

Trawl – Total Effort & Catch Estimation



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

- Make an estimate for every haul
- Choice of method depends on
 - haul size
 - observer presence when haul comes aboard
- Unsorted or sorted first
- 5 methods

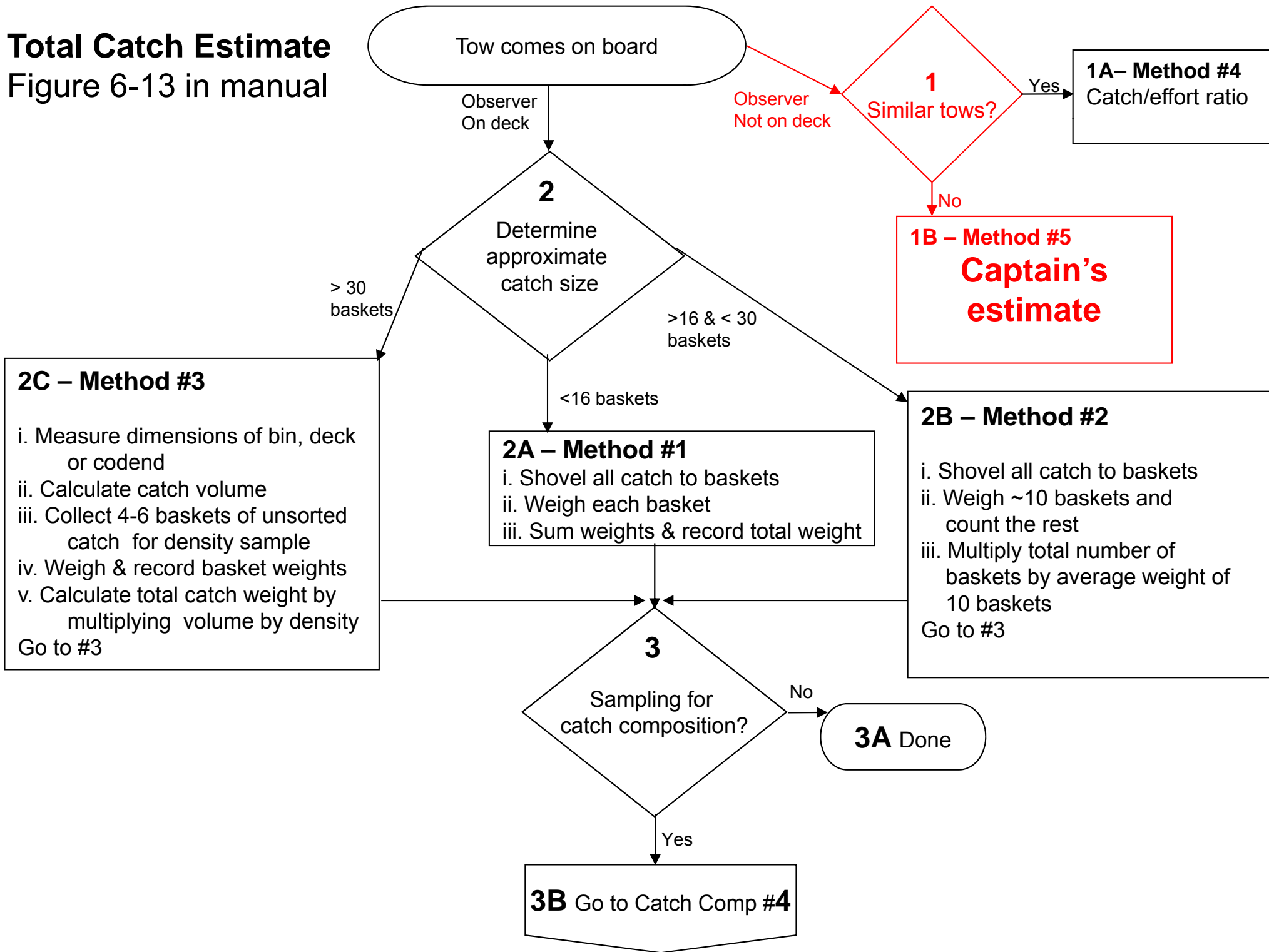
Total Catch Estimation - Methods

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
