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

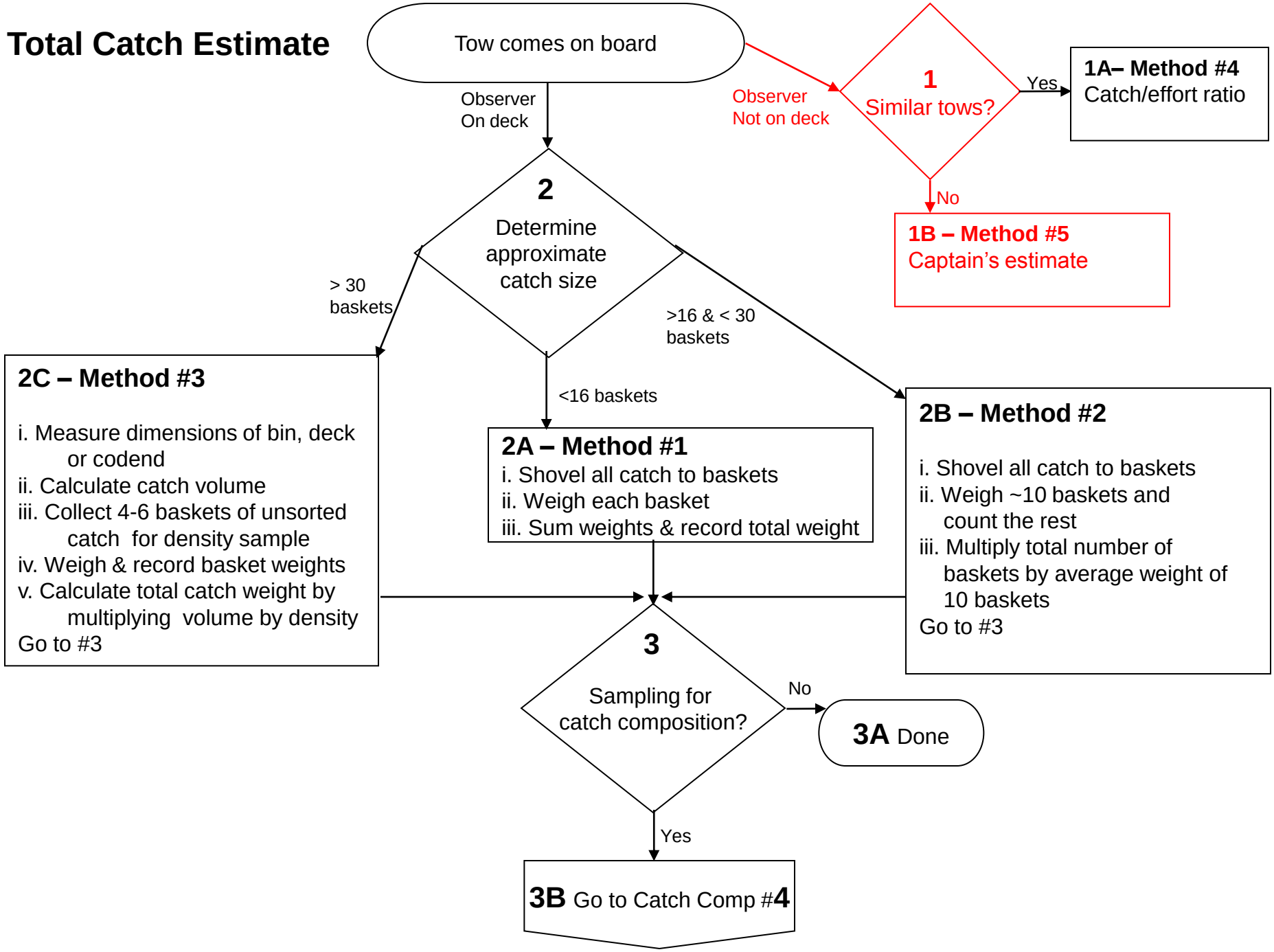
Objectives

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

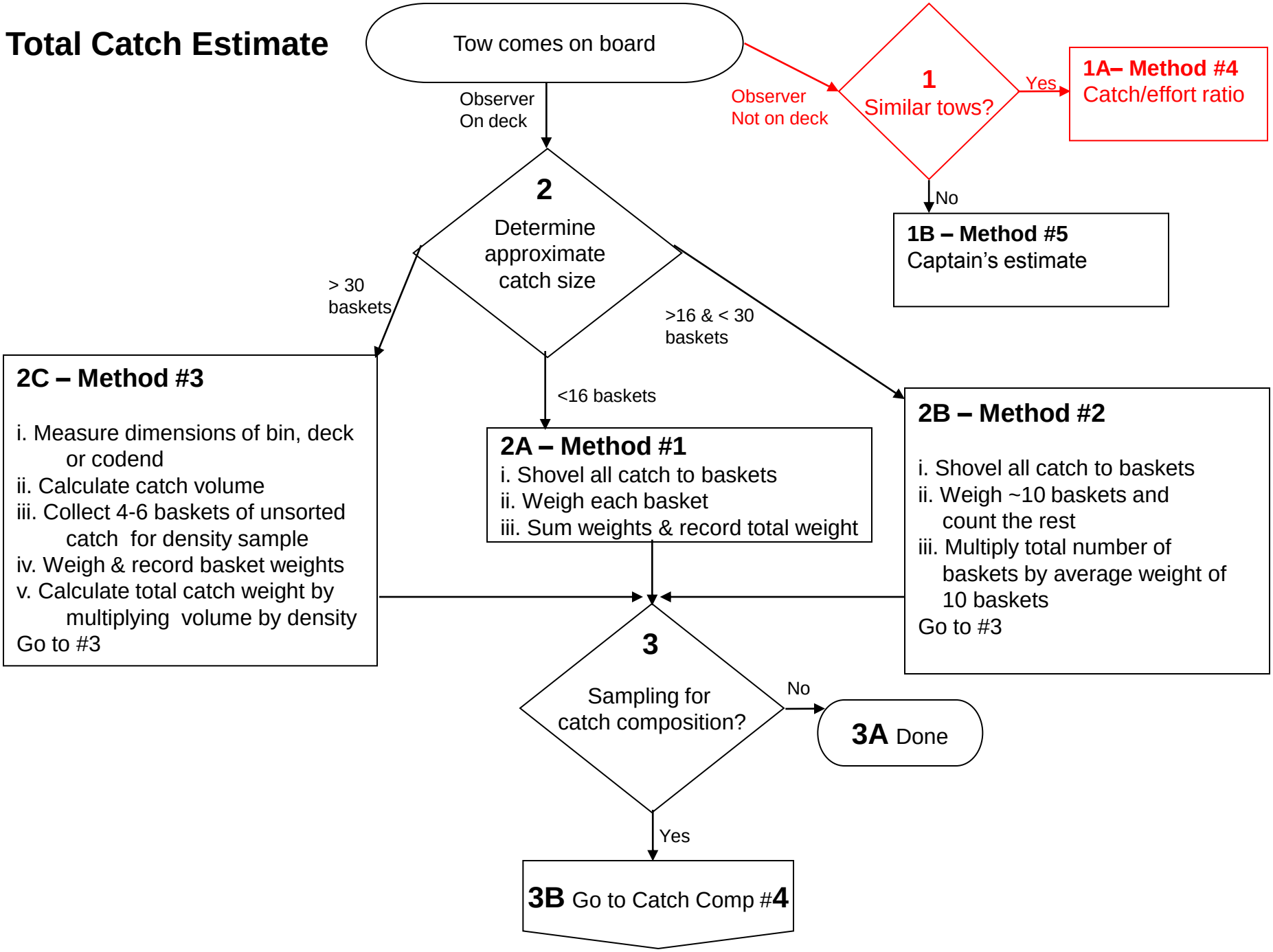
Total Catch Estimation - Methods

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

Total Catch Estimate



Total Catch Estimate

