Chapter 4

Trawl Sampling

I. Introduction

Prior to January 1, 2011, 70% of all WCGOP observer sea days were aboard trawlers. After January 1, 2011 NON Catch Shares Observer will only encounter Trawl vessels in the CA Halibut and Pink Shrimp fisheries. These trawlers target CA Halibut and Pink Shrimp. Trawl catch is often very heterogeneous, containing multiple species of fish and invertebrates in each haul. A trawl trip can last from one to seven days. All West Coast trawlers deliver to shore-based processors.

II. Trawl Gear and Fishing Strategy

Most trawl vessels on the west coast are stern trawlers. They use one net that is set and retrieved off the sloping stern ramp at the back of the vessel. However, there are also side haulers. These vessels set and retrieve their nets over the side of their vessels (See Figure 4-1 and Figure 4-2).

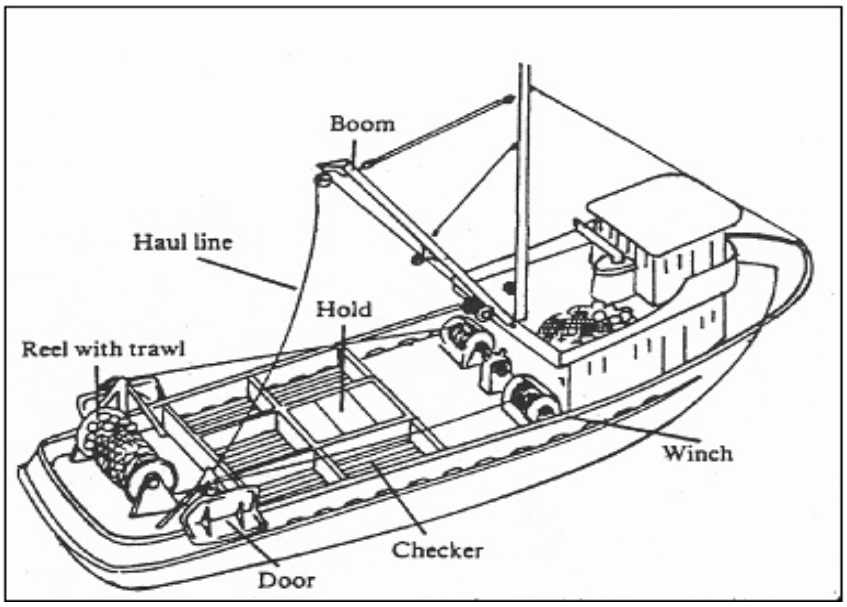

Figure 4-1: Trawl Vessel

Figure 4-2: Side hauling versus stern hauling

Trawling involves the towing of a funnel-shaped net behind the fishing vessel (See Figure 4-3). Trawl nets may be towed on or near the seafloor or in the water column. West coast trawlers use "doors" in front of and on each side of the net to spread the mouth of the net horizontally. The doors are pushed apart and down by hydrodynamic forces and by their own weight. Aluminum or plastic floats laced to the headrope on the upper lip of the net and a weighted footrope, laced to the lower lip of the net, hold the net mouth open vertically. The length of the cable (**main wire**) dragging the net behind the vessel determines the towing depth. Trawl nets can be 100' or greater in width across the opening and over 150' long.

Main wire - the two large cables used to connect the trawl net to the fishing vessel while fishing.

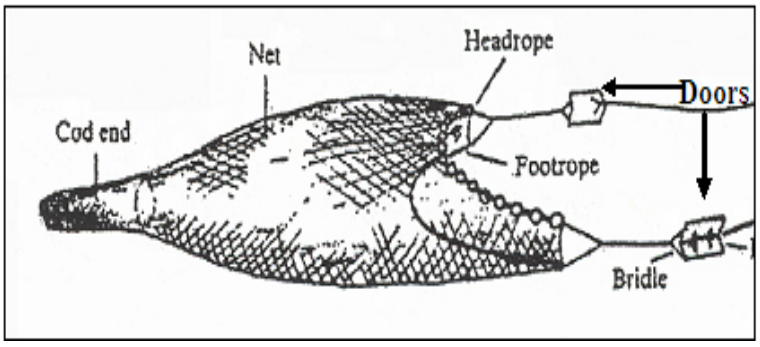

Figure 4-3: Trawl Net

The footrope or groundrope is directly attached to the bottom, leading edge of the mouth of the net. The purpose of the footrope is to separate the target species from the seabed and raise the netting far enough above the seabed to prevent damage. The footrope may be weighted with chain or may be rope-wrapped wire or cable when fishing on a soft bottom. If the net is towed over rough bottoms (as for rockfish) steel bobbins, rubber disks or rubber rollers ('tires') are attached to the footrope. The bobbins are designed to roll and drag over the bottom (See Figure 4-4).

Regulations governing harvest levels in the groundfish trawl fleet have a footrope component. There are two "sizes" of footropes used in the groundfish trawl fleet.

Large Footrope – Any footrope that includes one or more rollers that is greater than or equal to 8 inches in diameter.

Small Footrope – Any footrope where all rollers are less than 8 inches in diameter.

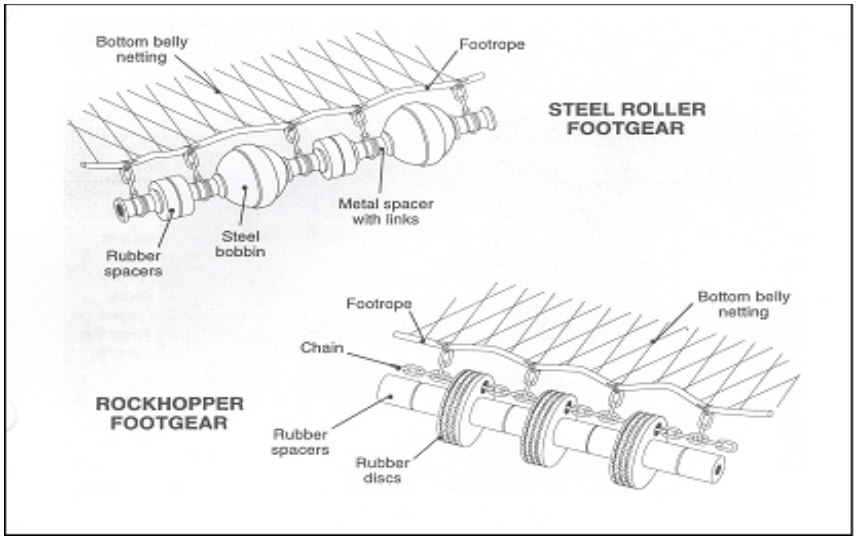

Figure 4-4: Roller Gear

There are a variety of types of trawl gear:

Bottom Trawl – One net is towed with the footrope in contact with the seabed. Bottom trawlers include roller (also

called bobbin) trawls and Danish and Scottish seine gear. A bottom trawl is generally towed at two to four knots on or above the sea floor.

- **Selective Flatfish Trawl (Pineapple Trawl)-** This net is a type of bottom trawl (See Figure 4-5). It was designed by WOC fishers to reduce the catch of rockfish and other overfished species. Fishers used the net in an experimental fishery for two years to prove the efficiency. Based upon the findings, the PFMC now mandates it's use in certain areas and/or increases quotas for vessels that use the selective flatfish trawl. The characteristics of this net includes:
    - A headrope that is cut back and at least 30% longer than the footrope, which allows fish a greater area to escape.
    - The expected rise, how high the headrope is above the bottom of the net, at the center is less than or equal to five feet.
    - No floats are on the center half or third of the headrope. Floats are only allowed on the wings.
    - A two seam, rather than four seam, net.
    - A small footrope can only be used with this net

Fishing regulations state that gear type 17 - Pineapple Trawl/Selective flatfish net must be used when fishing shoreward of the RCA, North of 40 10'.

WOC fishers = Washington, Oregon and California fishers.

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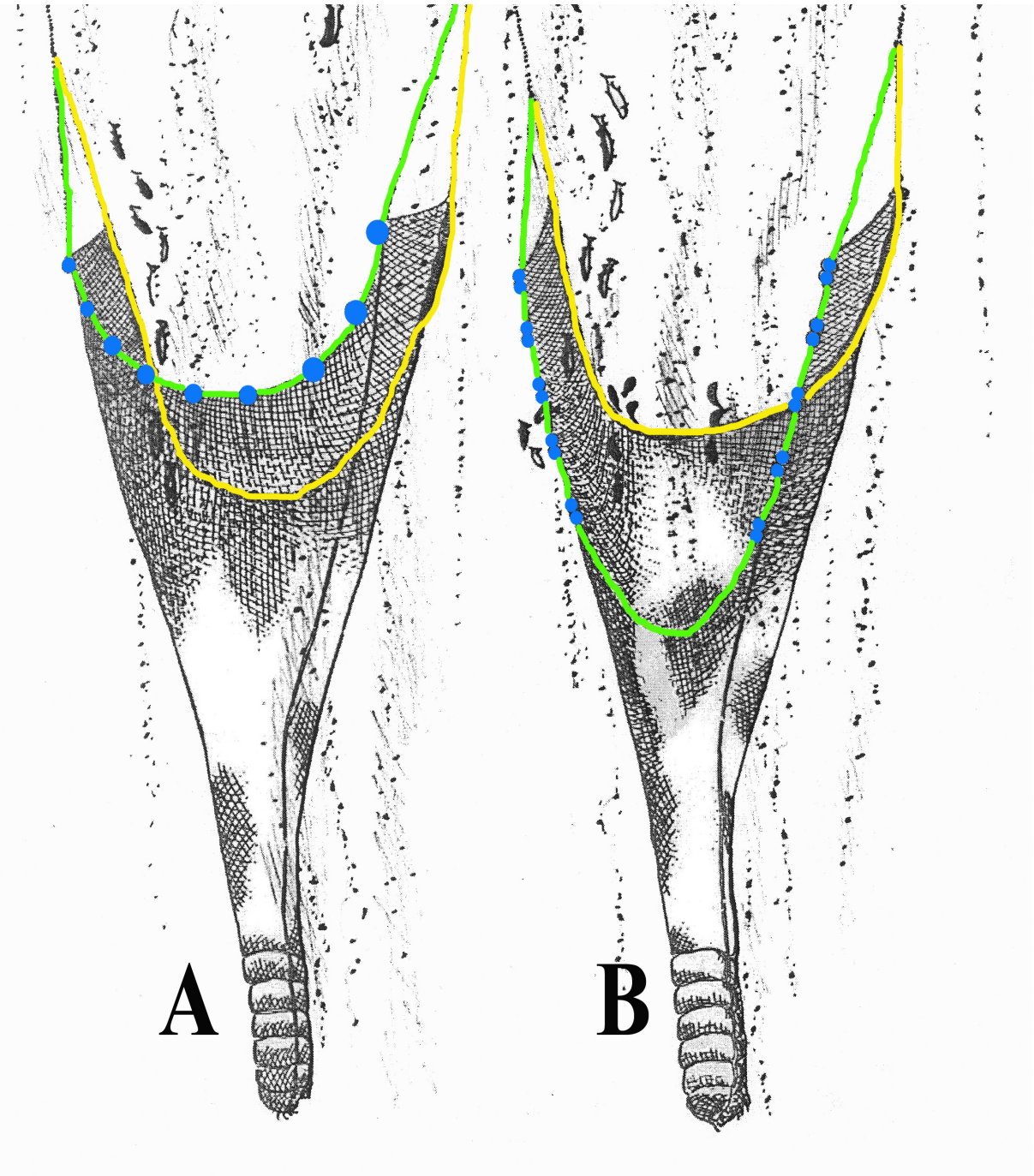

Figure 4-5: (A) Trawl net compared to (B) OR Set-back Flatfish net. The light yellow lines show the footropes, the green lines with the blue circles show the headropes. The blue circles are the floats.

