

Trawl – Total Catch Estimation & Effort

INSERT INSTRUCTOR Name



Sampling Priorities

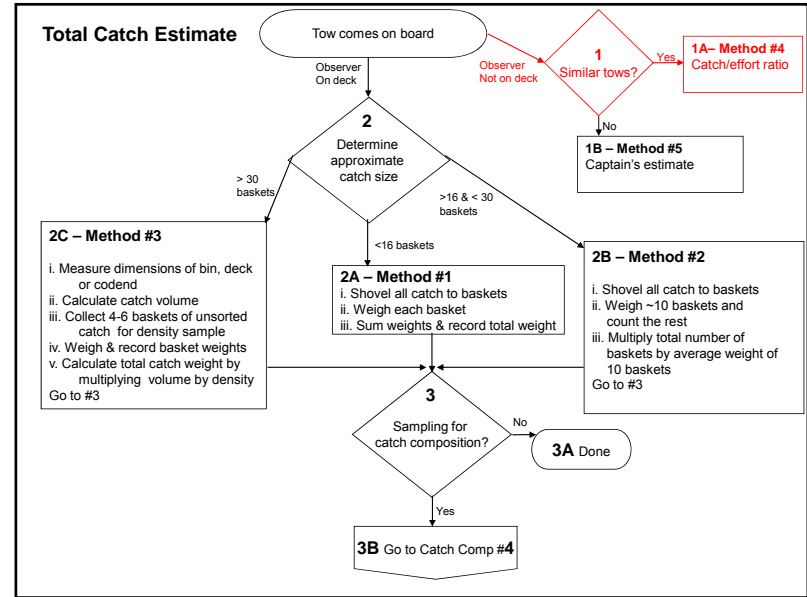
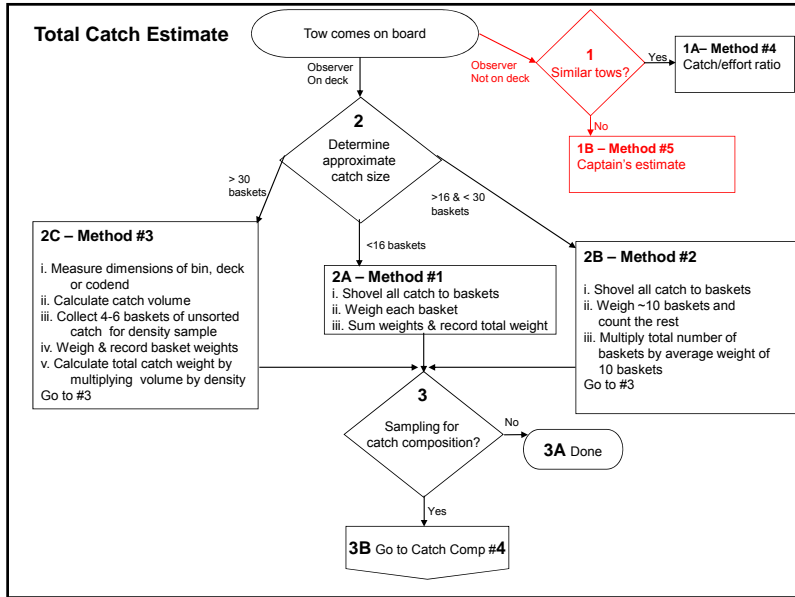
1. **Collect information on fishing effort**
2. Randomly sample for catch composition
3. Record gear characteristics
4. Collect length-frequency data on target and non-target catch

Objectives

- Describe two methods to estimate total catch
- Determine when each method should be utilized
- Demonstrate ability to complete the Trawl Effort / Catch form