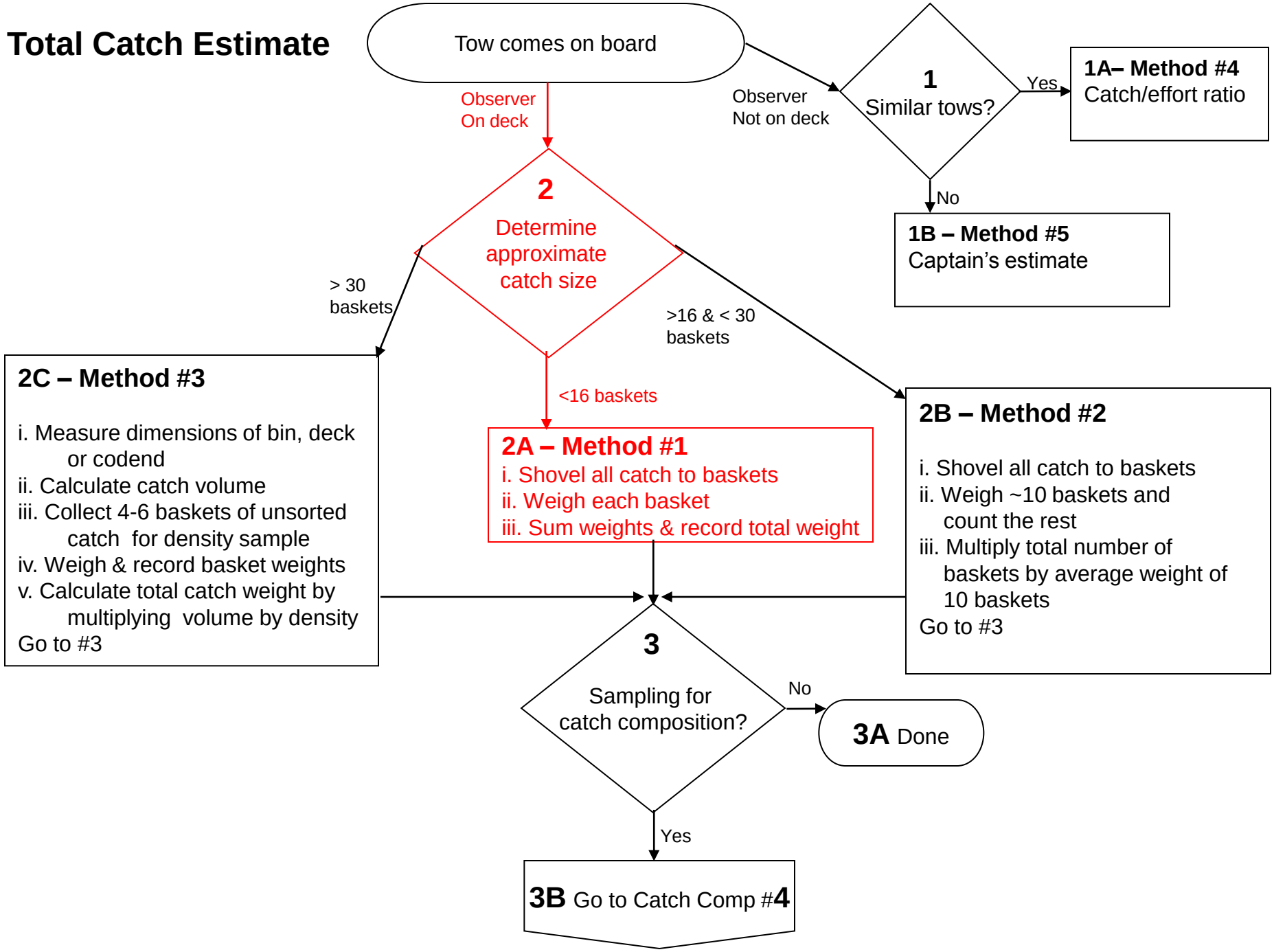


Catch/effort ratio

Haul	Total Wt	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**

- (Σ Total weight of similar hauls / Σ Haul duration of similar hauls) * Haul duration of unknown haul = Estimated weight of unknown haul
- (2.53 mt / 800 minutes) * 238 minutes = 0.752675 mt or 0.75mt