10. Unable to estimate

Section 6.6.1 of Observer Manual

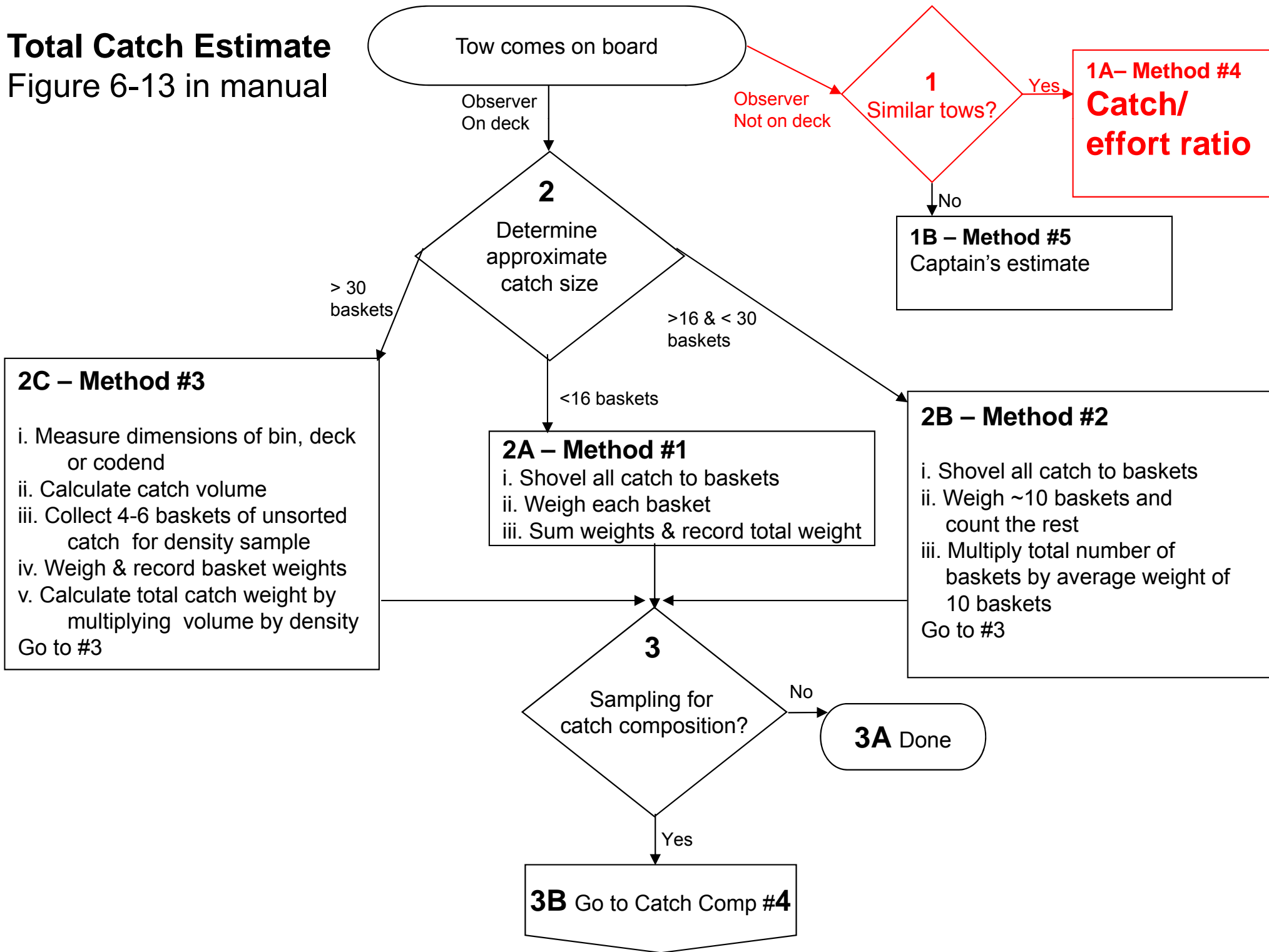
Total Catch Estimate

Figure 6-13 in manual



Total Catch Estimate

Figure 6-13 in manual



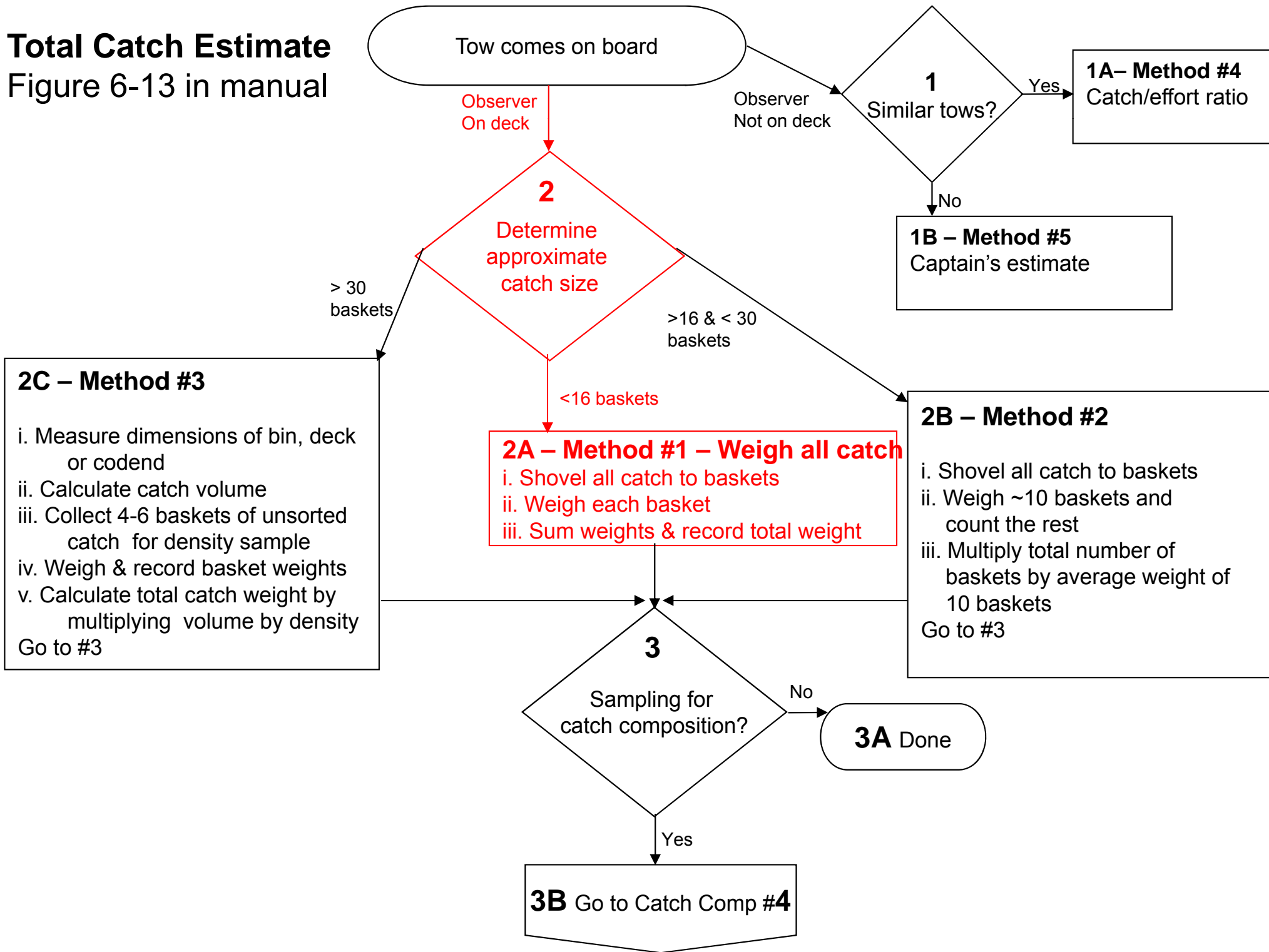
Catch/effort ratio

Haul	Total Catch (mt)	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

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

Total Catch Estimate

Figure 6-13 in manual



Weigh all catch – before sorting

24.3
kg

23.3
kg

27.7
kg

22.8
kg

22.9
kg

23.2
kg

24.7
kg

25.6
kg

24.6
kg

24.4
kg

15.4
kg

- Σ basket weights = 258.9 kg

Weigh all catch – after sorting

Retained

Spp A 59.3 kg	Spp E 7.6 kg
Spp B 45.5 kg	Spp F 6.8 kg
Spp C 25.2 kg	Spp G 4.3 kg
Spp D 20.3 kg	Spp H 1.5 kg