Outrigger - any pole that can be lowered over the side of a boat and is used to enhance stability and aid in fishing.

Paired Bottom Trawls (Double Rigged) – Two nets are towed, one net off each side of the vessel from large **outriggers** lowered at 60° angles. The nets are folded on deck or hung from booms when not fishing. They have two sets of doors, one set for each net. Paired nets are often used for CA/OR Pink Shrimp.

Midwater Trawl – Midwater trawls are generally towed above the ocean floor, although they may be used near the bottom. They are generally towed faster than bottom trawls to stay with the schooling fish they target. All midwater trawls must have a protected footrope without bobbins and rollers.

Trawl gear is used to harvest:

- Deep Water Slope Fish (Sablefish, Dover Sole, Shortspine and Longspine Thornyheads).
- Shelf and Slope Rockfish.
- Midwater Rockfish (Widow, Yellowtail, and Chilipepper).
- Shelf and Slope Flatfish.
- Pacific cod.
- Pacific hake.
- California Halibut.
- Pink shrimp.

Trawl gear varies depending on the species sought and the size and horsepower of the boats used.

Operations of Trawlers

The following flow chart represents typical activity of a trawl vessel.

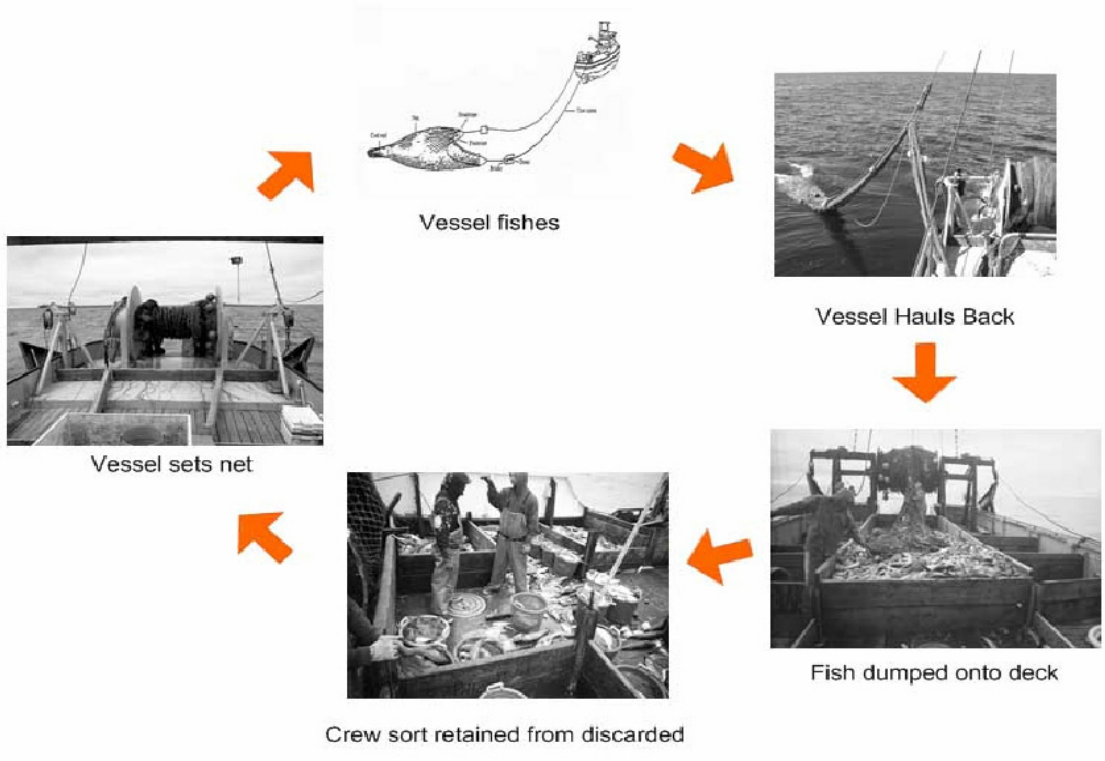

Figure 4-6: Typical activity of a trawl vessel.

Safety Concerns on Trawlers

The equipment used by trawlers can cause serious injury if you are not aware while on deck.

Trawl nets are heavy and in rough seas, tend to roll around the trawl alley or bin. Be careful to avoid putting any part of your body between the codend and the trawl alley/bin boards, as you can be crushed.

Be especially aware of the main wire and other cables being used to haul in a codend. If these snap, they fly in many directions and can cause major damage to the vessel and cause serious injury to the crew. Check for fraying on the wires during your first haul back. **Stay in the wheelhouse,**

with the hatch closed, while the crew is hauling in the codend. If you are on deck during haul back, always wear your safety helmet.

Be aware that working on trawl vessels often requires a lot of lifting. Take care to use proper lifting techniques on these vessels and wear a back brace if appropriate. Filling baskets partially instead of all the way to the top is a good way to reduce the amount of weight lifted at one time and can reduce the occurrence of back injuries. See Chapter 9, "Health and Safety", for more information on reducing the risk of back and wrist injuries.

III. Data Collection on Trawlers

The following trawl fisheries are observed by WCGOP NON Catch Shares:

CA Halibut (open access)
CA Pink shrimp (open access)
OR Pink shrimp (open access)
WA Pink shrimp (open access)

Observers collect the following information on trawl vessels:

1. Fishing Effort
2. Total Catch
3. Catch Category Weight
4. Species Composition
5. Biological Data

This section of the manual is organized in the above order. This order is also the sequence you will normally use to collect data on trawl vessels. Biological Data collection is described in detail in Chapter 7, "Biological Sampling" and Chapter 8, "Protected Resources".

Diversity of Fleet and Effects on Sampling

Although vessel characteristics make the fleet very diverse, sampling protocols are consistent for all net vessels. There are, however, a number of vessel characteristics that influence catch sampling. The most important characteristics that influence sampling are:

Trawl vessels on the West Coast range from 40 feet to 80 feet.

1. **Vessel size** – The size and layout of a vessel is often a limiting factor when sampling. A vessel with a small deck may not have enough deck space to hold all the discard. Therefore, the vessel may sort the discard directly out a scupper, over the side or down the stern ramp. On small vessels, observers may not have a designated sample area or a sample area with much space.

Trawl tows range from 45 minutes to 20 hours.

2. **Duration of tow** – Tow duration can vary greatly. If a vessel is making long tows, over 3 hours, observers will have plenty of time to sort and weigh samples. Observers on vessels that haul every hour have a limited amount of time to complete sampling duties.

Trawl tows range in size from 100 lbs to 40,000 lbs.

3. **Size of tow** – Vessel size and size of tow are related. Problems are created when a small vessel has a large tow because there is very little room for the work up of samples. It can also create a dangerous working environment.

Trawl tows can have as few as 5 species and as many as 45 species.

4. **Composition of tows** – Most tows encountered will have a large diversity of fish species. This is not necessarily a problem for experienced observers that are able to identify species easily. However, the species composition of the tow will affect the sample size. If the vessel has a bag full of tiny thornyheads or flatfish, it may be necessary to reduce the sample size.

5. **Sorting technique of crew**– Each vessel will have a unique sorting method. Discuss with the crew prior to the first haul how they sort and the best way to collect samples. Communicating with the crew that samples will

be collected from **discard only** is key to fulfilling sampling requirements.

Types of crew sorting on Groundfish Trawl vessels:

1. Crew sorts retained into bins or baskets while leaving discard on deck.

2. Crew sorts out a scupper-retained fish are taken out of the flow of fish while discards are flushed directly off the vessel.

3. Crew sorts retained into bins or baskets and tosses or scoops discard overboard.

4. Crew presorts certain species.

5. Crew sorts from chute that discards fish directly over the side.

All of the factors above are interrelated. For example, if a small vessel has short tow duration and tows are large, how the combination of these factors affect sampling options needs to be considered.

IV. Fishing Effort Information

Fishing Effort information includes where vessels fish, how long it takes fishers to catch fish, what fishers are attempting to catch, what type of gear is being used, and how much is being caught. All of this information is recorded on the Trip Form. The front side of the form includes total catch and gear performance information while the back side is the haul location information. The specifics of estimating total catch are discussed in the next section.

Vessel Logbooks

All trawl vessels are required to record fishing activities in a current logbook (See Figure 4-8). Observers copy information out of this book onto the Trip Form – Haul Locations for groundfish trawlers.

If a logbook is not available, Captain's often keep a personal journal of fishing effort information that you can use with their permission. If they do not, ask them to record the

information on a piece of paper. Some observers may have a handheld GPS to use for coordinates also.

Tip* It is important for observers to complete the Trip Form-Haul Locations after each haul. Some vessels may not fill in their Logbook until the steam in and/or record more or fewer hauls than actually occurred. If the Vessel Logbook is reviewed and copied after each haul, the risk of erroneous data recording is reduced.

Trip Form Instructions

See Trip Form Figure 4-7:Trip Form (front) on page 15 and Figure 4-9:Trip Form - Haul Locations (Back) on page 20.

- **Fishery Sector** – Circle the sector the vessel participated in (**LE** = Limited Entry, **OA** = Open Access, or **EFP** = Exempted/Experimental Fishing Permit).