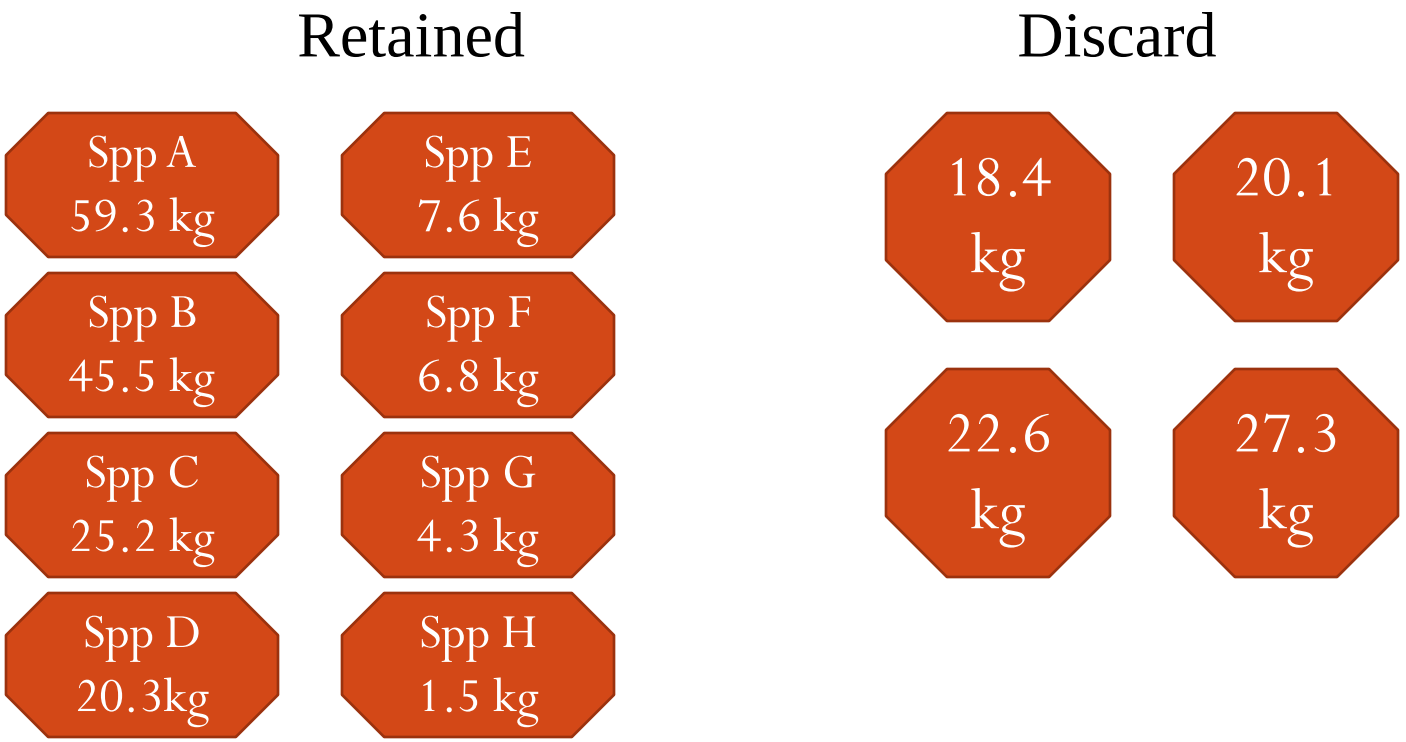
Total Catch Estimate



Weight all catch – no sorting

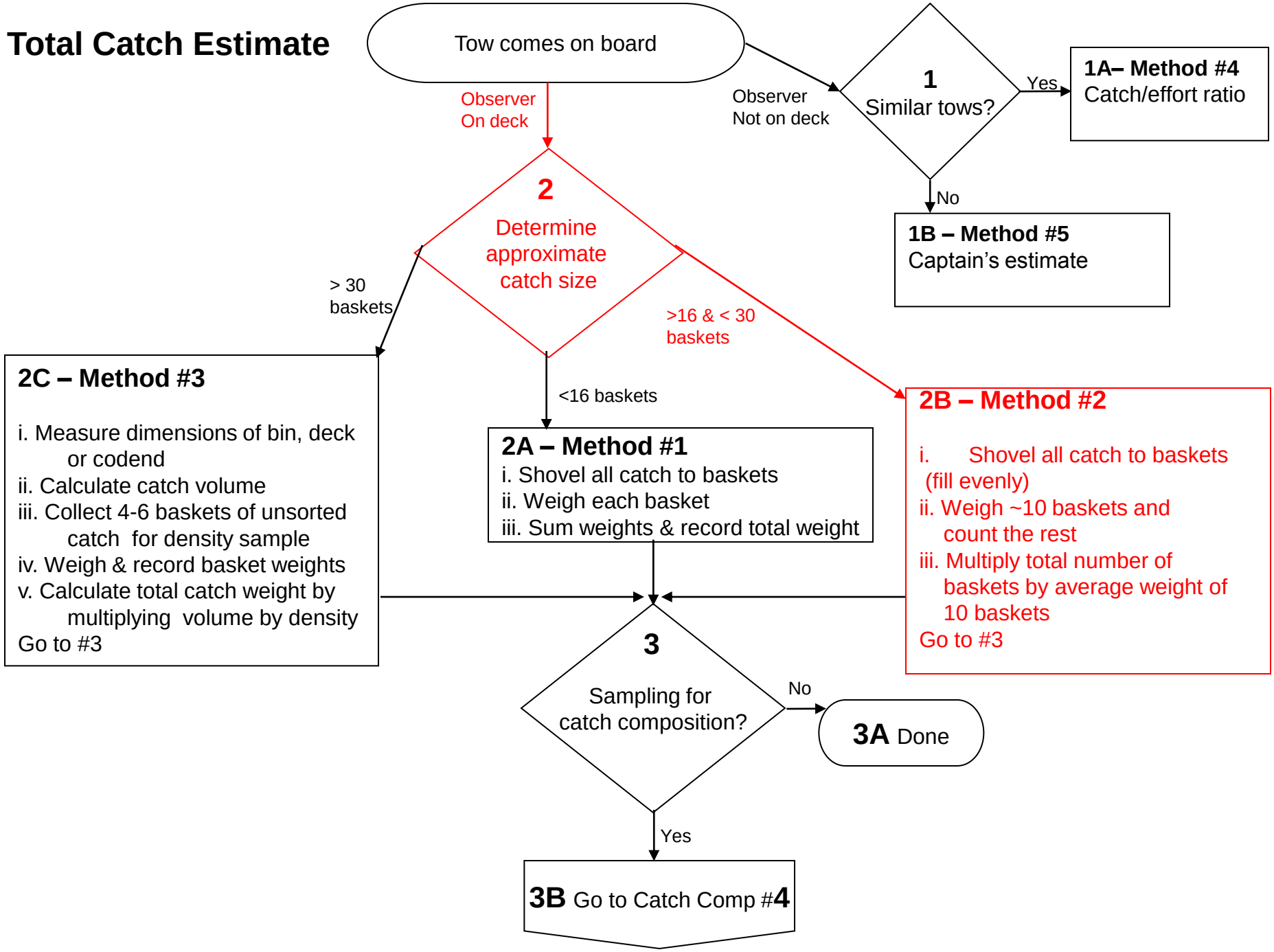
- Σ basket weights = 258.9 kg

Weight all catch – sorting

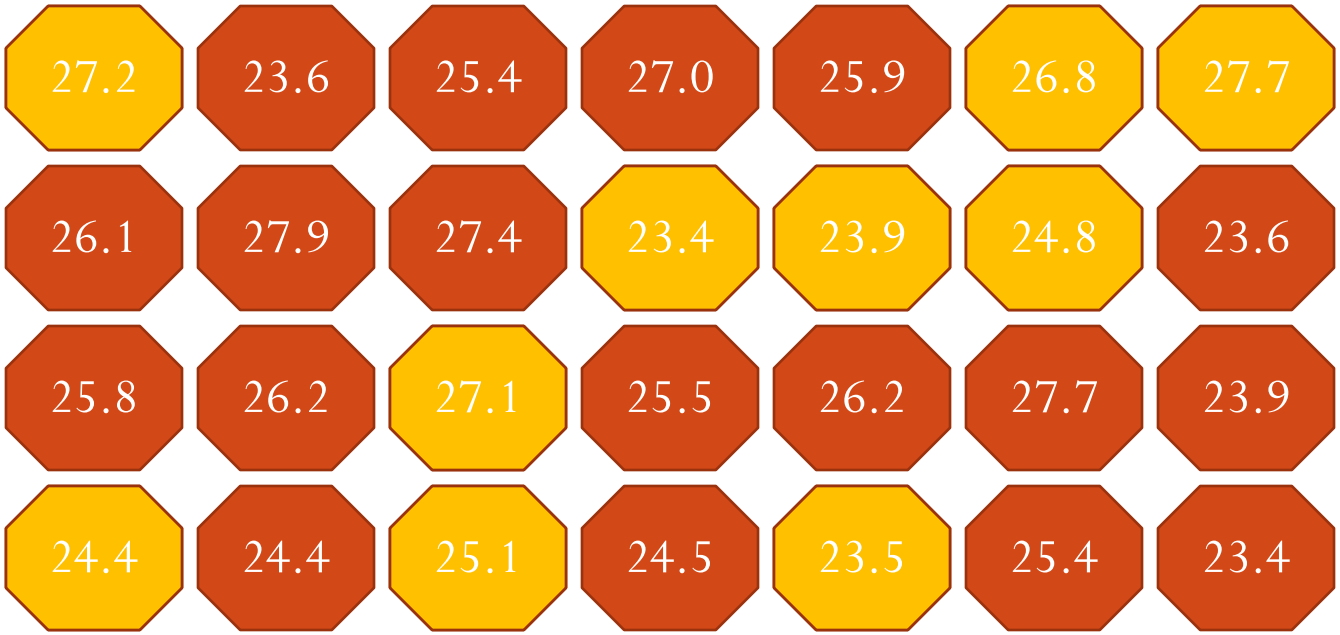


