



How Discards Are Calculated for Groundfish Sectors and the Common Pool

Northeast Regional Office

During fishing operations, fish are occasionally discarded at sea. The amount of the discarded fish must be determined so that it can be subtracted from the Annual Catch Entitlement (ACE) of the sector or the common-pool. Both sectors and the common pool need this information so that they don't exceed their ACEs. Otherwise the ACE would have to be reduced accordingly in the next fishing year. NOAA Fisheries Service and the New England Fisheries Management Council (NEFMC) also need this information to monitor overall catch rates and to set annual catch limits. The way that discards are calculated depends on whether the fishing trips are observed or unobserved.

Discards for Observed Trips

- If 100% of the hauls are observed, the actual observed discards are applied to the trip. Landings + discards = total catch for the trip.
- If less than 100% of the hauls are observed, the discards from the observed hauls are used to estimate the amount of discards for the unobserved hauls.

Discards for Unobserved Trips

Discards are estimated for trips that are not observed. The discard estimation process is performed at the stratum level. A *stratum* is made up of trips by members of the same sector, or members of the common pool, with the same gear type and in the same stock area. In other words, a stratum is a way of grouping similar trips.

Discard Ratio

The basis for calculating discards on unobserved trips is the ratio of discards-to-total landings from observed trips within a stratum. This is called the *discard ratio*. (A *ratio* compares the size, or magnitude, of two quantities.) For example, suppose there were on observed trips within the stratum 100 pounds of discards out of a landings total of 10,000 pounds. The discard ratio would be:

$$100/10000 = 1/100 = 0.01$$

Cumulative Method

NOAA Fisheries Service employs a *cumulative* method of estimating discards. This means that as more data are reported during the fishing year, discards are re-estimated with updated discard ratios using the most current year-to-date totals. (You'll see an example at the end of this document.)

The method to determine the discard ratio for unobserved trips is one of the following:

- Assumed
- Transition
- In-season

These ratios are determined by how many observed trips have occurred, as explained in the following sections.

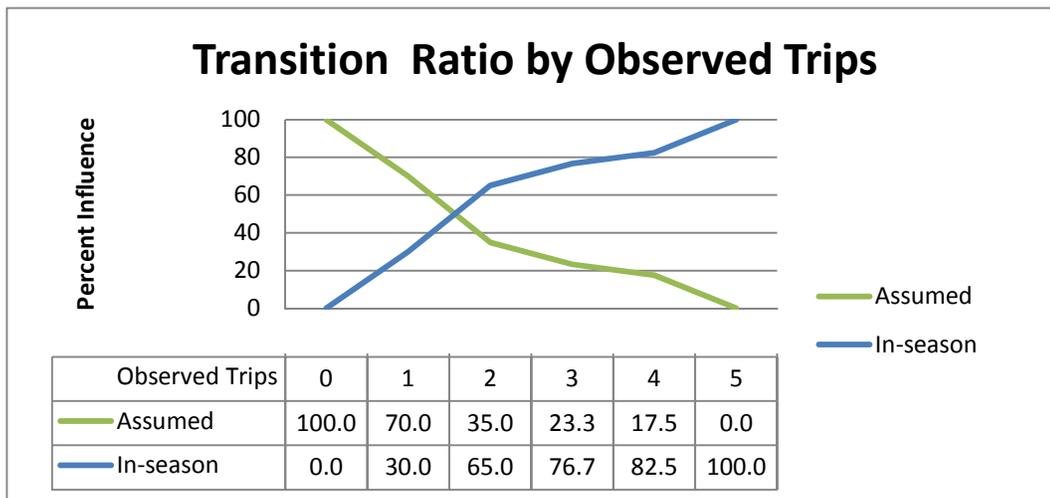
Assumed Discard Ratio

At the beginning of the fishing year, before any observed trips have occurred, NOAA Fisheries Service provides an assumed discard ratio. This is based on observer data from one or more previous years for the same gear and stock. For fishing year (FY) 2010, observer data from FY 2008 – 2009 were used.

Transition Discard Ratio

For the first four observed trips within a stratum in the fishing year, NOAA Fisheries Service provides a transition discard ratio. After each observed trip, the transition ratio diminishes the influence of the assumed discard ratio in the calculation of discards for that stratum. After four trips have been completed in the stratum, the in-season ratio replaces the assumed and transition ratios. See [Figure 1](#) for an illustration of the decreasing weight given to the assumed discard ratio as observed trips accumulate.

Figure 1: Influence of Assumed and In-season discard ratios on the Transition discard ratio



In-Season Discard Ratio

Starting at the fifth observed trip in a stratum, NOAA Fisheries Service changes the method to the in-season ratio. This ratio uses discard data from observed trips to estimate discards from unobserved trips. As more observer data become available, NOAA Fisheries Service updates the in-season discard ratio and applies it to all unobserved trips within that stratum during the fishing year.

Understanding the In-Season Discard Ratio

Determining discards from unobserved trips using the in-season discard ratio is a two-step process:

1. Getting the discard ratio for the sector, gear, and stock of interest
2. Computing the discards for the sector, gear, and stock of interest

Getting the Discard Ratio

Remember that NOAA Fisheries Service uses the observed trips to estimate the discards from all unobserved trips in a stratum. The observed data are used for a calculation to produce each in-season discard ratio. These ratios are supplied by NOAA Fisheries Service. The discard ratio is d/k_{all} :

- d = Year-to-date observed discards for a stock from observed trips
- k_{all} = Year-to-date landings of all species from observed trips

Refer to the example described earlier in the section [Discard Ratio](#).

