

Science, Service, Stewardship



Discard Estimation: Applying the selected method

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Postscript 9/10/2010: slide 13 corrected

Overview

Discard Estimation: Applying the selected method

- Discards on observed, partially observed, and unobserved trips
- Overview of the three types of ratios for unobserved trips
 - Assumed discard ratio
 - Transition discard ratio
 - In-season discard ratio
- How to calculate K_{all} by stratum
- Examples

Observed Trips

Used for direct observation and in-season rates

discard weight of stock j (d_j)

kept weight of stock j (k_j)

sum of kept weight of all species ($kall_o$, $kall_u$)

where o =observed hauls and u = unobserved hauls

Stratification variables: general trip characteristics

include: sector, gear, mesh, area fished

Clarification: 'observed' haul means observed for all discards
the kept portion of catch is obtained for every haul

Discards for Observed Trips

- If 100% of the hauls are observed, the actual observed discards are applied to the trip.

Dealer 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.
 - Use d/kall ratios from observed hauls and apply to the unobserved hauls
 - Discards will only be estimated for those stocks which were observed as discarded on the observed hauls

Discards for Observed Trips continued

when all hauls
are observed

$$Do_{s,i,j} = \sum_{o=1}^O d_{s,i,j,o}$$

when some hauls
are observed

$$\hat{D}o_{s,i,j} = \frac{\sum_{o=1}^O d_{s,i,j,o}}{\sum_{o=1}^O kall_{s,i,o}} * \left(\sum_{u=1}^U kall_{s,i,u} + \sum_{o=1}^O kall_{s,i,o} \right)$$

Where in a given stratum:

$Do_{s,i,j}$ is the estimated discarded pounds for species j, trip i, and sector s;

$d_{s,i,j,o}$ is the discarded pounds of species j from observed trip i and sector s and observed haul o ;

$kall_{s,i,u}$ is the kept pounds of all species on unobserved hauls of an observed trip i and sector s;

$kall_{s,i,o}$ is the kept pounds of all species on observed hauls of an observed trip i and sector s;

O is the number of observed hauls during the trip $o=1, \dots, O$

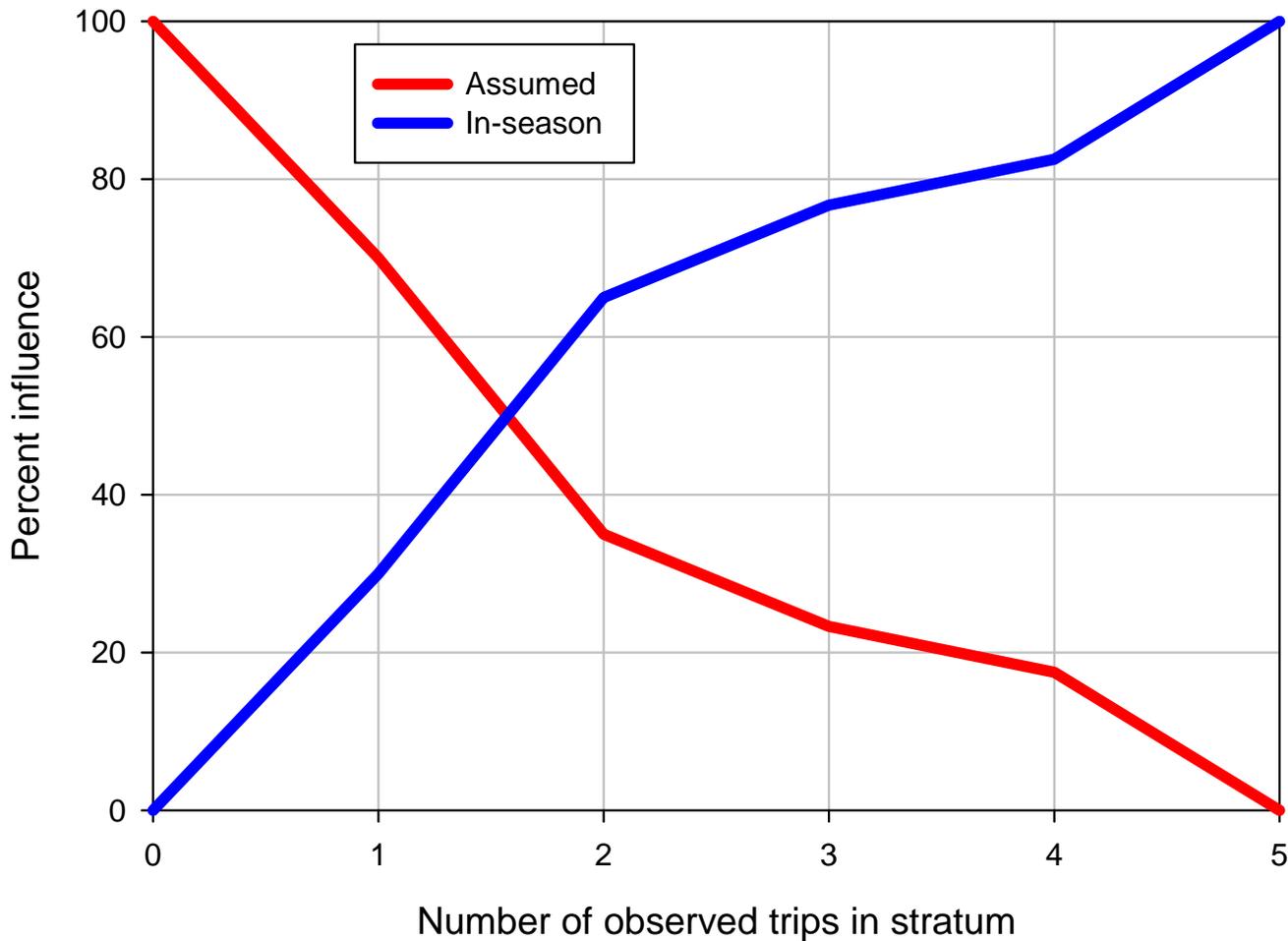
U is the number of unobserved hauls during the trips $u = 1, U$