- Σ retained + Σ discard = 170.5 + 88.4 = 258.9 kg

Total Catch Estimate

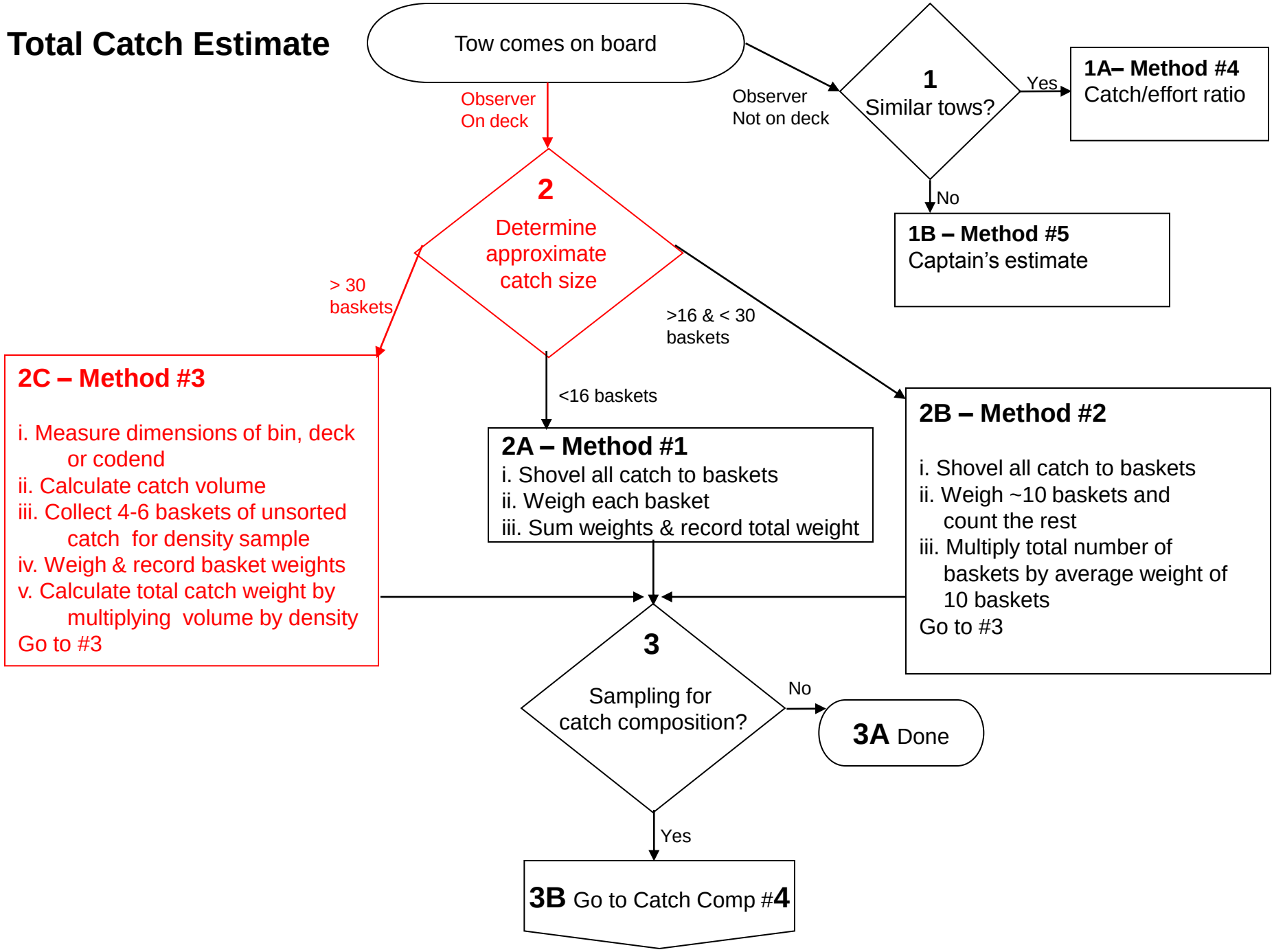


Weight subset of catch – no sorting



- 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

Total Catch Estimate