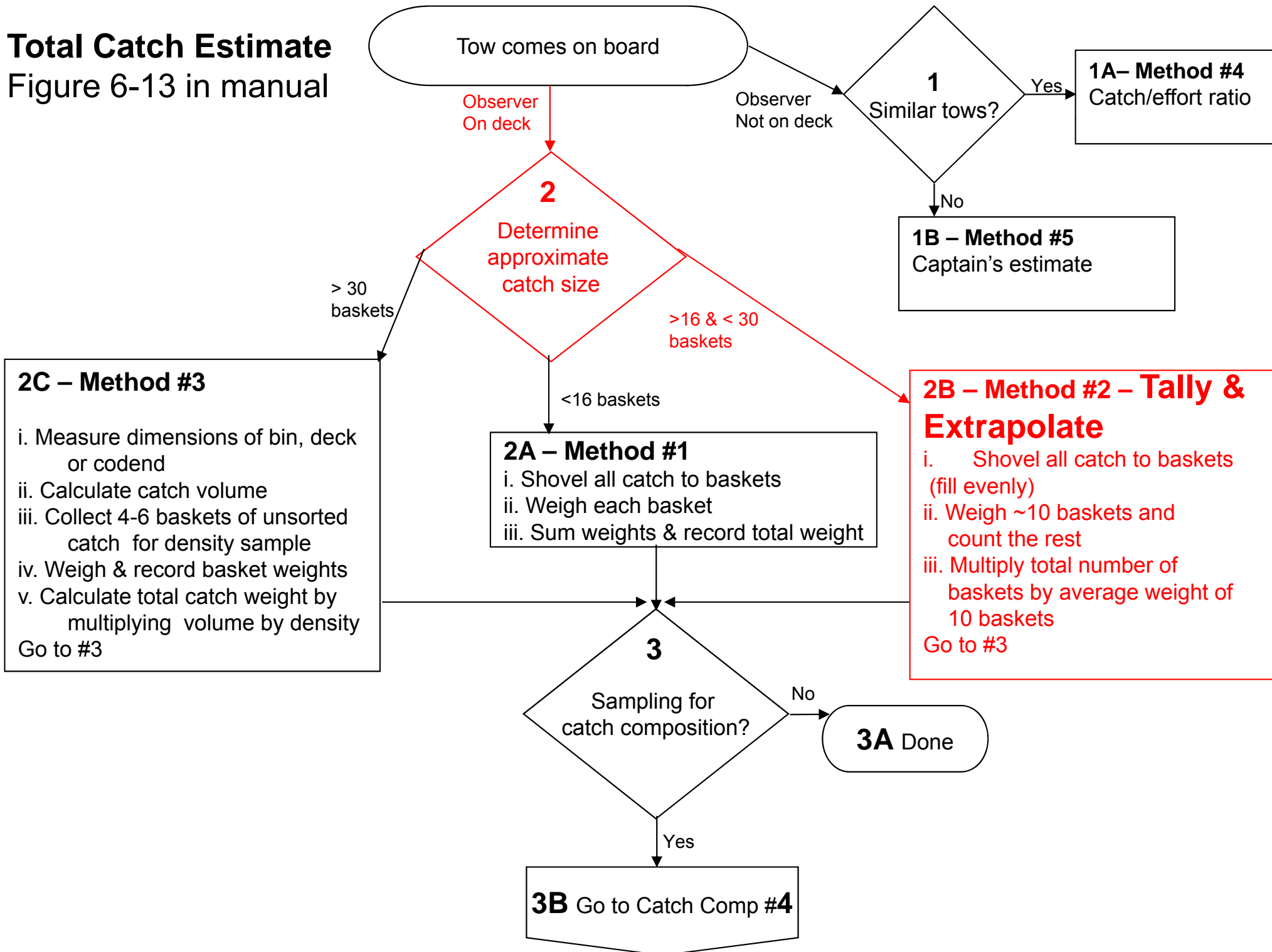
Discard

18.4 kg	20.1 kg
22.6 kg	27.3 kg

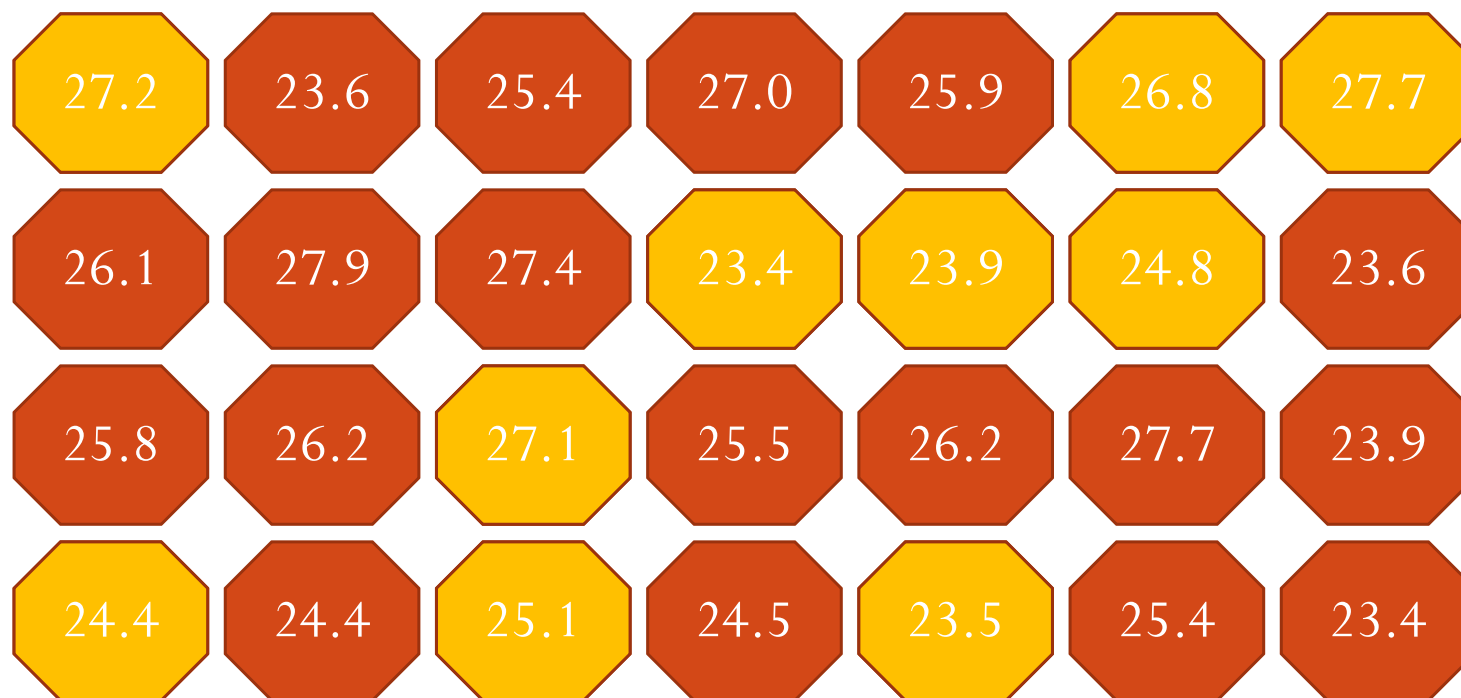
- $\Sigma \text{ retained} + \Sigma \text{ discard} = 170.5 + 88.4 = 258.9 \text{ kg}$