EFP -Permits that allow fishing activities that would otherwise be prohibited. The permits are usually written by the states and must pass a vote by the PFMC.

- **Page #** – All Trip Forms are numbered together by trip. (If there are 5 Trip forms on one trip, number them 1 – 5).
- **Trip Number** – This is an automatically generated number by the database. Complete this field once the trip has been started in the database.

Tip* Some observers find it easier to start a trip prior to leaving port. Doing this allows the observer to fill in the Trip Number while at-sea rather than when the observer returns to port.

- **Observer Name –** Record your first and last name.
- **USCG #** – Record the USCG vessel number. All Limited Entry groundfish trawl vessels have a six or seven digit USCG number. Request this number from

the vessel skipper or a coordinator. **If the vessel does not have a USCG number, leave field blank and fill in the State Registration Number field.**

- **State Registration Number** – Use this field **only** if the vessel does not have a USCG number. The state registration number will begin with a **CF** in California, **OR** in Oregon, and **WN** in Washington.
- **Vessel Name –** Record the full name of the vessel

Trip Information

Page ___ of ___

__LE __OA __EFP

Trip # [| | | |] USCG # [| | | | | |] or State Reg # [| | | | | | |]

Observer Name ______________________ Year [2 | 0 | 1 |]

Vessel Name ______________________ Partial Trip [ ] Total # of Fishing Days (KNOWN) [ ]

Fishery ______________________ Vessel Logbook Name ______________________

Permit/License # ______________________ Vessel Logbook Page # ______________________

______________________ Observer Logbook # ______________________

____

Skipper's Name ______________________ # of Crew ____________
(including captain, not including observer)

Departure Date/Time ___/___/___ ________ Departure Port ______________________

Landing Date/Time ___/___/___ ________ Landing Port ______________________

Fish Ticket #	WOC	Date	Fish Ticket #	WOC	Date

Haul Information

Haul/ Set #	Observer Total Catch Estimate	Weight Method	Total Hooks/Pots	Gear Perf	Seabird Avoidance (Gears 7, 9, 19, & 20)	Avg. Soak Time m = minutes, h =hours	Comments
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
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						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
						< 1m 1-5m 5-15m 15-30m 30-45m 45-60m 1-2h 2-6h 6-12h 12-24h 24-36h 36+h	
Key-punch Check							

Trip Form v.9 January 2010 OMB Control No. 0648-0593 expires 9-30-2012

Figure 4-7: Trip Form (front)

Question: What's a trip?

Answer: A trip is a fishing activity that typically results in the completion of a fish ticket (landing receipt). The exception is when the vessel fished but did not retain any species.

- **Partial Trips –** Check the box if the trip included more days than were observed. (Fish ticket includes unobserved catch.)

Tip* Partial trips usually occur when a vessel fishes multiple day trips in a row.

- **Total # of Fishing Days (Known)** – Document the total number of days the vessel fished before landing. This field is only completed when the trip is a partial trip.

Tip* Do not guess or make an assumption to complete this field. If you do not know how many days the trip lasted, leave column blank.

- **Fishery** - Record the name of the fishery the vessel was selected for:

  CA Halibut
  CA Pink Shrimp
  OR Pink Shrimp
  WA Pink Shrimp

- **Vessel Logbook Name -** Record the name of the logbook the vessel is using to record fishing effort information. The following logbooks can be used:

Fishery	Vessel Logbook Name
CA Halibut	Shrimp/Prawn Trawl Logbook
CA Pink Shrimp	Scallop/Shrimp Logbook
OR Pink Shrimp	OR Scallop/Shrimp Logbook
WA Pink Shrimp	no offical logbook

- **Permit/License #** – Document the permit/license number being used. Only one permit/license number should be used on trawl vessels.

Question: Why do observers record logbook page numbers?

Answer: The fishing locations of vessels carrying observers are compared to the fishing locations of vessels not carrying observers to ensure vessel activity has not changed with observers on board.

- **Vessel Logbook Page Number -** The Vessel Logbook number is the page number(s) where the skipper is recording the trip information. Do not record the number of the entire Logbook! Logbook page numbers are located:

Vessel Logbook Name	Page Number Location
WOC Groundfish Logbook	Bottom left corner (See Figure 4-8)
CA Shrimp/Prawn Trawl Logbook	Top of page, to the right of header
OR Scallop/Shrimp Logbook	Bottom right corner

Vessel Name Example Departure: Date 7 (Month) 6 (Day) 96 (Year) Time 0400 (local - 24-hour) Port Westport, WA

Federal Document No. 12345 Return: Date 7 (Month) 8 (Day) 96 (Year) Time 0600 (local - 24-hour) Port Westport, WA

Crew Size (including Captain) 3 Buyer(s) Generic Seafoods

DATE mo/day		TIME local 24-hour clock	LATITUDE Degrees	LATITUDE minutes	LONGITUDE Degrees	LONGITUDE minutes	Ave. depth of catch (fathoms)	NET TYPE	Target Strategy	Estimated pounds retained each tow - enter 4-letter code from species code list provided: SABL	DOVR	LSPN	SSPN	WDOW	YTRK
7/6	set	1300	47	58.7	125	47.3	500	B	DTS	300	4,000	500	100		
	up	1730	48	02.6	125	45.5									
7/7	set	0800	47	20.3	125	28.3	575	B	DTS	100	5,000	800	150		
	up	1400	47	46.4	125	34.4									
7/7	set	1800	46	52.6	124	53.2	90	M	WDOW					16,000	500
	up	2200	46	54.1	124	53.6									
	set			.		.									
	up			.		.									
	set			.		.									
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	set			.		.									
	up			.		.									

REMARKS:

Signed: John Doe

TO BE COMPLETED BY AGENCY

VESSEL	FISH RECEIVING TICKET NO..
PORT	

39761

Figure 4-8: The "Washington-Oregon-California Groundfish Logbook."

- **Observer Logbook #** - Record the number on the front page of the Observer Logbook used to document information about the trip.

- **Skipper's Name –** Record the first and last name of the skipper.
- **# of Crew (including captain)** – Document the number of crew, including the captain, on the vessel.
- **Departure Date/Time** – Document the date and time the vessel left port.
- **Departure Port** – Document the port the vessel departs from.
- **Landing Date/Time** – Document the date and time the vessel returns to port.
- **Landing Port** – Document the port the vessel returns to.
- **Fish Tickets Number(s)** – Obtain the numbers of all landing receipts (fish tickets) from the vessel skipper, the port biologist, or the state liaison. **This is a required field for all fisheries and trips!**
    - CA fish tickets begin with a letter followed by six digits.
    - OR fish tickets are seven digits.
    - WA fish tickets begin with a letter followed by six digits.
- **WOC -** The state agency code is **C** - for California deliveries, **O** – for Oregon deliveries, or **W** – for Washington deliveries.
- **Date –** Document the date in MM/DD/YY of fish ticket issuance.

Question: Why are observers required to record Fish Ticket Numbers?

Answer: When observer data is analyzed, the total landed weight from the Fish Ticket is used to estimate the amount of discard by species per landed weight of target(s).

Haul Information Instructions

- **Haul/Set Number –** Number hauls consecutively, starting with 1 for each trip.

- **Observer Total Catch Estimate (OTC) –** Record the total catch estimate to two decimal places. Observer Total Catch estimate is recorded in pounds.

- **Weight Method –** Enter the number that represents the weight method used to obtain the observer total catch estimate. The weight methods that may be used for Trawl OTC's are:

  6 – Other
  14 - Visual Experience

  

  Tip* See Appendix WCGOP Codes - for a complete list of weight methods.

- **Total Hooks/Pots –** This column will be blank on all trawlers.

- **Gear Performance** – Record one of the following codes to document gear performance:

  1 - No problem
  2 - Pot was in the haul
  3 - Net hung up
  4 - Net ripped
  5 - Trawl net or codend lost, pot(s) lost, other gear lost
  7 – Other problem – Document other gear related problem in the comments section.

- **Seabird Avoidance Gear –** Leave this field blank on trawlers.

- **Avg. Soak Time -** Leave this field blank on trawlers.

- **Comments –** Document any information that is important about the haul. If the vessel documented more than one target strategy, list other strategies in this column.

- **OTC Keypunch Check** – Sum the OTC's for an entire trip and **record total weight of trip** in the OTC

keypunch check box. (If more than one Trip Form is used, sum total catch estimates of ALL hauls to obtain keypunch check.).

- **Total Hooks/Pots Keypunch Check** – This field will be blank on all trawlers.

Trip Form – Haul Locations Instructions

See (See Figure 4-9).

TRIP FORM - HAUL LOCATIONS

Trip Notes:

Haul/ Set #		Date		Time	Latitude		Longitude		Depth of Catch (fathoms)	Gear Type	Target Strategy
		Month	Day		Degrees	Minutes	Degrees	Minutes			
	Start					.		.			
	End					.		.			
	Start					.		.			
	End					.		.			
	Start					.		.			
	End					.		.			
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	End					.		.			
	Start					.		.			
	End					.		.			
	Start					.		.			
	End					.		.			

Figure 4-9: Trip Form - Haul Locations (Back)

Starred **(*)** fields indicate information that can be obtained from the "Washington-Oregon-California Groundfish Logbook".

- **Trip Notes –** Document any information pertinent to understanding the trip.

- **Haul/Set Number –** Number hauls consecutively, starting with 1 for each trip that correspond to hauls on front of form.
- **Start and End Date* –** Document the date the haul was set and the date the haul was retrieved as MM/DD.
- **Start and End Time* –** Document the Pacific Standard Time (PST) the haul was set and retrieved in 24-hour notation (military time). A haul starts when the net has reached fishing depth and ends when the brake is released and haul back begins.
- **Start and End Latitude*** – Document the latitude (in degrees, minutes, 1/100th of a minute) that the haul was set and retrieved.

Loran: If the vessel is using Loran C and the degrees of latitude and longitude cannot be obtained while at sea, document the Loran coordinates so that you can convert the positions to degrees after the trip. See Appendix for Loran Information and how to convert Loran C coordinates to latitude and longitude positions.

Tip* When an observer boards a vessel that has a GPS, check to be sure that it is recording in degrees, minutes, 1/100th of a minute. If not, ask the captain to change the view to 1/100th of a minute instead of seconds. (See Figure 4-10)

- **Start and End Longitude*** – Document the longitude (in degrees, minutes, 1/100th of a minute) that the haul was set and retrieved.