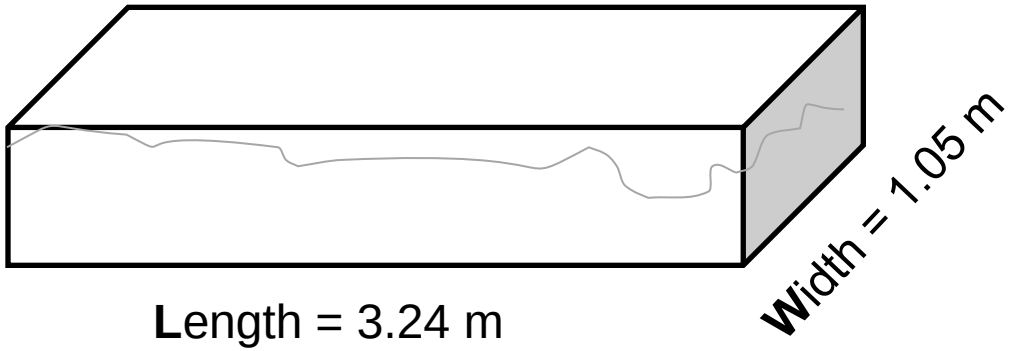


Volumetric estimate - bin

- 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



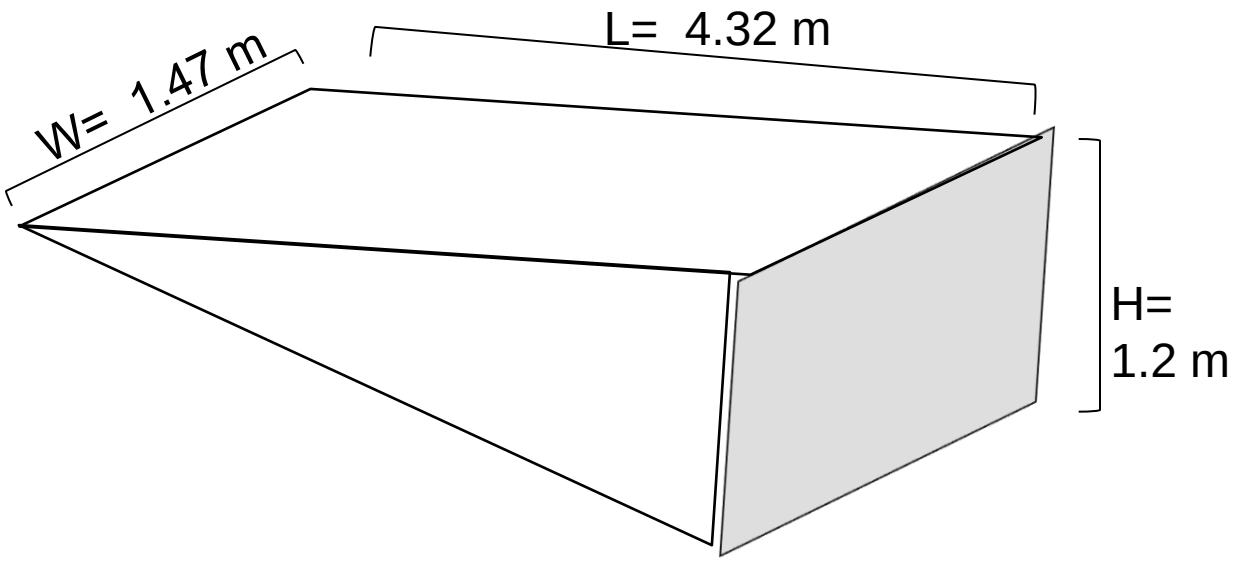
Volume (rectangular bin) = L * W * $H_{average}$
V = 3.24m * 1.05m * 0.415 m = 1.41183 m3