Discards for Unobserved Trips

- Three types of discard ratios
 - **Assumed** – there are no observed trips in that stratum for the current fishing year.
 - **Transition** – there are between 1 and 4 observed trips in that stratum for the current fishing year.
 - Exponentially weighted ratio that combines both assumed and in-season ratios and decreases the influence of the assumed ratio as more trips are observed.
 - **In-season** – there are ≥ 5 observed trips in that stratum for the current fishing year.

Discards for Unobserved Trips continued

Contribution of the assumed and in-season ratios to the calculation of the transition ratio as a function of the number of observed trips



Discards for Unobserved Trips

- Discards will be estimated for all stocks occurring in the area fished
- Apply the stratum-specific discard ratio (d/k_{all}) to the total retained pounds of ***all species*** (K_{all}) from all unobserved trips in that stratum
 - All weights used in the calculations are in pounds, live weight

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

where:

d/k_{all} = *discard ratio calculated from observer data (pending on the number of observed trips in the stratum, could be either an assumed, transition or in-season discard ratio).*

K_{all} = *Year-to-date total landings of all species from unobserved trips.*

D = *Estimated year-to-date discards for unobserved trips in the stratum.*

Discards for Unobserved Trips continued

- What is included in “kept of all species”?
 - All species that are retained
 - Non-groundfish species (e.g., lobster, dogfish)
 - Unmarketable fish; legal sized unmarketable allocated groundfish must be retained per regulations
 - Bait, home consumption
 - Protected species (e.g., sturgeon, turtles) can't be retained
 - Debris (e.g., rocks, shells, sea weed) are not retained

A comprehensive data collection program collects info on all species, gear interactions, habitat, etc.

Stock Apportionment and Kall

Trip used large-mesh otter trawl gear and fished in statistical area 515

Note: 1 subtrip

1) Uses VTR kept quantity, Dealer landings, and NMFS-provided conversion factors to convert landed weight to live weight.

Note: VTR are good faith hail weights, Dealer assumed to be exact.

2) Match VTR with all Dealer transactions for the trip, convert to live pounds, sum all species live lbs (K_i)

<u>VTR</u>		<u>DEALER</u>		<u>NMFS</u>	
<u>Species</u>	<u>AREA 515</u>	<u>Species*</u>	<u>Landed lbs.</u>	<u>Live lbs.</u>	<u>conversion factors</u>
COD	210	COD	215	252	1.17
HADD	325	HADD	320	365	1.14
FLGS	125	FLGS	120	120	1
FLDAB	230	FLDAB	235	235	1
SKWINW	110	SKWINW	115	261	2.27
CUSK	25 HC				
LOB	75	LOB	75	75	1
Total	1100		1080	1307	
				25 HC	
				1332	Kall

K_{all} includes bait, home consumption, etc

HC = home consumption

* species are reported by species, market category, grade, and unit of measure

Trip used large-mesh otter trawl gear and fished in statistical areas 515 and 561

Note: 2 subtrips

1) Uses VTR kept quantity, Dealer landings, and NMFS-provided conversion factors to convert landed weight to live weight

Note: VTR are good faith hail weights, Dealer assumed to be exact.

