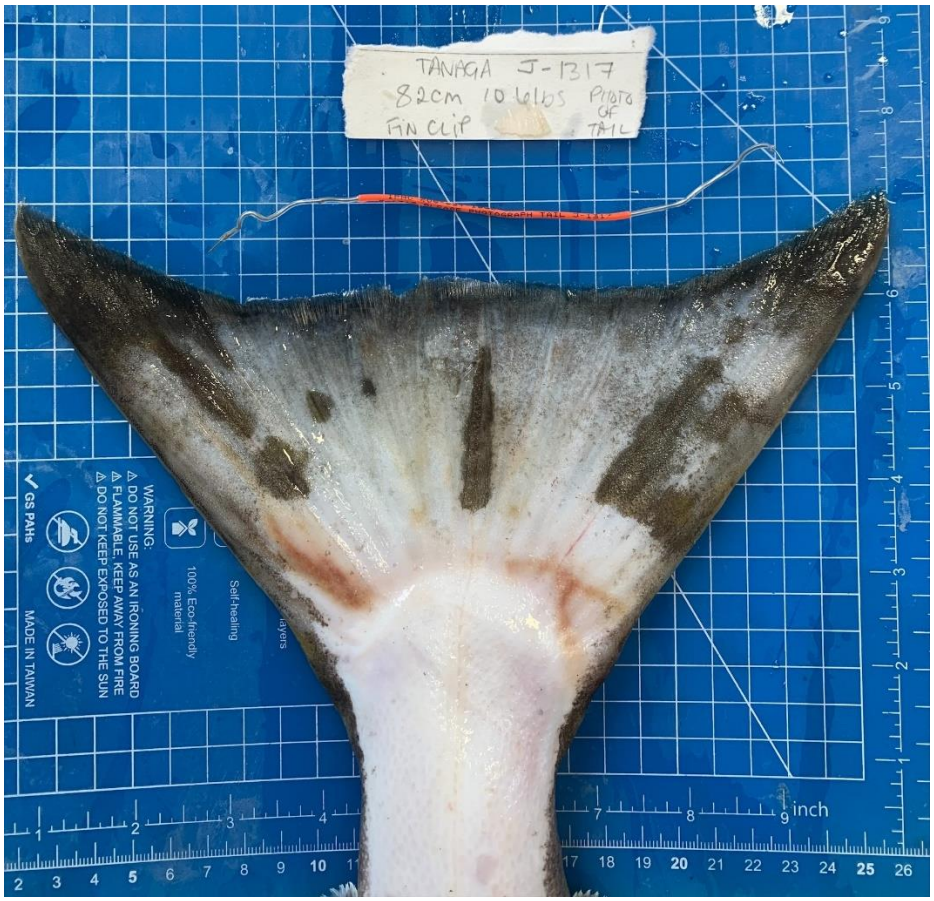
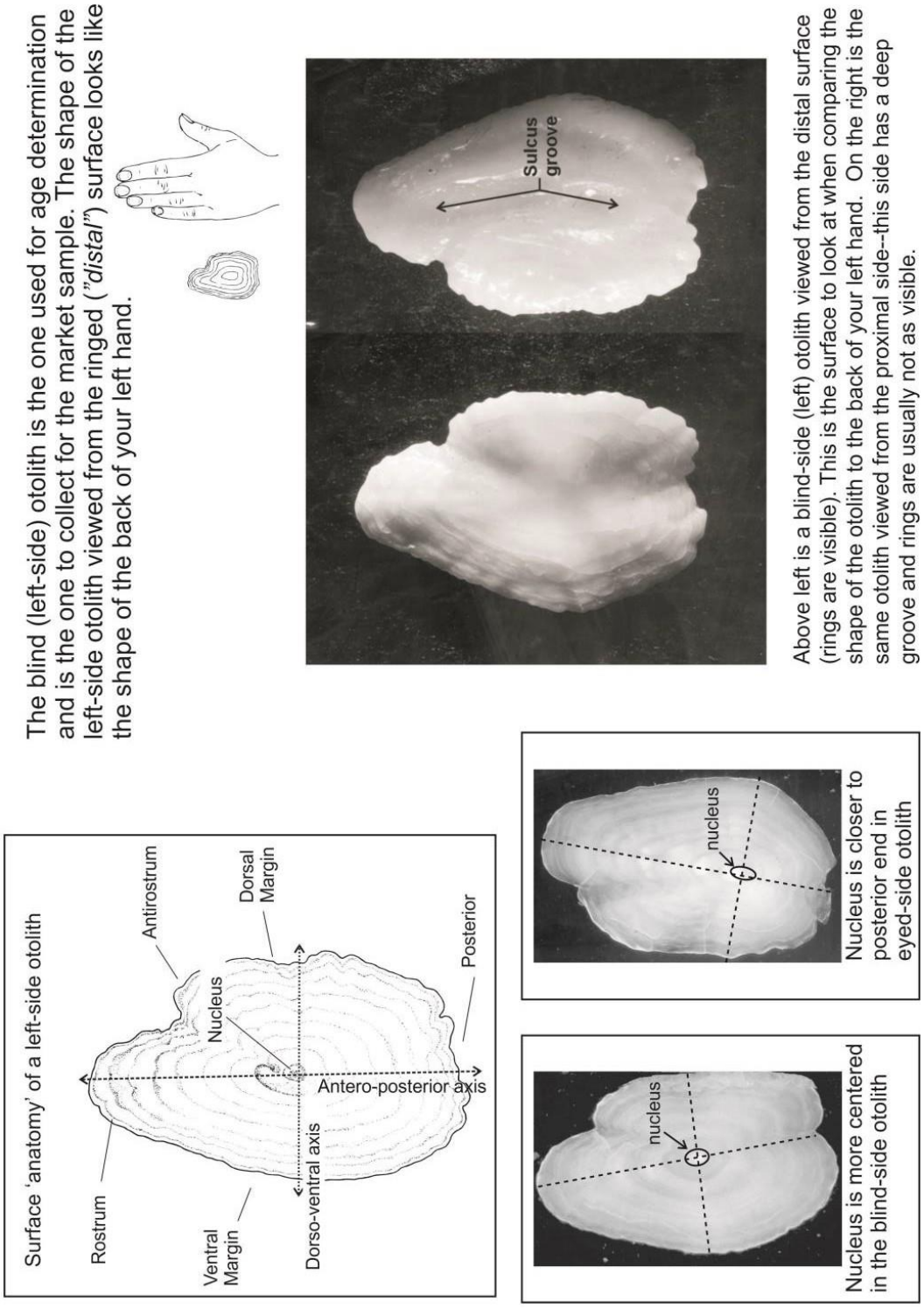
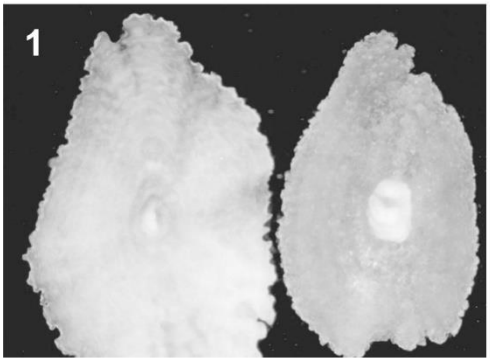