Figure 4-10: GPS Showing Latitude and Longitude

Fathoms: 1 Fathom = 6 Feet

- **Depth* –** Document the fishing depth in **fathoms**. The "Washington-Oregon-California Groundfish Logbook" only requires the vessel to document the depth at which most of the fish were caught. If only one depth is documented, use it for both depth fields.

- **Gear Type* –** Enter a code for the gear type based on the configuration of the gear, rather than how it is being fished. **Use the Trawl Net Identification Key in the Observer Logbook to determine groundfish trawl gear type.**

Be very careful when documenting gear type on trawlers. **Remember, regulations state that gear type 17 - Pineapple Trawl/ Selective flatfish net must be used when fishing shoreward of the RCA, North of 40 10'.**

1 - Groundfish Trawl, Footrope < 8 inches (Small footrope, Not a pineapple trawl))
2 - Groundfish Trawl, Footrope > 8 inches (Large footrope)
3 - Midwater Trawl
4 - Danish/Scottish Seine
5 - Other Trawl Gear
12 - Shrimp Trawl - Single Rigged (one net)
13 - Shrimp Trawl - Double Rigged (two nets)
14 – All Net Gear Except Trawl
17 – Pineapple Trawl (small footrope)

Tip* Regulations require that trawlers fishing shoreward of the RCA (depth generally less than 150 fathoms) use the Pineapple Trawl (selective flatfish net).

****If the fishing vessel is not using one of the above gear types, this is most likely the wrong section of the manual. Please refer to Chapter 5, "Fixed Gear Sampling" and/or Chapter 6, "Fixed Gear Sampling on Small Boats" ****

- **Target Strategy* -** Enter the vessel's target strategy. Refer to Appendix for Catch Categories List and Target Strategies. If the vessel is recording more than one target strategy on a single haul, record the strategy that has the largest representation in the catch. Document other target strategies in the haul comments field.

V. Observer Total Catch Estimates (OTC)

The total catch weight must be estimated for all hauls. There are two options for obtaining OTC on trawlers.

Weight Method 14 – Visual Experience
Weight Method 6 – Other

Weight Method 14 – Visual Experience

Visual estimates are the preferred option for total catch weight on trawlers. Prior to the first haul on the vessel, ask the skipper or crew how much their codend holds (by weight) and how much their trawl alley holds. Record their estimates in the Observer Logbook, Vessel Diagrams section. Use their estimate, as well as the area of the trawl alley and other resources, to visually estimate the total weight of each haul. Record the visual estimate on the back of the Catch Form.

Weight Method 6 – Other

This weight method should never be intentionally used. It creates confusion for end users and debriefers because it does not indicate how the weight was actually derived. If this method is used, document what happened in the observer logbook and on the paperwork.

VI. Sampling Catch

Once the catch is dumped on deck, the crew will begin sorting retained individuals from discarded individuals. Due to the large quantity of fish, observers only sample discarded catch on trawlers. Observer's do document estimates of retained catch, but these are usually skipper estimates. **Remember, on trawlers, the observer's primary responsibility is to sample the discarded portion of the catch.**

Catch Categories

Chapter 3, "Observer Basics" discussed catch categories briefly. This section provides a review and more specific information regarding catch categories on trawl vessels. As a review, there are two rules that apply to catch categories:

- Retained and discarded individuals are always documented in separate catch categories.
- Individuals are grouped in the same catch category when they are sampled together. All individuals in the grouping must have the same weight method and sample method.

Naming Catch Categories

A list of catch categories and the corresponding three or four letter PacFin codes can be found in the Appendix Catch Categories List and Target Strategies.

When naming catch categories:

1. If the catch category is species composition sampled, the name of the catch category is irrelevant and usually named ZMIS.
2. If a catch category is not sampled for species composition, the contents must be documented using the most descriptive catch category code possible. To determine catch category code, in order of preference, use:
    - Species specific code (i.e. ARRA, Aurora rockfish)
    - Species grouping code (i.e. NSLP, North Slope Rockfish)
    - If neither exists, use one of the following codes:
        - FISH - single fish species that is discarded.
        - INVT - invertebrate discard.
        - MBOT - miscellaneous bottom items, including rocks, mud, logs, bones, garbage, etc.

The most common reason for a catch category not to be species composition sampled is species whose weight is visually estimated.

- ZMIS - mixed catch which can include fish species, invertebrates, and bottom items (like rocks, logs, etc.). ZMIS should not be used for unsampled catch categories. Use the most specific catch category when ever possible.

Retained Catch on Trawlers

As mentioned previously, observers do not independently estimate the weight of retained catch on trawlers. Fishers are required to record the weight of retained species by catch category in a vessel logbook. Observers copy these estimates for retained catch **exactly**, unless:

- Vessel does not record catch category (often happens with species retained in small quantities).
- Vessel uses an invalid PacFin code or a code that is not the most descriptive possible. (Select most applicable name from Catch Category list, see Appendix Catch Categories List and Target Strategies).
- Vessel estimates of retained catch not representative of the weight and/or composition of the catch.

If a vessel is not estimating retained catch by catch category, the observer is responsible for obtaining estimates. This can be done by simply asking the skipper for an estimate or by obtaining an independent estimate using one of the weight methods discussed later in this chapter.

Discarded Catch on Trawlers

The amount of fish discarded on trawlers is extremely variable, from close to 0% to 100% of the total catch. Observers sort the discard into one or multiple grouping (catch categories). There are three factors that distinguish discarded catch categories from each other on trawl vessels:

Vessel Sort Example:

Often vessels will "presort", or remove quickly, some of the hardier species. Presorted species often fall into a separate catch category than those species not presorted.

Vessel/Observer Sorting – If the entire discard is not weighed and the crew sorts species different ways, then the species will fall into catch categories based on the way the crew sorted them. Observer sorting of discard may also lead to species falling into different catch categories.

Weight Method – The method used to obtain the weight estimate of the species or grouping of species can be used to determine the number of discarded catch categories. If portions of the catch have different weight methods, they must be in different catch categories.

Sample Method – If species have the same weight method but are sampled for species composition differently, this also requires them to be in different catch categories.

Sampling Priority on Trawlers

The priority for observer sampling on trawlers is:

1. **Discarded** prohibited species - Marine mammals, sea turtles, seabirds, green sturgeon, salmon species, and Dungeness crab (North of Point Arena) and Pacific Halibut.
2. **Discarded** overfished species - Cowcod, Dark-blotched rockfish, Pacific Ocean Perch, Canary rockfish, Yelloweye rockfish, Bocaccio rockfish, Widow rockfish and Petrale sole.
3. **Discarded** rockfish species.
4. Species that are both retained and **discarded**. Because some species are high-graded or have size restrictions, a sample of the discarded individuals is very important.
5. All other **Discarded** species.

6. Biological Sampling. (see details in Chapter 7, "Biological Sampling" and Chapter 8, "Protected Resources")

Priorities 1 - 6 must be completed on ALL hauls

7. **Retained** species not recorded by vessel.
8. **Retained** overfished species.
9. **Retained** rockfish species.
10. **Retained** mixed species catch categories. Vessels will mix flatfish or rockfish species. If the crew is mixing species, take a species composition sample from the mixed group.
11. Other **Retained** Species.

Observer effort on trawlers is focused on obtaining the most accurate estimates of discarded catch possible. Remember that through the use of catch categories, more precise methods of estimation can be used for those higher priority groups (prohibited species, overfished species, rockfish). But, **all** discarded catch weight must be estimated using one of the weight methods explained below.

VII. Weight Methods for Estimating Catch Category Weights

There are 12 weight methods that can be used to determine catch category weights on trawlers:

1 - Actual weights
2 - Bin Volume/Trawl Alley Estimate
3 - Basket Weight Determination (BWD)
5 - OTC – Retained
6 - Other
7 - Vessel Estimates (Retained only)
8 - Extrapolation
9 - Pacific Halibut Length/Weight Conversion

14 - Visual Experience
15 - Visual Spatial

The weights obtained by these methods are recorded on the Trawl/Prawn Pot Catch Form.

Weight Method 1 – Actual Weights

When Actual Weight is commonly used:

1. Total discard is less than 1000 to 1500 lbs and vessel has enough deck space for all discard.
2. Priority species - Actual weight should be used for salmon species, overfished species, and all rockfish species whenever possible.

Step-by-Step Instructions

1. Place all of the individuals from the catch category in observer baskets.
2. Weigh baskets. There will be one catch category for all of the species in the baskets.

Catch Category Wt(lbs) = ∑ Basket Weights

OR

1. Sort all of the individuals in the catch category by species.
2. Weigh each species group.

Catch Category Wt(lbs)= ∑ All Species Groups in Catch Category

Weight Method 2 - Checker Bin Estimates

When Bin Volume is commonly used:

1. All discard is placed in a bin or left in the trawl alley.
2. Species/species grouping is initially sorted into a bin because vessel plans on retaining it. However, at end of sort, vessel decides to discard all or a portion of the species/species grouping.

Step-by-Step Instructions

1. **Determine the appropriate volume formulas for each area of the bin(s).** (see Appendix Weights and Measurements). Most bins will be rectangular, however, some will have odd shaped areas (See Figure 4-11 and Figure 4-12).
    - **Example**: Bin is rectangular, therefore length, width, and height measurements needed.
2. **Measure the area of the bins in meters.** The area of the bin will most often be determined by measuring the length and width of the bin(s). If there are variations in the shape of the bin, multiple measurements of length and width should be made. If the catch category fills more than one bin, the total area of the bin will be:

Total Area (m^2) = Σ of Areas (m^2) of All Bins

    - **Example**: The length of the bin = 2.43 meters and the width of the bin = 1.59 meters
3. **Measure the height of the discard in the bin in meters.** The height of the fish in the bin provides the final dimension needed to obtain the volume. Height is measured by placing a calibrated stick into the bin to measure the depth of fish at one or several points. If the height of fish varies throughout the bin, multiple height

measurements should be taken. If multiple heights are measured, determine the average height:

Average Height of Fish in Bin (m) = Height A (m) + Height B (m) + Height C (m) .....
# of Height Measurements Taken

- **Example**: Height of fish in the bin varied, therefore three height measurements taken. They were .47 meters, .31 meters, and .25 meters. The average height = (.47m + .31m + .25m)/ 3 = 0.343333333 meters.

4. **Determine volume of bin(s).** Make sure that all of the measurements are as precise as possible. To obtain volume of the catch category:

Volume of catch category (m^3)=Total Area of Bin(m^2) x Average Height of Fish in Bin (m)

- **Example**: Volume of the bin = 2.43m X 1.59m X 0.343333333m = 1.326536998 m^3.