Total Catch Estimation - Methods

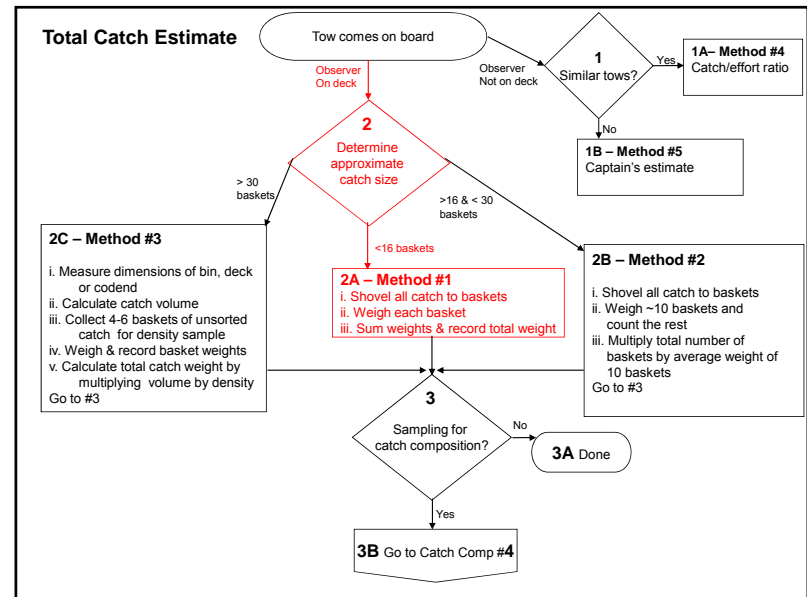
1. Weigh entire catch (small, ~400 kg,) before or after sorting;
2. Weigh subsample, tally total baskets and extrapolate to total catch using average basket weight (moderate, ~400-750kg);
3. Volumetric estimate: Bin or codend (large);
4. Catch/effort ratio
5. Captain/vessel estimate – least desirable



Catch/effort ratio

Haul	TotalWt	Start	End	Duration (min)
17	0.87	22:47	02:20	273
18	1.11	02:59	06:38	219
19	0.55	07:10	12:18	308
20	X	12:51	16:49	238

- $(\sum \text{Total weight of similar hauls} / \sum \text{Haul duration of similar hauls}) * \text{Haul duration of unknown haul} = \text{Estimated weight of unknown haul}$
- $(2.53 \text{ mt} / 800 \text{ minutes}) * 238 \text{ minutes} = 0.752675 \text{ mt}$ or 0.75 mt