Estimated weight = V * density

= 1.41183 m3 * 0.912554 mt/m3 = 1.28837111382 mt

Est weight = 1.29 mt

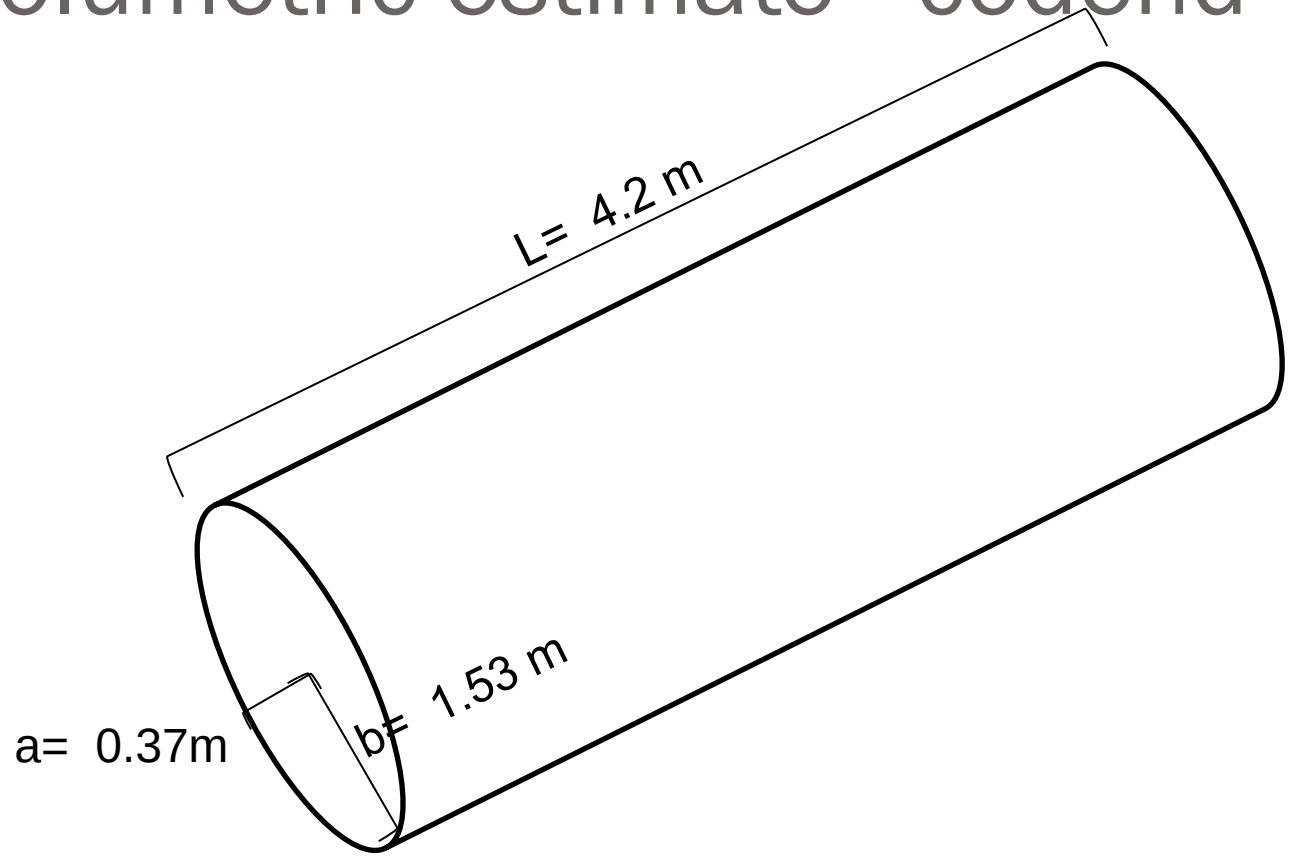
Volumetric estimate - bin



Wedge Volume = ½ (H * L * W)

V= ½ (1.2 * 4.32 * 1.47) = 3.81024 m3

Volumetric estimate - codend



Ellipsoidal Solid

V = π * short radius * long radius * length

V = π * a * b * L

V = π * .37 m * 1.53 m * 4.2 m

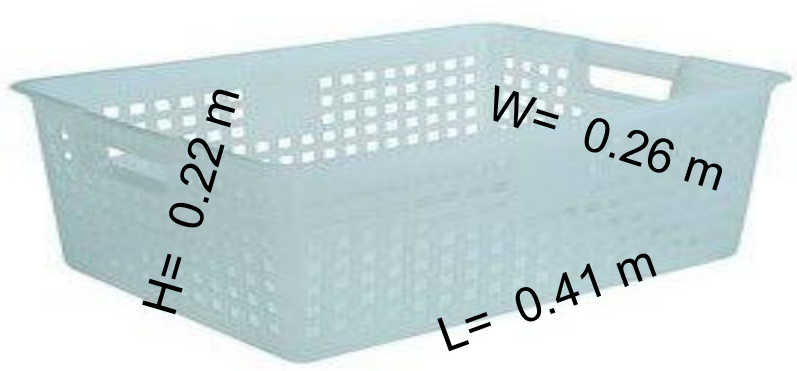
V = 7.469513 m3

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

Basket volume = L * W * H

V= 0.41 * 0.26 * 0.22
V= 0.023452 m3

Density (ρ) = mass (mt) / V (m3)
ρ = .1346 mt / (0.023452 m3 * 6)
ρ = .1346 mt / (0.140712 m3)
ρ = 0.95656376 mt/m3

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

Trawl Effort / Total Catch

Page ____ of _____

Observer code	Vessel code	Trip ID

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		.									

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:
[illegible] – 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

Trawl Effort / Total Catch

Page ____ of _____

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

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Trawl Effort / Total Catch form