5. Once the volume of the bin(s) has been determined, randomly select area(s) to take density baskets.
   - Visually divide the bin into sections of equal size.

1	2
3	4

- Use a random number table or a watch to select one or two areas from which one or more baskets will be taken.

6. Fill baskets to either the top of the holes in the basket or the top of the basket using individuals from selected section(s). Collect fish by moving down and out through the fish, being sure to reach the deck.
   - **Example**: 2 baskets filled to the top of the holes.
7. Weigh baskets.
   - **Example**: Baskets weigh 71.02 lbs and 68.61 lbs.
8. Determine the average basket weight.

Average Basket Wt (lbs) = Wt of Basket A (lbs) + Wt of Basket B (lbs)....
# of Baskets Weighed

- **Example**: (71.02 lbs + 68.61 lbs)/2 = 69.815 lbs.

9. Determine the density of the bin(s).

Density (lbs/m^3) = Average Weight of Baskets (lbs)
Volume of Baskets (m^3)*

***The volume of the basket is a known. The volume of a basket filled to the top of the holes equals .032m^3 .

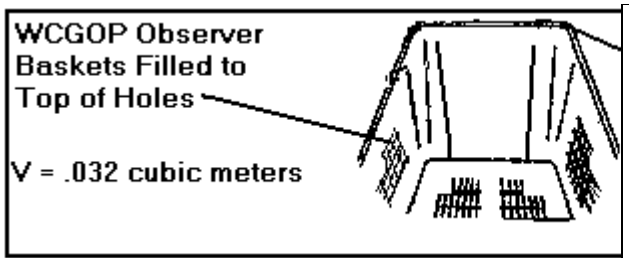


Figure 4-11: WCGOP Observer Basket Volumes

- **Example**: Density = 69.815 lbs/ .032 m^3 = 2181.71875 lbs/m^3

10. To determine catch category weight:

Catch category weight(lbs) = Volume of Bin (m^3) x Density (lbs/m^3)

- **Example**: Catch category weight = 1.326536998 m^3 X 2181.71875 lbs/m^3 = 2894.13 lbs

Figure 4-12: Trawl Alleys and Bins

Weight Method 3 – Basket Weight Determinations (BWD)

When Basket Weight Determination is commonly used:

1. Total discard weighs less than 1500lbs.

2. A large quantity of a single species or a mix of similar species is discarded. Species this commonly applies to are Arrowtooth flounder and Spiny dogfish shark. Groupings of species this commonly applies to are flatfish species and Splitnose rockfish and Aurora rockfish.

Step-by-Step Instructions

1. Visually estimate the number of baskets it will take to hold the entire catch category.
    - **Example**: Estimate it will take 28 baskets to hold entire catch category.

2. Devise a sampling plan to randomly select baskets to use to determine average basket weight. **A minimum of four baskets must be weighed when using the BWD weight method.** Use a spatial, systematic, or temporal frame. *See "Methods to Randomly Selected Baskets for Weights" earlier in the chapter for more information.*
    - **Example**: Decide to use 7 basket to determine average basket weight. Using a systematic random sampling frame, divide 28 (estimated number of baskets) by 7 = 4 (n). Randomly select a number between 1 and 4, 1 selected. Save the 1st, 5th (1 + 4(n) = 5), 9th (5 +4 (n) = 9), 13th, 17th, 21st,and 25th baskets of discard collected.

3. Place **all** species/items from catch category into baskets to obtain the total basket count. Each basket should be filled to the **same level** and contain a random sample of catch category composition.

Tip* In most cases when BWD is used, the last basket will be less full than all other baskets. Be sure to weigh this basket and add it's weight into the final calculation. See step 6 below.

- **Example**: Filled 27 baskets of discard. One partial basket also collected.

4. Weigh each randomly selected basket. **A minimum of four baskets must be weighed when using the BWD weight method** but observers are encouraged to weigh at least 6 – 10 baskets.
    - **Example**: 7 baskets of discard weighed 551.23 lbs.
5. Calculate average basket weight by summing all the basket weights and dividing by the number of baskets sampled

$$\text{Average Basket Weight (lbs)} = \frac{\sum \text{Basket Weights}}{\text{\# of Baskets Sampled}}$$

- **Example**: 551.23 lbs/ 7 baskets = 78.74714285 lbs.

6. If a partial basket remains, record the weight and add it to the calculated BWD estimate.
    - **Example**: Weight of partial basket = 35.87 lbs.
7. To determine catch category weight:

Catch Category Wt = (# Full Baskets x Average Basket Wt) + Wt. Partial Basket

- **Example**: (78.74714285 lbs X 27 baskets) + 35.87 lbs = 2162.04 lbs.

Method to Randomly Select Baskets for Weights

Systematic (preferred)

Other methods for selecting baskets are possible, but this is the preferred method.

a. Define population – **All baskets of fish in the catch category.**

b. Define sample frame – **Spatial systematic, based on baskets of fish.**

c. Define sample units – **Single baskets of fish.**

d. Number all sample units; this may require estimating how many baskets the catch category will fill; for example, estimate that catch category will fill 15 baskets - **Number baskets 1 – 15.**

e. Decide how many of the sample units you will weigh – **Decide to weigh 5 baskets.**

f. Divide the total number of sample units by the number of units you want to weigh. This gives you your value for "n". **n = 15/5 = 3.**

g. Randomly select a number between 1 and n. This will be the first sample unit in your sample. Use random number table to select a number between 1 and 3. – **Randomly select 1.**

h. Weigh the selected basket and then every n^{th} basket after that **- Weigh baskets 1, 4(1+3), 7(4+3), 10(7+3), and 13(10+3).**

Weight Method 5 – OTC – Retained

When OTC - Retained is commonly used:

1. Observer is sick or injured and unable to sample.

Step-by-Step Instructions

1. Visually estimate total catch weight (OTC).
2. Estimate weight of retained fish using one or more of the weight methods. Vessel estimates are the most commonly used weight method for retained catch.

3. To determine total discard weight:

Catch Category Wt(lbs) = OTC - Retained Species Weights (lbs)

Tip* Be sure to document in the observer logbook why the haul or catch category was not sampled.

Weight Method 6 – Other

This weight method should never be intentionally used. It creates confusion for end users and debriefers because it does not indicate how the weight was actually derived. If this method is used, document what happened in the Observer Logbook and on the deck sheets.

Weight Method 7 – Vessel Estimates

When Vessel Estimate is commonly used:

1. All estimates of retained catch categories on trawlers.

Step-by-Step Instructions

1. Copy retained catch category estimates from the vessel's logbook.

OR

1. Ask skipper for retained catch category estimate.

Weight Method 8 – Extrapolation

Presort – Vessels will attempt to get hardier, live fish back into the water quickly. After a codend has been dumped, the crew will sort through the catch, pulling out individuals of these species and toss them over. This usually happens prior to any other sorting of catch.

When Extrapolation is commonly used:

1. Species that are presorted, such as Dungeness crab, lingcod, and sablefish.

Tip* Pacific Halibut are also presorted but do not use extrapolation in this case. See weight method 9 for sampling of Pacific Halibut.

Step-by-Step Instructions

Tip* When weight method 8 is used, **an actual count of individuals is REQUIRED**!! The actual count must be recorded on the Catch Form in the Fish # column.

1. Devise a sampling plan to randomly select individuals from the presorted fish for average weights. Use a systematic, spatial, or temporal frame. **Specifics on implementing each type of sampling frame are described below.**
    - **Example**: Sablefish are being presorted on deck by 3 crew members. The observer determines they could count ALL the sablefish being thrown over by all the crew. The observer determines that they could get a weight from all the sablefish thrown over by just ONE crew member. Number the deckhands 1 - 3 and randomly select one of the numbers. In this example, all the sablefish from deckhand 3 will be collected and ALL the presorted sablefish will be tally counted.
2. Count the number of individuals, by species.
    - **Example**: 56 Sablefish presorted by all three crew members.

3. Determine the average weight of species An average fish weight should be determined using 15 non-target or 25 target fish..

$$\text{Average Weight} = \frac{\sum \text{Individuals Weighed (lbs)}}{\text{\# of Individuals Weighed}}$$

- **Example**: Collected 21 Sablefish from just one deckhand (#3) which weighed 65.77 lbs. Average weight = 65.77 lbs/ 21 fish = 3.131904761 lbs/ fish.

4. To determine catch category weight, apply the average weight to the total number of individuals of that species to obtain the catch category weight.

Catch category Wt = Average weight x Total Number of Individuals Caught

- **Example**: Catch category weight = 3.131904761 lbs/fish X 56 total fish = 175.39 lbs.

Tip* If extrapolation is used for more than one species, place each species in it's own catch category.

Methods for Randomly Selecting Individuals

- Systematic Random Selection.
- Spatial Random Selection.
- Temporal Random Selection.

Systematic Selection (preferred method)

Select individuals based on when they leave deck.

1. Estimate number of fish of particular species caught.

Systematic Random Sampling Frame Example:

The observer estimates that 60 Sablefish are usually presorted. In order to get 15 individuals, he divides 60/15 = 4. That means that one of every four fish should be taken for average weights. Using the random number table, a number between 1 and 4 is randomly selected. A 3 is selected. The observer collects the 3rd, the 7th (3+4), the 11th(7+4), etc. individuals for average weights.

2. Break the number of fish into sampling units (n) by dividing the number of fish needed for average weights by the number of fish likely to be on deck.
3. Choose which fish to take first by selecting a random number that is between 1 and the sample unit (n).
4. Then collect every n^{th} individual after that.
5. Weigh all selected individuals and divide by the number of individuals weighed to determine average weight

Spatial Selection

Select all individuals from a designated area on the deck.

1. Visually divide the deck into equal units.
2. Randomly select a unit to take individuals from.
3. Take all individuals in that unit.
4. Weigh all selected individuals and divide by the number of individuals weighed to determine average weight..

Temporal Selection

1. Select all individuals sorted or on deck during a unit of time. Estimate the time it will take to sort out species.
2. Randomly select a designated time during sort to take individuals or randomly select a time to begin taking individuals.
3. Take all individuals during randomly selected interval or take individuals until enough have been collected.
4. Weigh all selected individuals and divide by the number of individuals weighed to determine average weight.