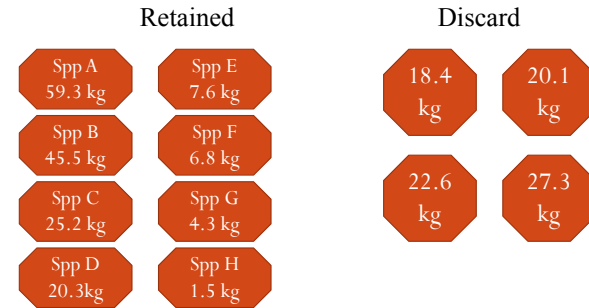


Weight all catch - no sorting

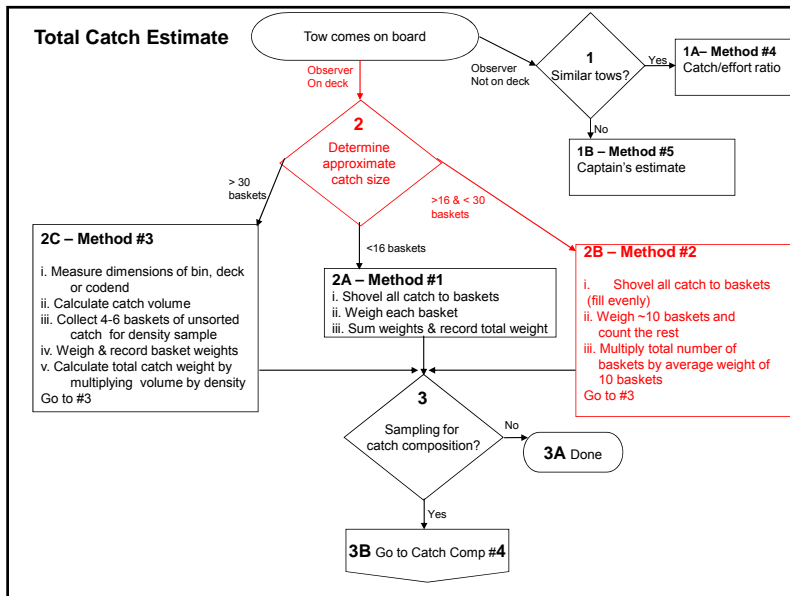


• Σ basket weights = 258.9 kg

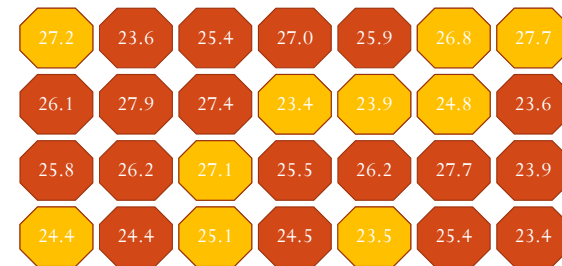
Weight all catch - sorting



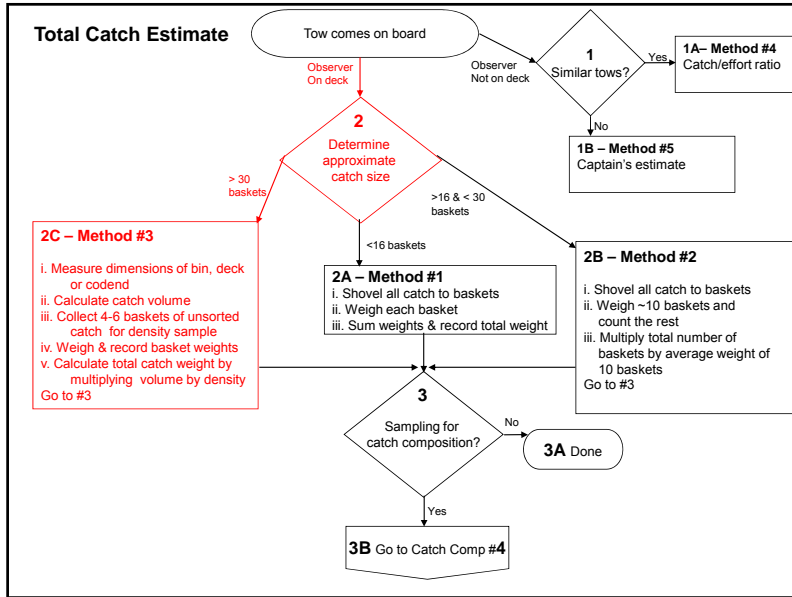
• Σ retained + Σ discard = 170.5 + 88.4 = 258.9 kg



Weight subset of catch - no sorting



- Fill evenly – randomly select 10
- Σ basket weights (orange) / # baskets weighed = 253.8 / 10
- Total count * average = 28 * 25.38 = 710.64 kg
- Actual = 713.7 kg



Volumetric estimate - bin

- Measurable areas on deck or holding bins
- Primary measurements: length, width & height
- Problems/issues:
 - Too much water
 - Accessibility
- Steps
 - Determine appropriate shape
 - Measure
 - Calculate volume

Volumetric estimate - bin

Heights = 0.56 m, 0.43, 0.48, 0.3, 0.35, 0.27
 Average H= 2.49 / 6 = 0.415 m

Length = 3.24 m
 Width = 1.05 m

Volume (rectangular bin) = L * W * H_{average}
 V = 3.24m * 1.05m * 0.415 m = 1.41183 m³