Total Catch Estimate

Figure 6-13 in manual



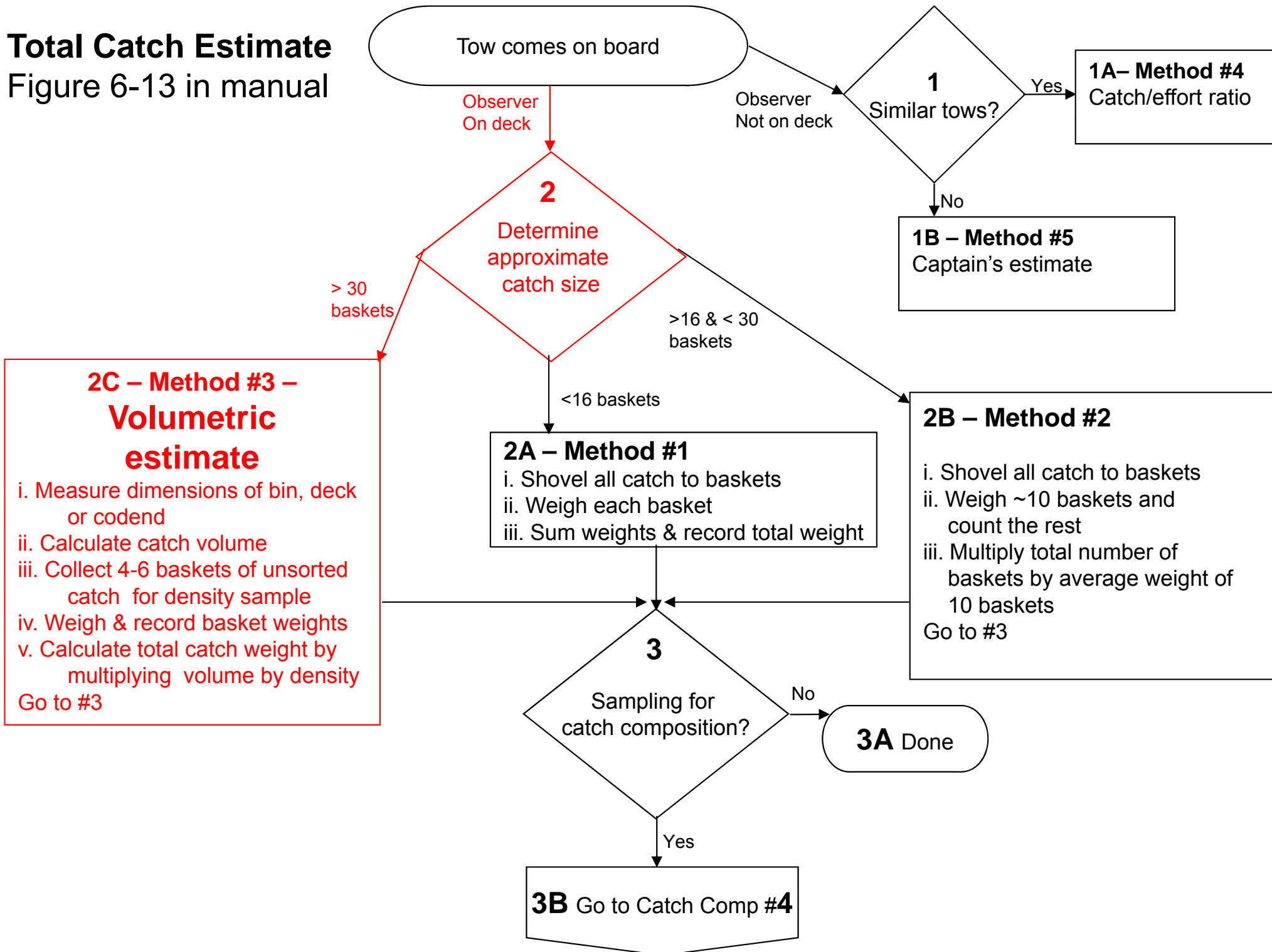
Weigh subset of catch – before sorting



- 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

Figure 6-13 in manual



Volumetric estimate - bin

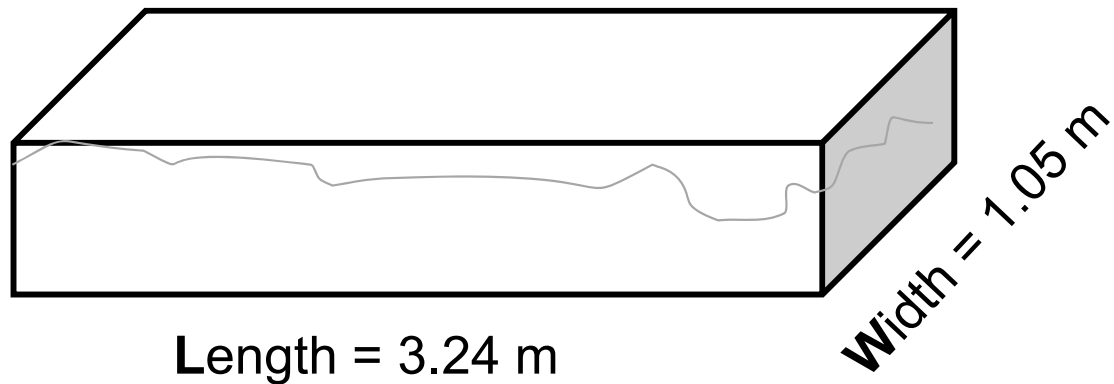
- Measurable areas on deck or holding bins
- Primary measurements: length, width & height