Figure 2.6. Example of image of white side Pacific halibut tail

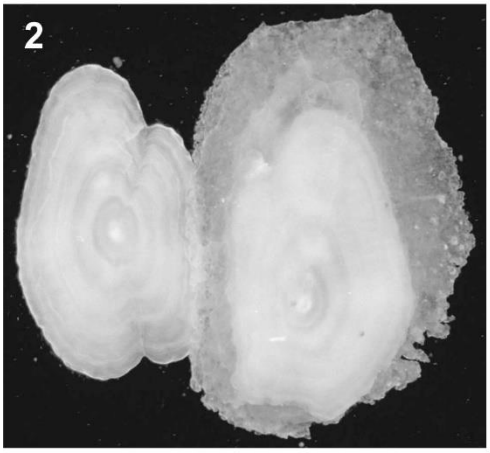
3. APPENDIX I: OTOLITH GUIDES



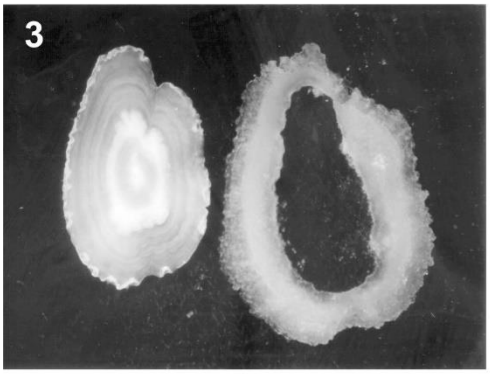
Recognizing Crystallized Otoliths: Otoliths are composed of calcium carbonate that can take one of two different crystalline forms. The form found in 'normal' otoliths is *aragonite* while in crystallized otoliths, the form is *vaterite*.