2) Match VTR with all Dealer transactions for the trip

3) Using VTRs for trip, calculate species percentage among statistical areas (this is used to apportion the Dealer data)

4) Convert Dealer landings to live pounds, apportionment of Dealer landings, and sum all species live lbs (Kj) by stock area.

<u>VTR</u> good-faith hail			actual	<u>DEALER</u>		<u>NMFS</u>		<u>DEALER APPORTIONED</u>	
Species	Qty	species %	Landed	Species*	Landed	Conv.	Live	Species	Live lbs.
<u>AREA 515</u>	kept		lbs.		lbs.	Factor	lbs.	<u>AREA 515</u>	
COD	210	33.9%	215	COD	630	1.17	737	COD	250
HADD	325	72.2%	320	HADD	450	1.14	513	HADD	371
FLGS	125	100.0%	120	FLGS	120	1	120	FLGS	120
FLDAB	230	30.3%	235	FLDAB	765	1	765	FLDAB	232
SKWINW	110	26.2%	115	SKWINW	435	2.27	987	SKWINW	259
CUSK	25	100.0% <i>HC</i>	25	LOB	155	1	155	LOB	78
LOB	75	50.0%	75	FLYT	505	1	505	FLYT	0
Subtotal	1100		1105					<u>CUSK</u>	25 <i>HC</i>
								AREA 515 Kall	1333

<u>Species</u>				<u>Species</u>		
<u>AREA 561</u>				<u>AREA 561</u>	Live lbs.	
COD	410	66.1%	415	COD	487	
HADD	125	27.8%	130	HADD	143	
FLGS	0	0.0%	0	FLGS	0	
FLDAB	530	69.7%	530	FLDAB	533	
SKWINW	310	73.8%	320	SKWINW	729	
LOB	75	50.0%	80	LOB	78	
FLYT	500	100.0%	505	FLYT	505	
Subtotal	1950		1980	AREA 561 Kall	2475	

Trip Total	3050	3085	3060	3783	Trip Total Kall	3808
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* Species are reported by species, market category, grade, unit of measure

3 Examples

Example 1: Observed trip with all hauls observed

Example 2: Observed trip with some hauls unobserved

Example 3: Unobserved trips

DISCARDED species

Haul Identifier	Obsr-flag	Stat. Area	COD	WINTER FLD	WITCH FLD	AM. PLAICE	WINDOWPANE	HADDOCK	WHITE HAKE	HALIBUT	REDFISH	
130200903E170050001	1	562				3	1					
130200903E170050002	1	562	3				3	1				
130200903E170050003	1	561		4				5			3	
130200903E170050004	1	561	4	3					5			
130200903E170050005	1	561									3	
130200903E170050006	1	522										
130200903E170050007	1	522	55	5	3			2			5	
130200903E170050008	1	521	279	4			1	4				
130200903E170050009	1	521	72								6	
130200903E170050010	1	521	65				1					
130200903E170050011	1	521	46									
130200903E170050012	1	515		45	4					13	32	
130200903E170050013	1	515										
130200903E170050014	1	515			3	8						
130200903E170050015	1	515	6	10	8							
Total			530	49	29	22	6	10	2	18	49	715
Subtotal for Area 515			6	45	17	16	0	0	0	13	32	
Subtotal for Area 521			462	4	0	0	2	4	0	0	6	
Subtotal for Area 522			55	0	5	3	0	0	2	0	5	
Subtotal for Area 561			4	0	7	0	0	5	0	5	6	
Subtotal for Area 562			3	0	0	3	4	1	0	0	0	

Note: no discards

Example 1

Observed trip with all hauls observed

Large-mesh Otter trawl
15 hauls
5 stat. areas

Weight in live pounds

Discarded Species	Stock										Observed Discards by stock	1 - survival ratio	TRIP Total Discards
COD	GM (515)	6									6	1	6
COD	GB (521, 522)	517									517	1	517
COD	EGB (561, 562)	7									7	1	7
WINTER FLD	GM (515)		45								45	0.5	23
WINTER FLD	GB (522,561,562)		0								0	1	0
WINTER FLD	SNE (521)		4								4	0.5	2
WITCH FLD	UNIT(515,521,522,561,562)			29							29	1	29
AM. PLAICE	UNIT(515,521,522,561,562)				22						22	1	22
WINDOWPANE	NOR (515,521,522,561,562)					6					6	1	6
WINDOWPANE	SOU					0					0	1	0
HADDOCK	GM (515)						0				0	1	0
HADDOCK	GB (521, 522)						4				4	1	4
HADDOCK	EGB (561, 562)						6				6	1	6
WHITE HAKE	UNIT(515,521,522,561,562)							2			2	1	2
HALIBUT	UNIT(515,521,522,561,562)								18		18	1	18
REDFISH	UNIT(515,521,522,561,562)									49	49	1	49
TOTAL		530	49	29	22	6	10	2	18	49	715		691