Computing the Discards

Following is the formula for calculating the unobserved discards from observed trips:

$$D = d/k_{all} * K_{all}$$

where:

- D = Year-to-date discards for unobserved trips in the stratum
- K_{all} = Year-to-date total landings of all species from unobserved trips

Sector managers get the discard ratios from NOAA Fisheries Service and apply the discard ratios to the K_{all} value they get from dealers. For common pool operations, NOAA Fisheries Service applies the discard ratios. See the section [Example: Applying the In-season Discard Ratio](#) for more information.

Applying Discard Ratios

If you are a sector manager, you apply the discard ratios. The discard ratio used in the cumulative method is based on the discards aggregated by all observed trips within that stratum (sector–stock area–gear or common pool–stock area–gear) in the current fishing year. The discard ratio includes values for all stocks for which there have been discards in the stratum. Each stock discard ratio should be applied across all aggregated data of all unobserved trips within the stratum. As data accumulate throughout the year, the discard estimations become more accurate.

The cumulative estimation method computes discards at the sector level or the common pool level, **not** at the individual vessel or trip level. The method will accurately estimate discards for the sector or the common pool, but may not necessarily accurately estimate discards at the trip or vessel level. If discards are applied at the individual level, vessels could be charged for discards for stocks they have not caught. Sector managers can determine for themselves the best way to manage discards.

Example: Applying the In-season Discard Ratio

The remainder of this section provides several tables that show an example of applying the in-season discard ratio. This example illustrates sector operations, but the same methodology would apply to the common pool.

Note: If there are no discards in the stratum for the reporting period, the discard ratio is zero, which should be applied.

[Table 1](#) shows the observed trips in a sector for a gear/mesh and stock; with the catch weight in live pounds (lb). These are the data used to compute the d/k_{all} ratio. For example, at Week 2, the discard ratio (d/k_{all}) is computed by dividing the aggregated discards from Weeks 1 and 2 (503 lb) by the landings from all species from Weeks 1 and 2 (28,670 lb). The key data are highlighted in **yellow**.

[Table 2](#) shows the unobserved trips in a sector for a gear/mesh and stock; weight in live pounds (lb). The K_{all} values are multiplied by the d/k_{all} ratio to produce the estimated discards. For example, at Week 2, the discard ratio based on observer data from Week 1 through Week 2 (0.0175) in [Table 1](#) is multiplied by the sum of the unobserved trips from Week 1 through Week 2 (33041 lbs, in **blue**) in [Table 2](#). This produces the discard estimate of 578.2 lbs (in **green**) for unobserved discards at Week 2.

You can try this process yourself for Week 4, for example. At Week 4, multiply the d/k_{all} ratio from Weeks 1 through 4 by the K_{all} from unobserved trips from Weeks 1 through 4 to estimate the year-to-date discards from unobserved trips in that stratum.

Table 1: Observed Trips in the Sector

Observed Trips							
Trip	Week	Trip			Year-to-date (updated weekly)		
		Trip discards (lb)	Trip landings of all species (lb)		Discards, d (lb)	Landings all species, kall (lb)	d/kall ratio
O1	1	27	5600		348	24800	0.0140
O2	1	128	4500				
O3	1	23	3800				
O4	1	50	6700				
O5	1	120	4200				
O6	2	155	3870		503	28670	0.0175
O7	3	125	4213		648	37883	0.0171
O8	3	20	5000				
O9	4	33.5	5200		708	46953	0.0151
O10	4	26.5	3870				

Table 2: Unobserved trips in the Sector

Unobserved trips in a Sector										
Trip	Week	Trip landings, Kall (lb)	Discards calculated in Week 1		Discards calculated in Week 2		Discards calculated in Week 3		Discards calculated in Week 4	
			d/kall ratio	Trip discards, D (lb)						
U1	1	6200	0.0140	87.0	0.0175	108.8	0.0171	106.1	0.0151	93.5
U2	1	4890		68.6		85.8		83.6		73.7
U3	1	8210		115.2		144.0		104.4		123.8
U4	2	4525				79.4		77.4		68.2
U5	2	3896				68.4		66.6		58.7
U6	2	5320				93.3		91.0		80.2
U7	3	6530						111.7		98.5
U8	3	4800						82.1		72.4
U9	3	5400						92.4		81.4
U10	4	6530								98.5
U11	4	5430								81.9
U12	4	5320								80.2
Year-to-date discards for unobserved Sector trips				270.8		578.2		851.3		1011.1

[Table 3](#) shows year-to-date discards (observed + unobserved) in a sector for a gear/mesh and stock. For example, refer to [Table 1](#) and [Table 2](#). You can see that the discard total for Week 1 is five observed trips and three unobserved trips for a total of eight trips.

Table 3: Year-to-date Discards

Trips	Week	Trip discards, D (lb)
8	1	618.8
12	2	1082.7
17	3	1499.3
22	4	1719.1

[Table 4](#) examines Week 1 more closely in order to illustrate the fact that the sum of discards from a sector's unobserved trips equal sector-level discards.

Table 4: Comparing Discards

Trip-level Discards equal Sector-level Discards				
Trip	Week	Trip landings, Kall (lb)	Discards calculated in Week 1	
			d/kall ratio	Trip discards, D (lb)
U1	1	6,200	0.0140	87.0
U2	1	4,890		68.6
U3	1	8,210		115.2
				270.8
Sector		19,300	0.0140	270.8