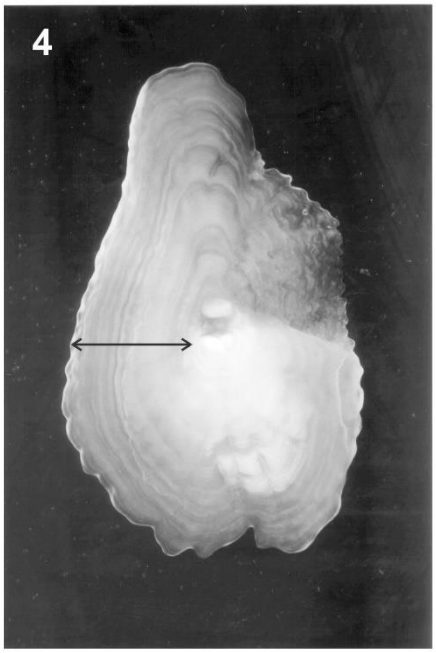
1. Fully crystallized: opaque form (left) and translucent form (right). These otoliths cannot be aged.



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 otolitih 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.

4. APPENDIX II: RANDOM NUMBER TABLE

9	2	3	3	0	3	3	9	7	3	4	5	4	2	5
2	5	5	3	1	6	1	0	5	9	9	2	4	2	2
0	7	9	7	2	7	7	3	3	0	9	1	5	7	5
5	3	6	1	0	5	7	5	7	3	4	8	1	5	1
6	9	4	0	6	9	3	5	3	2	7	6	3	0	7
0	0	2	0	5	0	4	9	5	8	2	9	9	8	5
0	1	1	7	2	7	1	4	4	6	0	5	4	6	7
0	3	9	7	9	6	1	8	9	0	5	8	7	2	9
5	2	4	3	1	2	8	3	3	3	2	3	8	0	0
6	0	8	2	3	2	4	4	5	8	4	8	2	0	4
1	1	5	8	4	4	1	3	0	9	5	9	0	8	9
9	6	4	9	6	0	2	9	7	9	7	4	3	0	5
7	4	6	4	6	8	3	9	1	3	9	7	0	8	6
6	4	0	8	1	8	5	0	8	5	1	8	5	0	7
9	5	4	7	6	4	1	1	7	5	2	5	8	9	6
6	6	3	9	6	9	8	8	4	1	9	4	0	6	4
3	3	0	5	8	5	1	6	6	4	7	9	6	0	5
3	7	3	6	3	6	6	5	7	1	7	0	8	5	9
6	5	0	0	7	7	5	0	3	1	5	3	4	0	5
6	6	9	1	4	9	0	9	2	1	1	4	0	6	3
9	3	2	3	2	1	4	0	6	9	4	8	5	6	0
9	4	0	6	3	0	4	9	2	4	5	7	0	9	6
9	2	7	1	8	8	5	4	3	7	5	4	2	4	5
9	4	1	2	1	2	3	1	4	8	3	0	2	1	0
7	7	4	0	1	8	9	8	3	7	5	7	8	6	0
7	7	8	9	9	4	1	8	6	1	9	5	6	2	8
0	7	7	7	4	2	2	3	0	0	6	4	4	7	1
9	8	5	1	7	9	4	8	3	6	9	9	7	8	4
2	9	9	8	4	0	6	0	3	7	3	0	1	5	5
7	1	1	6	4	7	3	6	3	8	5	4	5	3	8
7	4	0	4	5	8	0	8	4	5	6	5	1	9	2
2	3	3	8	7	0	0	0	2	3	1	6	1	0	9
7	3	0	4	1	7	5	3	2	5	9	0	1	7	5
6	2	4	6	5	1	4	4	7	1	9	7	3	0	9
5	9	0	4	1	2	0	4	3	6	4	3	9	7	2
5	0	3	5	4	8	5	1	3	9	6	2	1	1	5
1	7	0	2	4	5	5	8	9	4	3	9	3	9	5
9	0	5	0	5	0	3	4	1	3	5	8	4	2	2
5	2	3	2	2	6	5	2	3	2	9	4	7	2	4
0	4	2	1	5	1	5	8	9	6	5	3	8	8	1