Estimated weight = V * density
 = 1.41183 m³ * 0.912554 mt/m³ = 1.28837111382 mt

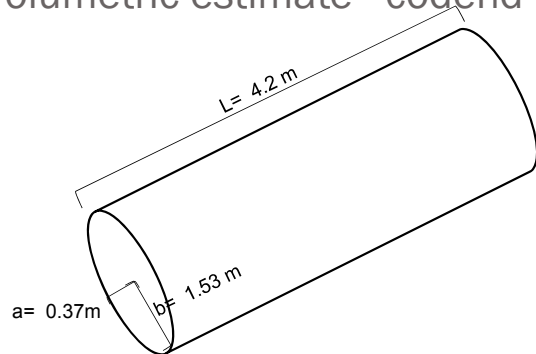
Est weight = 1.29 mt

Volumetric estimate - bin

W = 1.47 m
 L = 4.32 m
 H = 1.2 m

Wedge Volume = ½ (H * L * W)
 V = ½ (1.2 * 4.32 * 1.47) = 3.81024 m³

Volumetric estimate - codend



Ellipsoidal Solid

$$V = \pi * \text{short radius} * \text{long radius} * \text{length}$$

$$V = \pi * a * b * L$$

$$V = \pi * .37 \text{ m} * 1.53 \text{ m} * 4.2 \text{ m}$$

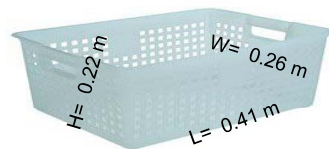
$$V = 7.469513 \text{ m}^3$$

Codend measurements

- Be aware of moving nets in trawl alley
- Measure dimensions using actual measurements and/or reference points (e.g. premeasuring trawl alley width, length can save time)
- Measure large codends in sections

Density

- Density = Weight (mt) / volume (m³) = Σ basket weights / Σ basket volumes



Basket weights (all filled to bottom of handle): 24.3 kg, 20.7 kg, 21 kg, 22.9 kg, 22.7 kg, 23 kg

$$\text{Basket volume} = L * W * H$$

$$V = 0.41 * 0.26 * 0.22$$

$$V = 0.023452 \text{ m}^3$$

$$\text{Density } (\rho) = \text{mass (mt)} / V \text{ (m}^3)$$

$$\rho = .1346 \text{ mt} / (0.023452 \text{ m}^3 * 6)$$

$$\rho = .1346 \text{ mt} / (0.140712 \text{ m}^3)$$

$$\rho = 0.95656376 \text{ mt/m}^3$$

Total Weight Calculations

- Total weight estimate = volume * density
- Observer logbook
 - Diagrams – if possible, make measurements of trawl alley and/or bins before leaving port
 - Space for haul by haul calculations
 - Record all original measurements and formulas used

Issues – removal of catch prior to sorting

- Dangerous or other ‘protected species’ may be removed prior to sorting.
- Inorganic debris & plant material
- Large fish

Record number, species, estimated weight and include the weight in the total catch estimate
Record on spp comp form if appropriate

Trawl Effort / Total Catch form

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Trawl Effort / Total Catch

Observer code		Vessel code		Trip ID		Position																	
Haul	Total net(s)	Gear type	Sampling	Target	Substrate	Day	Month	Year	Time (GMT)	Lat-Deg	Lat-Min	Lat-NS	Long-Deg	Long-Min	Long-EM	Depth (bottom)	Depth (fishing)	V/O	Sea state	Speed	Catch Estimate	Method	
Start												N											
End												N											
Start												N											
End												N											
Start												N											
End												N											

Gear performance codes:

1. No problem
2. Net spread issues (door- and warp-related problems)
3. Net not fishing (bogged, obstructed, bag untied, torn, etc)
4. Net lost
5. Other

Target:

S – Shrimp F – Fish

Substrate:

M – Mud S – Sand
R – Rocky C – Corals
CM – Corals & mud
CMS – Corals, mud & sand

Total Catch method:

1. Weigh entire catch
2. Weigh subsample & extrapolate to total basket count
3. Volumetric estimate: Bin or codend
4. Catch / effort ratio
5. Captain / Vessel estimate
9. Other

Trawl Effort / Total Catch form

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Trawl Effort / Total Catch

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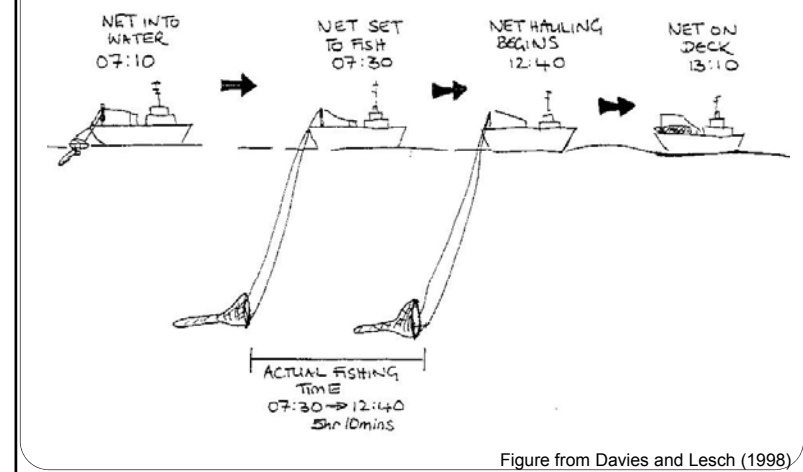
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Trawl Effort / Total Catch form