Weight Method 9 – Pacific Halibut Length/Weight Conversion

When PHLB length/weight is used:

1. Used only for Pacific Halibut.

Step-by-Step Instructions

1. Visually estimate (preferred method) or actually measure the length of each Pacific Halibut. If visual estimates are made, record estimates to the nearest whole centimeter.
    - **Example**: Visually estimate 2 PHLB at 70 cm, 1 at 90 cm, and 1 @ 120 cm.
2. Use the Pacific Halibut length/weight conversion table to obtain a weight for each individual (see Appendix Halibut Length/Weight Table).
    - **Example**: On the length/weight table it states: 70 cm PHLB weigh 8.77 lbs, 90 cm PHLB weigh 19.80 lbs, and 120 cm PHLB weigh 50.29 lbs.
3. To determine catch category weight, sum the weight of all the Pacific Halibut.

Catch Category Wt (lbs) = $\sum$ Pacific Halibut Wts from Length Weight Conversion Table

- **Example**: (8.77 lbs X 2) + 19.80 lbs + 50.29 lbs = 87.63 lbs.

Tip* Retained and discarded Pacific Halibut must be in separate catch categories. Typically trawlers have no retained P. Halibut.

Recording P. Halibut raw data should include the following information and format on the data forms: visual and/or actual length label(s), lengths recorded in whole centimeters,

and labeled weight data from the P. Halibut length/weight conversion table (in the appendix). See example below.

	CM.	From the L/W table
Discard	50 𝍸 ||	7@12.95=90.65
	60 𝍸 𝍸 𝍸 𝍸 ||	27@5.31=143.37
PHLB-	70 ||||	4@8.77=35.08
VISUAL	80 𝍸 𝍸 |	16@13.51=216.16
	90 𝍸 ||	12@19.80=237.60
	100 |	1@27.87=27.87
	110 |	1@37.94=37.94
		68 @ 788.67

see section "Working Smarter, not Harder" for more tips on sampling P. Halibut. Usually Halibut viability data is taken on all or randomly selected individuals. See Chapter 7, "Biological Sampling" for viability data collection on Pacific Halibut.

Weight Method 14 – Visual Experience

Visual estimates can be used for large amounts of mud, rocks, and miscellaneous junk.

When Visual Experience is commonly used:

1. Species that are too large to weigh, such as marine mammals, large skates, and sharks.
2. Estimates of total discard weight when two hauls are dumped on each other.
3. Hauls observer is unable to sample.
4. Weight of discard when all catch is dumped at-sea.
5. Weight of mixed discarded catch category species when other weight methods can not be used. Although this is the least preferred method for determining catch category weight, it may be the only estimate possible. If this method is used for a mixed grouping of discarded species, it's very important to get a species composition sample.

6. Weight of a single discarded species that has a large quantity. Commonly, the species this applies to are Arrowtooth flounder and Spiny dogfish shark.

Step-by-Step Instructions

1. Based upon previous experience, visually estimate the weight of the species or the catch category.

Tip* It may be helpful to ask the crew members for estimates of species or discard weight on new vessels or for first time encountered species. Do not rely solely on their estimates but use them to help gauge the independent estimate.

Weight Method 15 – Visual Spatial

When Visual Spatial is commonly used:

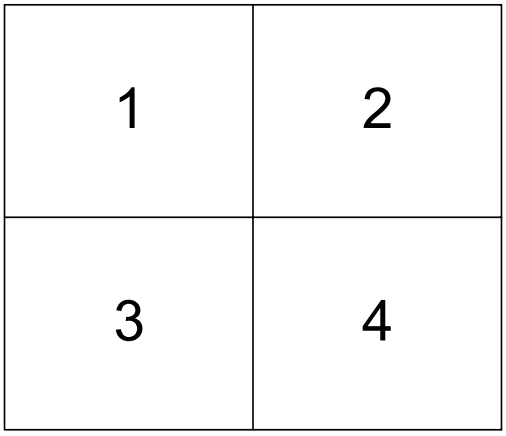
1. Mixed discarded species when a large quantity of fish are discarded.
2. Mixed discarded species on vessels with small decks, that bring up hauls back-to-back.

Step-by-Step Instructions

1. Visually divide the trawl alley into areas or sections of equivalent size. The visual grid can contain 2 or more sections.

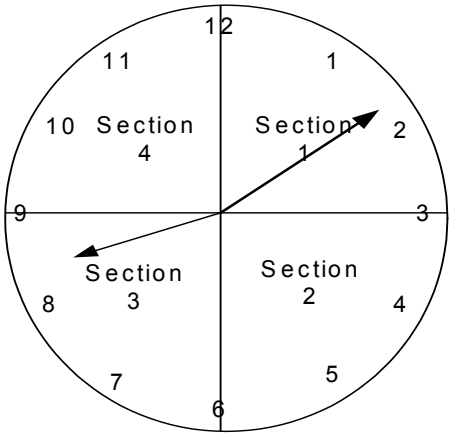
Tip* If time and space on deck is restricted and the observer determines a smaller sample size is required, then increase the visual grid sections (i.e. 10 or 12 sections). If time and space on deck allows for a larger sample to be collected then use a visual grid with fewer sections (i.e. 2 or 4).

2. Number each section.



3. Randomly select one or more sections(s) from which all discard will be collected. A watch or the random number table can be used to select random numbers.

As second hand is in section 3, all discard in that section is collected.



4. Collect all the discard from the selected section(s).

5. Weigh all the discard collected.
    - **Example**: The observer divided the trawl alley into a total of 4 visual sections and randomly choose to sample all the discard in ONE section. All the discard in section 3 = 564.12 lbs.

6. Determine catch category weight using the following equation:

Catch Category Wt.= <u>Weight of subsample (lbs)</u> x Total # of sections
# of section(s) discard collected from

- **Example**: The total catch category weight is calculated as:

$$\text{Total catch category wt.} = \frac{564.12 \text{ lbs}}{1 \text{ section sampled}} \times 4 \text{ total section} = 2256.48 \text{ lbs}$$

Tip* When using weight method 15, ensure the calculation is documented JUST as the example above. This is the preferred format and units to used on the data forms.

- When using weight method 15, keep in mind that more than ONE section of the visual grid can be sampled. An observer may determine that 2 or 3 sections of the visual grid could be sub-sampled. For example: If the observer visually divides the discard in the trawl alley into 8 sections and the observer determines that he can weigh all of the discard in 3 (randomly chosen) sections. The total catch category weight would be calculated as:

$$\text{Total catch category wt.} = \frac{664.12}{3 \text{ section sampled}} \times 8 \text{ total section} = 1770.99$$

VIII. Trawl/Prawn Pot Catch Form Instructions

The Catch Form is the standardized form used to document Catch Categories, Catch Weight and Catch

Weight methods. A Catch Form should be completed for all hauls (See Figure 4-13).

- **Haul Number** – Record the number of the haul.
- **Date** – Record the date as MM/DD/YY.
- **Trip Number** – This number is automatically generated by the database. Complete this field once the trip has been started in the database.

Tip* Some observers find it easier to start a trip prior to leaving port. Doing this allows the observer to fill in the Trip Number while at-sea rather than when the observer returns to port.

- **Page _ of _** – Number forms sequentially with in a haul.
- **USCG #** – Record the USCG vessel number posted on the exterior of the vessel or request this six or seven digit number from the vessel skipper or a coordinator. **If the vessel does not have a USCG number, leave field blank.**
- **Page _ of _** – Number forms sequentially with in a haul.
- **Catch #** - Number the catch categories consecutively, starting at 1 for each haul. The numbers on the paper Catch Form must match the numbers assigned by the database when data is entered.
- **R or D** – Record whether the catch category is from retained or discarded catch. Record **R** – Retained or **D** – Discarded.
- **Catch Category** – Record, in capital letters, the catch category sampled in the 3 or 4-letter PacFin code. For a list of PacFin catch category codes, see Appendix for Catch Categories and Target Strategies.

- **Weight** – Record the total weight of the catch category to two decimal places. Weight unit is pounds (lbs).
- **Volume** – If weight method 2 - Bin volume was used to estimate the catch category weight, record the volume, to two decimal places, in m^3.
- **Density** – If weight method 2 - Bin volume was used to estimate the catch category weight, record the density, to two decimal places, in lbs/m^3.

Record numbers of fish for Weight Method 14 – Visual Experience only when an actual count of individuals has been obtained.

Do not record extrapolated numbers on the Catch Form for trawl trips

- **Number of Fish** – Record the total number of fish in the catch category if weight methods 8 - Extrapolation, 9 - PHLB Length/Weight Conversion were used. If weight method 14 - Visual Experience was used for one or more individuals and you have an actual count of the number of individuals, record the number on the Catch Form. Do not record the total number of fish for weight methods other than 8, 9, and 14.
- **Weight Method** – Document the weight method used to estimate the catch category weight.
  - 1 - Actual Weight
  - 2 - Bin Volume/Trawl Alley Estimate
  - 3 - Basket Weight Determination
  - 5 - OTC-Retained
  - 6 - Other
  - 7 - Vessel Estimate (retained only)
  - 8 - Extrapolation
  - 9 - PHLB L/W Conversion
  - 14 - Visual Experience
  - 15 - Visual Spatial
- **Catch Purity** – If catch category was *sampled* for species composition, record **M** - Mixed if more than one species was within sample. Record **P** - Pure if there was only one species in species composition sample.

If the catch category was *not sampled* for species composition, record as **P** – Pure if the catch category is composed of 95% or greater a single species or as **M** – Mixed if the catch category is composed of less than 95% a single species.

- **Discard Reason** – Record the skipper/crew's reason for discard for unsampled (no species composition sample taken) discarded catch categories only. (refer to Chapter 3, "Observer Basics" for more information on these codes)
  - 11 - Incidental/Accidental
  - 12 - Drop-off
  - 13 - Market
  - 14 - Other
  - 15 - Predation
  - 16 - Regulation
  - 17 - Safety
  - 18 - Market (Dockside only)

- **Vessel Estimate** – Fill in the vessel estimate (from the Vessel Logbook) in this column ONLY if an independent estimate of a retained catch category weight was taken. If the weight method for the catch category is 7 – Vessel Estimate, leave this column blank and fill in the **Catch Weight column** with the vessel estimate.

- **Comments** – Document anything important about each category. Important information could include the composition of a mixed (less than 75% pure) unsampled catch category. For example, if the skipper documents a retained catch category as REX and the rex sole is mixed with sand sole, make a note of this in the comments column. **Species names should be recorded here if the catch category is not accompanied by a species composition sample and the catch category name does not indicate species** (e.g. SKAT)**.**

- **Keypunch Checks** – This is a required field for **Catch Weight** and **Catch Numbers of Fish.** Sum up the entries in each column and place the total in the corresponding keypunch box at the bottom of the form.