- Problems/issues:
 - Too much water
 - Accessibility
- Steps
 - Determine appropriate shape
 - Measure
 - Calculate volume
 - Multiply volume by density



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



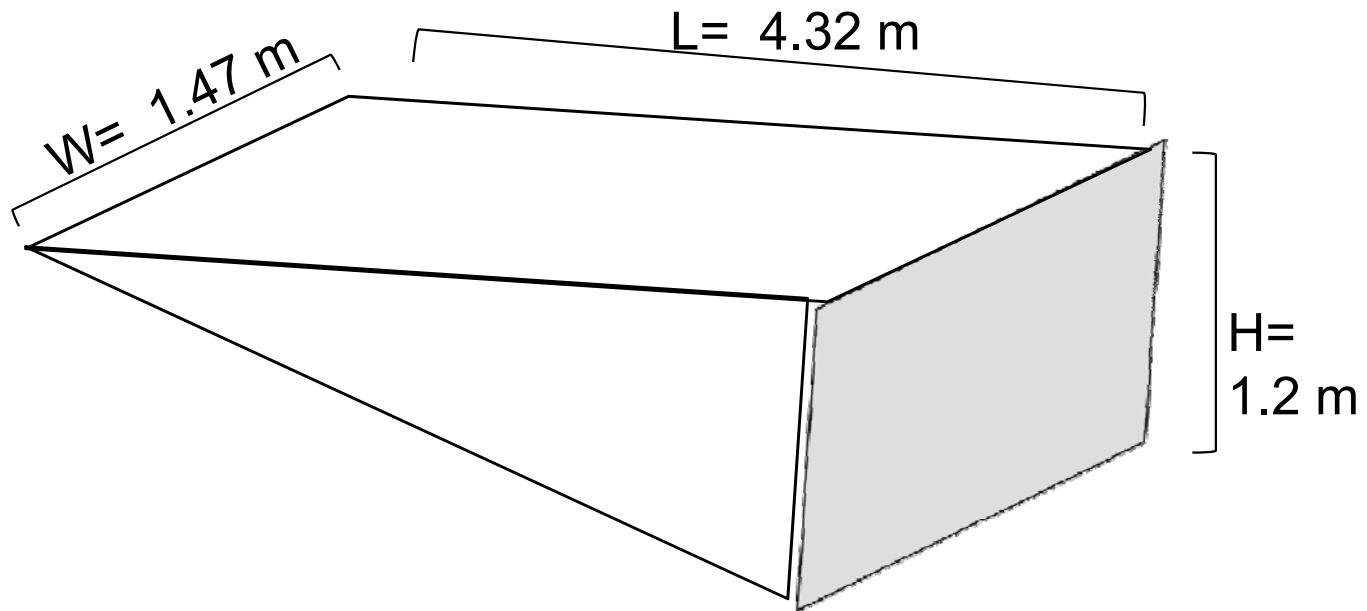
Volume (rectangular bin) = $L * W * H_{\text{average}}$
 $V = 3.24\text{m} * 1.05\text{m} * 0.415\text{ m} = 1.41183\text{ m}^3$