Trawl Effort / Total Catch form

Trawl Effort / Total Catch

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Observer code		Vessel code		Tow ID											
Hour	Total net Clear Port Sampled Target	Substrate	Date/Time			Position			Depth (bottom)	Depth (linnet)	V/O	Sea state	Speed	Catch Estimate	Netwt
			Day	Month	Year	Time (24hr)	Lat-Deg	Lat-Min							
			Start												
			End												
			Start												
			End												
			Start												
			End												

Gear performance codes: 1. No problem 2. Net spread issues (door- and warp-related problems) 3. Net not fishing (bogged, obstructed, bag untied, torn, etc) 4. Net lost 5. Other	Target: S – Shrimp F – Fish Substrate: M – Mud S – Sand R – Rocky C – Corals CM – Corals & mud CMS – Corals, mud & sand	Total Catch method: 1. Weigh entire catch 2. Weigh subsample & extrapolate to total basket count 3. Volumetric estimate: Bin or codend 4. Catch / effort ratio 5. Captain / Vessel estimate 9. Other
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Activity

- Working alone but you can discuss among yourselves
- 15 minutes then the rest is homework due when class starts tomorrow
- Review answers after graded

Summary

- What are the 2 types of volumetric catch estimates? When should a volumetric estimate be used?
- When should you weigh a subsample of the catch and extrapolate to the total basket count?
- How do you estimate catch if you were asleep during a haulback?
- True or false – Make an entry on the trawl effort and total catch form for sampled hauls only.

References

- Davies, S., and H. Lesch. 1998. The Commercial Sampling Programme, Grade One Observer Manual, Version 2.1 - CSP/03. Ministry of Fisheries and Marine Resources, Commercial Sampling Programme, Observer Section, Walvis Bay, Namibia.
- Pauly, D. 1984. Some simple methods for the assessment of tropical fish stocks. FAO Fish. Tech. Paper 234, FAO, Rome.

Activity –Trawl Effort / Total Catch form

Name:

Complete the blank Trawl Effort / Total catch form and attached logbook pages using the following information.

You board the Observer code: FS345, Vessel code: LIB9997, Trip #7

Your vessel is fishing with a single Crimond Nova Demersal trawl net deployed from the back of the boat and targeting bottom fish. Fishing depth was always 5m above bottom.

You board the boat at noon in Freetown (N8° 29.75 W013° 27.4) on 5/16/2011.

The first tow started on 5/16 at 2245 and finished the next day at 0215. There were some issues with the warp and the net hit hard on a very rocky bottom. The net was ripped and had to be repaired. You recorded the start and end position as N7° 46.35 W14° 8.75 and N7° 44.74 W14° 5.78, respectively. Start depth was 150 m and end depth was 100m. The weather was a little choppy (sea state ~4). Towing speed was consistently 2.3 knots and you use the captain's estimate of 1.00 mt.

The weather started to come down for the second haul and the net was mended with no further problems. The second tow was also on rocky bottom. You decided to take advantage of the down time to get some sleep. The captain woke you 30 minutes before the haulback at 0957. He wrote down the following 'start' information for you: time=0730; N7° 45'21" W14° 9'20"; bottom depth 120m, speed=2.3 knots. Because the vessel is new and the first tow was a mess, you decide not to sample this one and work on species ID and watch which species/size ranges are retained. You'll make a sampling plan after watching a real tow. However, because you're awake, you do record the end position at N7° 43.81 W14° 6.50 and end depth at 115 m. You eventually use hauls 3-5 for a catch/effort ratio estimate for total catch.