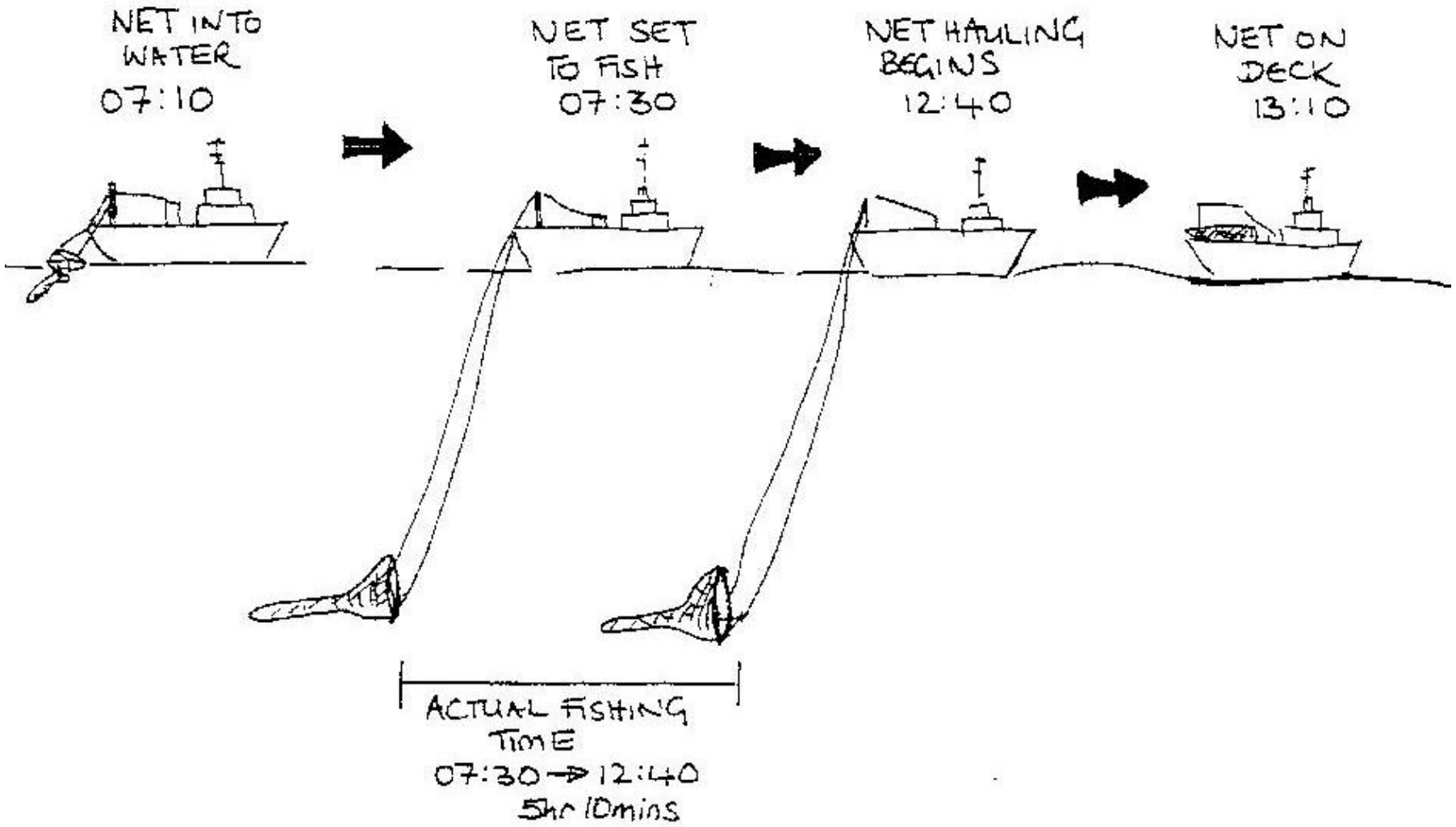

Figure from Davies and Lesch (1998)

Trawl Effort / Total Catch form

Trawl Effort / Total Catch

Page ____ of _____

Observer code	Vessel code	Trip ID

							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		.								

Gear performance codes:
1. No problem
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Target:
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Total Catch method:
1. Weigh entire catch
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3. Volumetric estimate: Bin or codend
4. Catch / effort ratio
5. Captain / Vessel estimate
9. Other

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.

Activity - answers

Observer code	Vessel code	Trip ID
FS345	LIB 9997	7

							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
0						Start	05	05	11	1200	8	29.75	N	13	27.40	W							
						End	Boarded vessel in Freeport					.	N		.								
1	1	2		F	R	Start	16	05	11	2245	7	46.35	N	14	8.75	W	150	145	O				
						End	17	05	11	0215	7	44.74	N	14	5.78	W	100	95	O	4	2.3	1.00	5
2	1	1		F	R	Start	17	05	11	0730	7	45.35	N	14	9.33	W	120	115	V				
						End	17	05	11	0957	7	43.81	N	14	6.50	W	115	110	O	3	2.3	0.43	4
3	1	1	x	F	S	Start	17	05	11	1023	7	43.04	N	14	6.66	W	150	145	O				
						End	17	05	11	1450	7	45.17	N	14	10.15	W	225	220	O	3	2.2	0.78	2
4	1	1	x	F	S	Start	17	05	11	1525	7	46.85	N	14	11.28	W	172	168	V				
						End	17	05	11	1902	7	51.23	N	14	13.74	W	195	190	O	3	2.3	0.70	2
5	1	1	x	F	S	Start	17	05	11	2117	7	51.54	N	14	13.56	W	161	156	O				
						End	18	05	11	0041	7	54.50	N	14	14.78	W	198	193	O	2	2.3	0.34	1
6	1	1	x	F	M	Start	18	05	11	0130	7	55.40	N	14	15.12	W	216	211	O				
						End	18	05	11	0716	8	3.09	N	14	15.22	W	224	219	O	2	2.3	6.41	3