Haul # ☐☐ **TRAWL/PRAWN CATCH FORM*** Page ____ of ____

Date ☐☐☐☐☐☐ Trip Number ☐☐☐☐☐ USCG # ☐☐☐☐☐☐☐

Catch #	R or D	Catch Category	Catch Weight	Volume	Density	#'s of Fish 1. Req. for wt. methods 8,9 2. Req. if actual # for wt. methods 6, 14	Weight Method	Catch Purity	Discard Reason	Vessel Estimate	Comments
Keypunch Check											

*Gear Types 1, 2, 3, 4, 5, 12, 13 14, 17

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Trawl/Prawn Catch From v. 8

Figure 4-13: Trawl/Prawn Catch Form

IX. Collecting and Documenting Species Composition

Once the catch has been placed into catch categories, a species composition sample can be taken from all, some, or only one of the catch categories. (See Figure 4-14) Species composition samples can consist of every individual in the catch category or a subsample of the individuals in the catch category. Subsamples must be representative of the entire catch category.

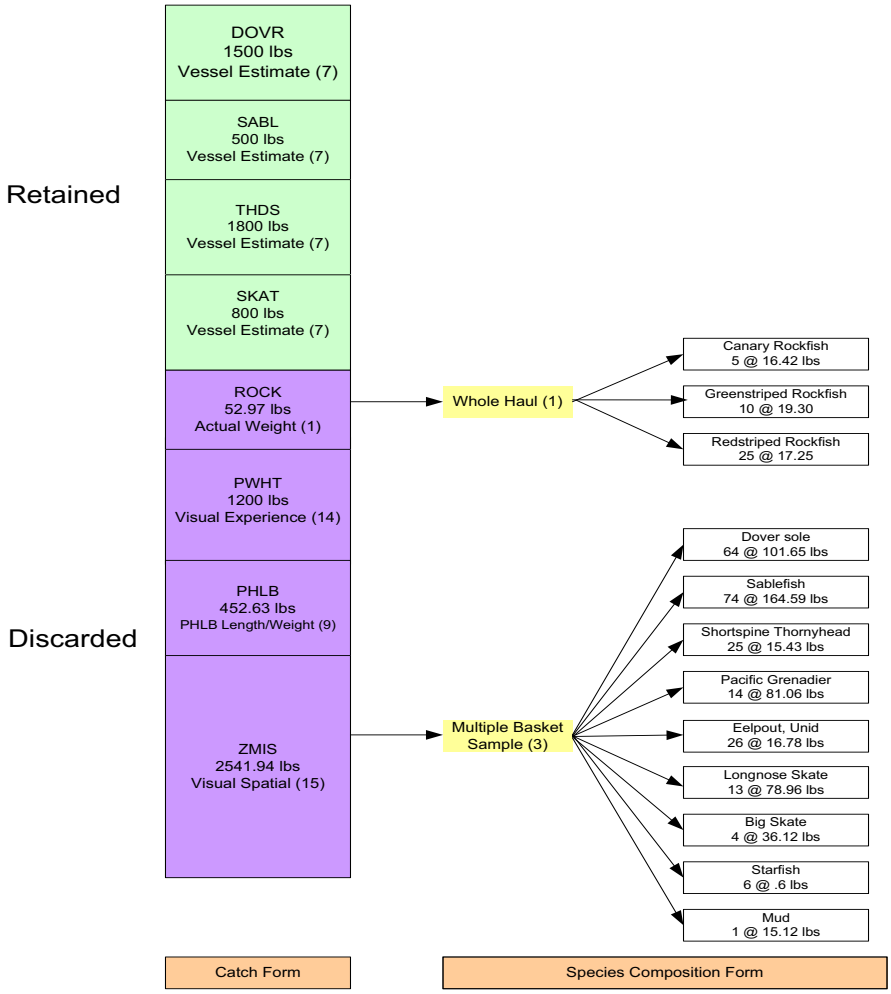

Figure 4-14: Catch to Species Composition

The most important thing to remember when species composition sampling on trawlers is that every fish/ item in the sample must be weighed.

Methods for Species Composition Sampling:

If Weight Method 1 – Actual Weights and Sample Method 1 – Whole Haul are used and the whole haul weight is different than actual weight, record the whole haul weight on the Catch Form.

Sample Method 1 - Whole Haul

1. Sort all individuals in catch category to species.
2. Weigh and count all individuals by species.

Sample Method 2 - Single Basket

1. Randomly take one representative basket from the catch category.
2. Sort individuals in basket to species.
3. Weigh and count all individuals by species.

Sample Method 3 - Multiple Basket

1. Randomly take two or more representative baskets from catch category.

Tip* Multiple basket samples should weigh, at minimum, 500lbs.

2. Sort individuals in baskets to species.
3. Weigh and count individuals by species.

Average Number Calculations

Single species catch categories - Document only those individuals that have been actually weighed AND counted on the Species Composition Form.

On trawl vessels, all species on the Species Composition Form **MUST** have an actual weight. However, observers do not have to count every individual in the species composition sample. **Average number calculations are used when a species composition sample contains more than one species and all individuals can not be counted.** Consider using average number calculations to estimate the number of individuals when:

- The catch category contains many small individuals of a given species/species group, such as juvenile rockfish.
- The catch category contains many individuals of the same species and counting all of them would greatly reduce the size of the species composition sample (e.g. flatfish species).

Step-by-Step Instructions

1. Randomly select a basket (or partial basket) of the species that were collected for the species composition sample.

Tip* When doing average number calculations, count and weigh as many individuals as possible. At minimum, 30 individuals should be weighed and counted for target retained species and 15 individuals should be weighed and counted for non-target retained and discarded species.

2. Weigh and count all the individuals in the basket.
3. Weigh all of the individuals of the species that appear in the species composition sample.
4. To determine the total number of individuals ("Sample Number" on the Species Composition Form):

$$\text{Total Sample \#} = \frac{\text{\# of Individuals Actually Counted}}{\text{Wt of Individuals Counted(lbs)}} \times \text{Total Wt of Species in sample (lbs)}$$

Species Composition Form Instructions

Species composition information is recorded on the Species Composition Form (See Figure 4-15). Species composition sampling on trawlers is documented on the front of the species composition form while the back of this form is reserved for calculation documentation. This is encouraged

by the program to reduce transcription errors made by the observers copying raw data from another location (i.e. back of catch form or back of the species composition form) to the front of the species composition form.

- **Haul Number** – Record the number of the haul that the sample came from.
- **Date** – Record the date as MM/DD/YY.
- **Trip Number** – This number is automatically generated by the database. Complete this field once the trip has been started in the database.

Tip* Some observers find it easier to start a trip prior to leaving port. Doing this allows the observer to fill in the Trip Number while at-sea rather than when the observer returns to port.

- **USCG #** - Record the USCG vessel number posted on the exterior of the vessel or request this six or seven digit number from the vessel skipper or a coordinator. **If the vessel does not have a USCG number, leave field blank.**
- **Trawl Biosampling List** - Circle the number that corresponds to the trawl biosampling list used on the haul. (see Chapter 7, "Biological Sampling" for more information about Trawl Biosampling)
- **Page _ of _** – Number forms sequentially with in a haul.
- **Catch #** - Record the number that corresponds to the catch category on the Catch Form.
- **Catch Category** – Record, in capital letters, the catch category sampled using the 3 or 4-Letter PacFin code. For a list of PacFin catch category codes, see Appendix for Catch Categories and Target Strategies.

- **Sample Method** – Record the method used to sample the catch category.
  1 – Whole Haul
  2 – Single Basket
  3 – Multiple Baskets

- **KP Weight and KP Number** – Sum the total weight of all species in the catch category sample and place the total weight in the Keypunch (KP) Weight box. Sum up the total number of all species in the catch category sample and place the total number in the Keypunch (KP) Number box.

- **Species** – Record the common name of the species in the sample. This column must be filled in with the species name. It is not acceptable to enter a species code number in this field. The common name listed on the paperwork must match the common name used in the database (see Appendix for Species codes.).

Tip* Catch category codes can be used in the common name field for those species with species specific codes.

- **Species Code** – Record the species code of the corresponding species. This field is used to ease data entry, therefore it does not necessarily need to be filled in on-deck. (see Appendix for Species Codes.).

- **Sample Weight** – Record the total weight of the species in the sample. **This weight MUST be an actual weight.**

- **Fish Number** – Record the number of fish of each species in the sample. This number may be an actual count (preferred) or extrapolated.

Tip* Keep in mind, for single species catch categories, record only those actually weighed AND counted on the Species Composition Form. For mixed species catch categories, numbers of fish can be extrapolated.

- **Discard Reason** - Record the skipper/crew's reason for discard. (refer to Chapter 3, "Observer Basics" for more information on these codes)

  11 - Incidental/Accidental
  12 - Drop-off
  13 - Market
  14 - Other
  15 - Predation
  16 - Regulation
  17 - Safety
  18 - Market (Dockside only)

- **Release Method** - Leave this column blank on trawlers. It is used by the Nearshore fisheries only.

- **Basket Weight and Number or Raw Data** – Use this column on deck to document numbers and weights of species. **Be sure to fill in the "Sample Weight" column with the total weight of the species in the sample and the "Fish #" column with the total number of individuals of the species in the sample.**

Haul # ☐☐ **SPECIES COMPOSITION FORM** **Trawl Biosampling List** 1 2 3 Page ____ of ____

Date ☐☐☐☐☐☐ Trip Number ☐☐☐☐☐ USCG # ☐☐☐☐☐☐☐

Catch #	Catch Category	Sample Method	KP Weight / KP Number	Species	Species Code	Sample Weight	Fish #	Discard Reason	Release method	Basket Weight	#	Basket Weight	#

Trawl Sample Methods : **1**-Whole haul species **2**-Single basket **3**-Multiple basket **Fixed Gear Sample Methods: 4**-FG Sample **5**-FG(Verified Fish Ticket) **6**-FG(Unverified Fish Ticket)
Reasons for Discard: 11-Incidental/Accidental **12**-Drop-off **13**-Market **14**-Other **15**-Predation **16**-Regulation **17**- Safety **18** – Market (Dockside only)
Release Methods for RF (Nearshore Fisheries Only): TO-Tossed over **MV**-Mostly Vented **DC**-Mostly released at depth by cage **DW**-Mostly released at depth weighted line **DO**-Mostly released at depth other method
OM-Other release method used **NC**-Not Collected

Species Composition Form v.10 Jan 2010

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Figure 4-15: Species Composition Form

X. Mixed Hauls

Occasionally, a vessel will dump a haul on top of a previous haul. There are two options for documentation and sampling when this occurs.