Discarded Species

Haul Identifier	Obsr-flag	Stat. Area	Sum of kept weight for all species on observed hauls (kall _o)	Sum of kept weight for all species on unobserved hauls (kall _u)	Discarded Species		
					COD	YELLOWTAIL FLD	HADDOCK
130200807A540110001	1	522	998.3			3	
130200807A540110002	1	522	680.8			1	
130200807A540110003	1	522	549.3				
130200807A540110004	1	522	828.3			1	
130200807A540110005	1	522	570.8			1	
130200807A540110006	1	522	679.8				
130200807A540110007	1	522	673.6			2	
130200807A540110008	0	522		246.0			
130200807A540110009	1	522	875.5			1	
130200807A540110010	1	522	795.5			1	
130200807A540110011	1	522	440.3			1	
130200807A540110012	1	522	725.5				
130200807A540110013	1	521	1116.7		11	1	
130200807A540110014	1	521	1091.0		3		5
130200807A540110015	0	521		377.7			
130200807A540110016	1	521	112.2				
130200807A540110017	0	521		796.9			
130200807A540110018	1	521	1461.2		13		4
130200807A540110019	1	521	233.2				2
130200807A540110020	1	521	1010.2		7		
130200807A540110021	1	521	495.7				2
130200807A540110022	0	521		429.0			
130200807A540110023	1	521	2994.9		12		
Total			16332.7	1849.6	46	12	13
Subtotal for Area 522			7817.6	246.0	0	11	0
Subtotal for Area 521			8515.1	1603.58	46	1	13
Total			16332.7	1849.6	46	12	13

Example 2

Observed trip that fished in two stat. areas;
19 observed hauls
4 Unobserved hauls

3 ACE stocks discarded

17 species kept
Weights in live pounds

$$\hat{D}_{s,i,j} = \frac{\sum_{o=1}^o d_{s,i,j,o}}{\sum_{o=1}^o kall_{s,i,o}} * \left(\sum_{u=1}^U kall_{s,i,u} + \sum_{o=1}^o kall_{s,i,o} \right)$$

Discarded Species	Stock	kall,o	kall,u	Observed Discards, by stock	Observed Disc. Ratio	Unobs. Discards	Total Trip Discards
COD	GB (522+521)	16332.7	1849.6	46	0.00282	5	51
HADDOCK	GB (522+521)	16332.7	1849.6		0.00080	1	14
YELLOWTAIL FLD.	GB (522)	7817.6	246.0	11	0.00141	0	11
YELLOWTAIL FLD.	GM (521)	8515.1	1603.6	1	0.00012	0	1
YELLOWTAIL FLD.	SNE						

Example 3: Unobserved trips

Observed trips in a Sector for a gear/mesh and stock; weight in live pounds (lb)

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			
O2	1	128	4500			
O3	1	23	3800	348	24800	0.0140
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			

week 1

week 2

week 3

week 4

Unobserved trips in a Sector for a gear/mesh and stock ; weight in live pounds (lb)

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		87.0		108.8		106.1		93.5
U2	1	4890	0.0140	68.6		85.8		83.6		73.7
U3	1	8210		115.2	0.0175	144.0		140.4		123.8
U4	2	4525				79.4		77.4		68.2
U5	2	3896				68.4	0.0171	66.6		58.7
U6	2	5320				93.3		91.0	0.0151	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		579.7		851.3		1011.1
Year-to-date discards for observed Sector trips				348.0		503.0		648.0		708.0
Year-to-date discards for Sector trips				618.8		1082.7		1499.3		1719.1

Close-up comparison calculations for Week 1

Trip	Week	Trip landings, K _{all} (lb)	Discards calculated in Week 1	
			d/k _{all} ratio	Trip discards, D (lb)
U1	1	6,200		87.0
U2	1	4,890	0.0140	68.6
U3	1	8,210		115.2
				270.8
Sector		19,300	0.0140	270.8

Questions?