0						Start	18	05	11	1300	8	4.93	N	14	16.00	W	Transit						
						End						.	N		.								

Activity - answers

Haul #: **1** Total catch WT: **1.00** Density Calculation	Total Weight Calculation **Captain estimate**
Haul #:**2** Total catch WT:**0.43** Density Calculation	Total Weight Calculation **Used hauls 3-5 for catch/effort ratio** **(0.78 +0.70+0.34 mt) * 177min = 0.430668 mt** **(267+277+204 min)**

Activity - answers

Haul #: **3** Total catch WT: **0.78 mt**	Total Weight Calculation **Weigh subsample / count baskets** **Basket weights = 26.3 +23.2+ 24.6 + 24.1 + 23.6 + 25.8 + 24.9 + 23.8+ 24.1+ 23.3 = 243.7 kg** **Total baskets=32** **Total catch = 32*0.02437 = 0.77984 mt**
Density Calculation	
Haul #:**4** Total catch WT:**0.70 mt**	Total Weight Calculation **Weigh subsample / count baskets** **Total retained: 347.3 kg** **Discard baskets: 14** **Ave discard basket weight = =26.3 +24.2+ 26.9 + 25.1 + 25.6 + 24.8 + 26.9 + 24.2+ 24.7+ 24.3 = 253.0 kg** **Discard wt = 14 * 25.3 kg = 354.2 kg** **Total = 347.3+354.2=701.5 kg**
Density Calculation	

Activity - answers

Haul #: **5** Total catch WT: **0.34 mt** Density Calculation	Total Weight Calculation **Weigh everything** **=24.3+22.2+24.6+25.1+25.6+24.8+23.9+22.8+ 24.1+22.3+25.2+25.4+25.7+23.5 = 339.5 kg**
Haul #:**6** Total catch WT:**6.41 mt** Density Calculation **Basket wts: 25.6, 24.8, 26.8, 25.5 kg** **density=(0.0256+0.0248+0.0268+0.0255)/(0.023452*4) = 1.094789**	Total Weight Calculation **Codend volume – ellipsoidal solid** **L=3.75, Width=2.15, H=1, 1.1, 0.8, 0.8m** **Average height=.925m** **V=3.1416 * 3.75 * (2.15/2) * (.925/2)** **V=5.85735** **Total catch = V * density** **= 5.85735 * 1.094789 = 6.41257 mt**