The 3rd haul which you decide to sample was on sandier bottom and started at 1023. The initial bottom depth was 150m and ended at about 225m. You also recorded the positions at N7° 43.04 W14° 6.66 and N7° 45.17 W14° 10.15. The haulback began at 1450. Sea state remains at ~3 and tow speed slowed a bit to 2.2 knots. This haul was moderate in size. You estimate you could fill 25-30 baskets. You decide to get the crew to shovel everything into baskets and weight 10. The weights are: 26.3 kg, 23.2 kg, 24.6 kg, 24.1 kg, 23.6 kg, 25.8 kg, 24.9 kg, 23.8 kg, 24.1 kg, 23.3 kg. The actual basket count was 32.

You were still on deck when the 4th haul went into the water so the captain recorded some information for you. time=1525; N7° 46'51" W14° 11'17"; bottom depth 172m, speed=2.3 knots, sea state 3, sandy bottom. The method of weighing / counting baskets of unsorted catch created a lot of extra work for the crew. You decide that this time, you'll let the crew sort first. Then you'll weight all the retained and subsample the basket weights for discard. This haul ends at 1902 at 195m depth. You record the position: N7° 51.23 W14° 13.74. The total retained weight was 347.3 kg and there were a total of 14 discard baskets with an average weight of 25.3 kg/basket.

Haul 5 was also on sandy bottom. It's after dark but you're committed to sampling the next 2 tows. The start & end times are 2117 and 0041 (on May 18). Start position was N7° 51.54 W14° 13.56 and initial depth was 161 m. You also record the end information as: N7° 54.50 W14° 14.78 and 198 m depth. The weather has come down even more to sea state 2 and tow speed is the usual 2.3. The catch was small so you weighed it all before sorting. Basket weights were: 24.3 kg, 22.2 kg, 24.6 kg, 25.1 kg, 25.6 kg, 24.8 kg, 23.9 kg, 22.8 kg, 24.1 kg, 22.3 kg, 25.2 kg, 25.4 kg, 25.7 kg, 23.5 kg.

Haul 6 was on fairly muddy bottom and it was clear this was a very different tow when it came up. The codend was full of mud and invertebrates mixed with a few fish. You decide a codend estimate is the best way to go. You record the start information as 0130, N7° 55.40 W14° 15.12 and 216 m and end info as 0716, N8° 03.09 W14° 15.22 and 224 m. You use the formula for an ellipsoidal solid. The dimensions were: length=3.75m, diameter 1=2.15m, diameter 2= average of 1.0, 1.1, 0.8, 0.8m. Using the basket dimensions in the manual (Section 6.6), your density weight samples were: 25.6, 24.8, 26.8, 25.5 KG.

There was no more fishing on May 18. Recorded a position around 1300 of N8° 4.93 W14° 16.0

Haul #: Total catch WT:	Total Weight Calculation
Density Calculation	
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Density Calculation	
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Density Calculation	

Observer code	Vessel code	Trip ID
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						Date/Time				Position												
Haul	Total nets	Gear Perf	Sampled ?	Target	Substrate	Day	Month	Year	Time (24-hr)	Lat-Deg	Lat-Min	Lat-N/S	Long-Deg	Long-Min	Long-E/W	Depth (bottom)	Depth (fishing)	V / O	Sea state	Speed	Catch Estimate	Method
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
						End					.	N		.								

<p>Gear performance codes:</p> <ol style="list-style-type: none"> 1. No problem 2. Net spread issues (door- and warp-related problems) 3. Net not fishing (bogged, obstructed, bag untied, torn, etc) 4. Net lost 5. Other 	<p>Target: S – Shrimp F – Fish Substrate: M – Mud S – Sand R – Rocky C – Corals CM – Corals & mud CMS – Corals, mud & sand</p>	<p>Total Catch method:</p> <ol style="list-style-type: none"> 1. Weigh entire catch 2. Weigh subsample & extrapolate to total basket count 3. Volumetric estimate: Bin or codend 4. Catch / effort ratio 5. Captain / Vessel estimate 9. Other
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						Day	Month	Year	Time (24-hr)	Lat-Deg	Lat-Min	Lat-N/S	Long-Deg									Long-Min
						Start					.	N		.								
						End					.	N		.								
						Start					.	N		.								
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