1. If you have taken a species composition sample from the first haul prior to the second haul being dumped on top:
    - Record the two hauls as separate hauls.
    - Use a visual estimate for the OTC of the second haul.
    - Visually estimate or use other weight methods to estimate the weight of discard from first haul.
    - Record species composition from first haul.
    - If possible, visually estimate the weight of discard on second haul. If not possible, use OTC - Retained weight on Catch Form.
    - Do not take a species composition sample from second haul.
2. If you have not taken a species composition sample from the first haul prior to the dump:
    - Record the hauls as one haul, using the start time/location/etc. from the first haul and the end time/location/etc. from the second. Be sure to document in notes that they were recorded as two separate hauls in vessel logbook.
    - Sum total catch estimates of first and second haul and record as OTC. If two weight methods were used to determine total catch, document as weight method 6 - Other and document how weight was estimated in Haul Comments.
    - If vessel records as two separate hauls, copy retained catch categories and weights (sums of weights if same catch category) from both hauls onto one Catch Form.

Shrimp Tows
Due to short tows and long sorting times, mixed hauls are a common occurrence aboard shrimp trawl vessels. When this occurs, observers will often combine 2 or more hauls and treat them as one.

- Estimate the total weight of discard from both hauls. Record weight on Catch Form.
- Take a random, non-biased, representative species composition sample from the combined hauls.

OR

- Record the hauls as separate hauls.
- Copy vessel's estimate of retained catch categories for each haul on separate Catch Forms.
- Visually estimate discard weight for each haul. If unable to independently estimate, use OTC - Retained for discarded catch category estimates.
- Do not take species composition samples for either haul.

XI. Working Smarter, Not Harder

When sampling on deck, think about ways to minimize the amount of effort, especially lifting, that needs to be accomplished. Here are some things to consider:

1. **Don't weigh fish more than once.** For instance, if you are going to whole haul a catch category, do not weigh the full baskets and then sort and weigh the individual species. Instead, sort into species and weigh, then use the sum of all the weights as the catch category weight.
2. **Sample small individuals separately from larger individuals**. Small flatfish or thornyheads are hard to handle and time consuming to identify. One option for dealing with them is to split small species into their own catch category. By sampling larger specimens first, time is saved and deck space is freed up. Determine the catch category weight of the small individuals and take a one or two basket sub-sample for species composition.
    - **Thornyheads and Splitnose/Aurora**- When large quantities of thornyheads or small rockfish species are discarded or when the discarded

individuals are small, it is very important to get the proportion of shortspine to longspine thornyheads or splitnose to aurora rockfish in the discard. Use one of the following methods when sampling discarded thornyheads, splitnose/aurora discard or any other discard of similar species that meet the above criteria:

- If all discard is actually weighed and whole hauled, place thornyheads/splitnose/aurora in the ZMIS catch category with other discard. All individuals must be identified to species (e.g. do not use thornyhead, unid on Species composition form).
- If discard is not actually weighed and whole hauled, then ***either*** identify all thornyheads/splitnose/aurora to species in the species composition sample or place them in their own catch category, estimate total weight of thornyhead/splitnose/aurora's in the haul, and take a single basket species composition.
- **Thornyhead unid- should never be used on the Species composition form!!**

3. **When there is a large amount of discard of a single species, estimate the weight of that species separately from other discarded species.** For instance, some hauls have a large amount of arrowtooth flounder or spiny dogfish shark discard. Observers can visually estimate (based on experience) the total weight of these species in the haul, take a single basket species composition sample, and then use a more accurate weight method for the weight of other discarded species.
4. **Bottom line: Get creative.** Remember that there are 10 weight methods (not including OTC - Retained and Other) that can be used to determine catch category

weights on trawlers. Using a combination of methods on a single haul often results in better estimates of discard and less work for you. Talk with year-round observers for ideas for specific fisheries and/or vessels.

Working Smarter on Pink Shrimp vessels

Pink Shrimp Sampling. Shrimp tows generally contain less total discard than those of other trawl fisheries. However, due to short tow times and high numbers of small individuals, it is often difficult or impossible to whole haul for all species. When unable to whole haul, consider using the following sampling strategies.

- Many observers will collect an Actual Weight for all discard, while randomly selecting 1 or more baskets for species composition sampling. Begin by estimating the amount of discard in the haul and the number of baskets it will fill. Then randomly select one or more baskets for Species Composition. Weigh all baskets of discard and collect species composition/ biological information from the randomly selected basket(s).
- Since any one species may be represented by hundreds or even thousands of individuals in a haul, use extrapolated values for the numbers of fish. Count and weigh as many individuals as possible of each species (with very small individuals it is recommended that you count and weigh at least 100) and then just weigh the rest and apply an average number calculation.
- When a tow contains a large amount of Hake or Rockfish, the crew will oftentimes "float" it. The hopper is filled with water, causing the Hake and/ or Rockfish to float to the top, while most other species settle on the bottom. The "floaters" are then scooped off the top. These fish can be

treated as a separate catch category, since they are handled differently than other discard in the haul.

- Oftentimes, there will be large numbers of unidentifiable juvenile rockfish. If Rockfish Unid. is used on the Species Composition form, **do not** take lengths for **any** Rockfish spp. in the haul. Be sure to take pictures or bring back specimens of any unidentified Rockfish spp. encountered.

Working Smarter with Pacific Halibut

Consider all options when a haul has a large number of Pacific Halibut. Crew members will usually presort as much of the Pacific Halibut as possible. This usually occurs very quickly and can be very overwhelming for observers. When large numbers of Pacific Halibut are in the haul, consider using one of the following methods:

- Most observers will visually estimate the lengths of PHLB and use weight method 9 - PHLB Length/Weight Conversion to determine Catch Weight.
- A combination of both actual and visual lengths can be handled in the same way and can be combined into one Catch Category. When this method is used, be sure to clearly label actual and visual lengths, as such.

The following examples are not commonly used, but might be useful when PHLB numbers are extremely high (~100+):

- Split Pacific Halibut into two catch categories. Visually estimate the length of all the Halibut thrown over by a given crew member or during a randomly selected time. Tally (count) all those Pacific Halibut that you are not estimating the length of. You will have two catch categories on the Catch Form. One catch category will include

the PHLB that were visually lengthed and will be documented with weight method 9 - PHLB Length/Weight. The second catch category will include those Halibut that were tally sampled. To determine the weight of these Halibut, multiply the average weight from the visually lengthed PHLB by the number tallied. Document the catch category with a weight method of 14 - visual experience. The "# of Fish" column on the Catch Form should be completed for both PHLB catch categories.

- Split Pacific Halibut into two catch categories. Visually estimate the length of all the Halibut in a randomly selected section of deck or time period. These will be in a PHLB catch category with weight method 9 - PHLB Length/Weight. For the rest of the PHLB not visually estimated, create another catch category of PHLB, with a weight method of 14 - visual experience. Determine the average weight of the PHLB sampled by weight method 9 and multiply it by the proportion of deck/time not sampled (1/2, 1/4). The "#'s of Fish" column will be blank for this catch category.

XII. Unsampled Hauls

There may be times when a haul cannot be sampled due to illness, injury, or weather conditions. When a haul is not sampled break the discard into species specific catch categories (e.g. OFLT, SKAT, ROCK). Avoid using ZMIS catch category for a unsampled catch categories. Take the following steps when a haul is unsampled:

Trip Form

- Record location, gear, and other information just like it is recorded for a sampled haul.

- Observer Total Catch Estimate – At minimum, make a visual estimate of the total catch weight.

Trawl/Prawn Catch Form

- Record vessel estimates of retained catch categories.
- For discarded catch categories, place all species in one category. Subtract the vessel estimates of retained species from the visual estimate of OTC. Use Weight Method 5 – OTC – Retained to obtain an estimate of the discarded catch weight.
- Document the appropriate reason for discard for the catch category.

XIII. Discard That Cannot Be Attributed To A Specific Haul

On rare occasions, a vessel will discard fish from the hold. This happens if market conditions change during a trip or if they are catching larger fish that are worth more money. Record discard that cannot be attributed to a specific haul on the Trip Discard Form (See Figure 4-16).

The Trip Discard Form is not entered into the database system. Document the information from the Trip Discard Form in the Trip Comments on the Trip Page.

Trip Discard Form Instructions

- **Trip Number** – This number is automatically generated by the database. Complete this field once the trip has been started in the database.

  Tip* Some observers find it easier to start a trip prior to leaving port. Doing this allows the observer to fill in the Trip Number while at-sea rather than when the observer returns to port.

- **USCG #**– Record the USCG vessel number posted on the exterior of the vessel or request this six or seven digit number from the vessel skipper or a coordinator. **If the vessel does not have a USCG number, leave field blank and fill in the State Registration Number field.**

- **Date** – Document the month (MM) and day (DD) that the trip discard took place.

- **Time** – Document the time, in PST military time, that the trip discard took place.

- **Species** – Document the common name of the species that was discarded.

- **Weight** – Document the weight, in pounds, of species discarded.
- **# Of Fish** – Document the number of fish discarded (if known).
- **Weight Method** - Document the weight method used to estimate the species weight.
  - 1 - Actual Weight
  - 2 - Bin/Trawl Alley Estimate
  - 3 - Basket Volume Determination
  - 6 - Other
  - 7 - Vessel Estimate (for retained only)
  - 8 - Extrapolation
  - 9 - PHLB L/W Conversion
  - 14 - Visual Experience
- **Discard Reason** - Record the skipper/crew's reason for discard.
  - 11 - Incidental/Accidental
  - 12 - Drop-off
  - 13 - Market
  - 14 - Other
  - 15 - Predation
  - 16 - Regulation
  - 17 - Safety
  - 18 - Market (Dockside only)
- **Comments** – Document any additional information that is important.

Trip Discard Form Page ____ of ____

Trip Number | | | | | | USCG # | | | | | | | |

Date		Time	Species	Weight	# of Fish	Weight Method	Discard Reason	Comments
Month	Day							

Trip Discard Form v.2 January 2004

Figure 4-16: Trip Discard Form

XIV. Examples

In this trawl example, be aware that the biological sampling duties that observer's are responsible for on every haul are not addressed. Biological sampling is described in detail in Chapter 7, Biological Sampling and Chapter 8, "Protected Resources" .

Coming soon!