Estimated weight = $V * \text{density}$

$= 1.41183\text{ m}^3 * 0.912554\text{ mt/m}^3 = 1.28837111382\text{ mt}$

Estimated weight = 1.29 mt

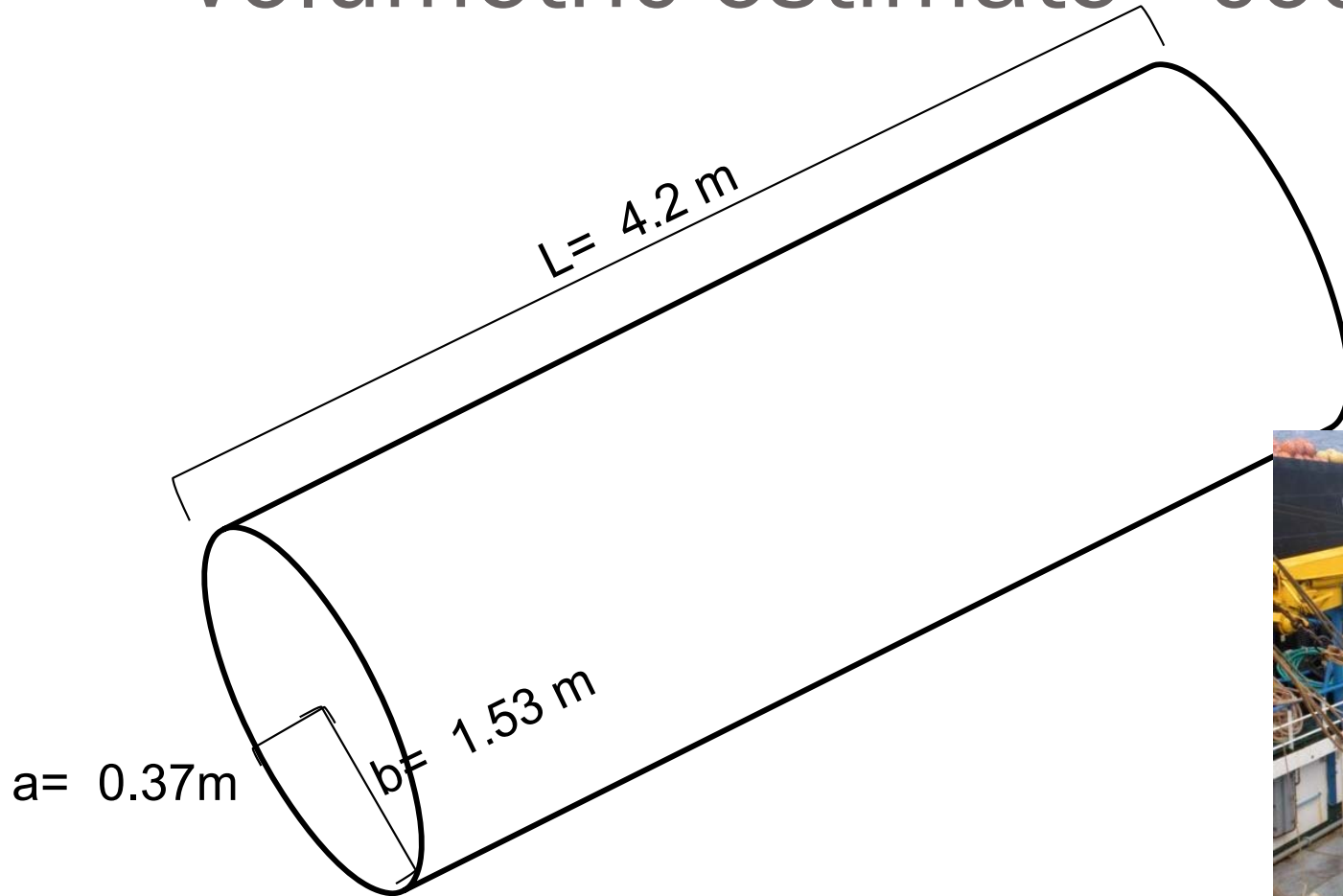
Volumetric estimate - bin



$$\text{Wedge Volume} = \frac{1}{2} (H * L * W)$$

$$V = \frac{1}{2} (1.2 * 4.32 * 1.47) = 3.81024 \text{ m}^3$$

Volumetric estimate - codend



Ellipsoidal Solid

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

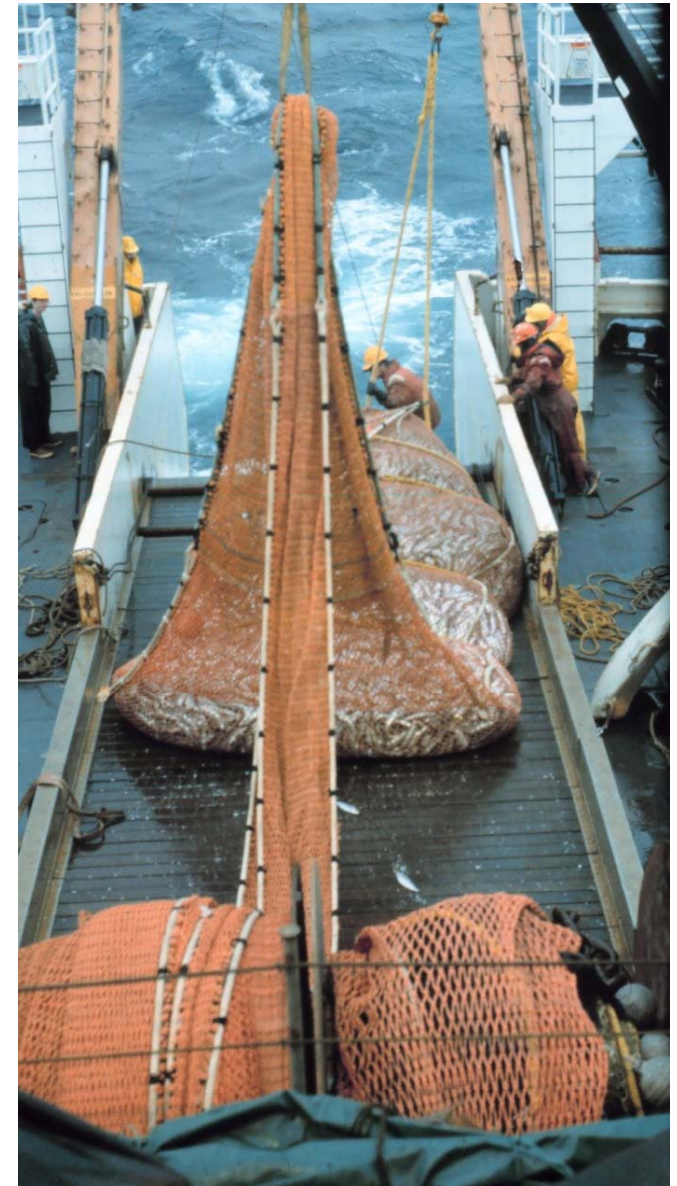
$$V = \pi * a * b * L$$

$$V = 3.14 * .37 \text{ m} * 1.53 \text{ m} * 4.2 \text{ m}$$

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

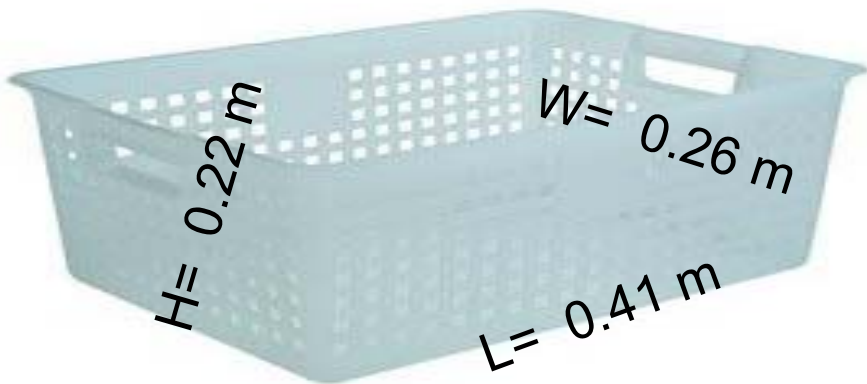
Codend measurements

- 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

Total basket wt = 134.6 kg or 0.1346 mt

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 (covered this morning)
 - 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

Retained catch estimate

- Sometimes you will be unable to access discards
- Retained based on # cartons retained * average carton weight

Species	# cartons retained	Carton weight	Estimated retained weight per species
Cassava fish	3	25 kg	75 kg
Shrimp	12	20 kg	240 kg
Grouper	1	25 kg	25 kg
TOTAL			340 kg or 0.34 mt

Trawl Effort / Total Catch form

Observer code					Vessel code					Trip ID											
Haul	Total nets	Gear Perf	Sampled?	Target	Substrate	Date/Time			Position						Depth, bottom (m)	Depth, fishing (m)	V/O	Speed (knots)	Retained catch (mt)	Total Catch Est. (mt)	Method
						Day	Month	Year	Time (24-hr)	Lat-Deg	Lat-Min	Lat-N/S	Long-Deg	Long-Min							
						Start					.			.							
						End					.			.							
						Start					.			.							
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						End					.			.							
						End					.			.							

Gear performance codes:

1. No problem
2. 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 count (basket, cartoon)
3. Volumetric estimate: Bin or codend
4. Catch / effort ratio
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10. Unable to obtain Total Catch estimate

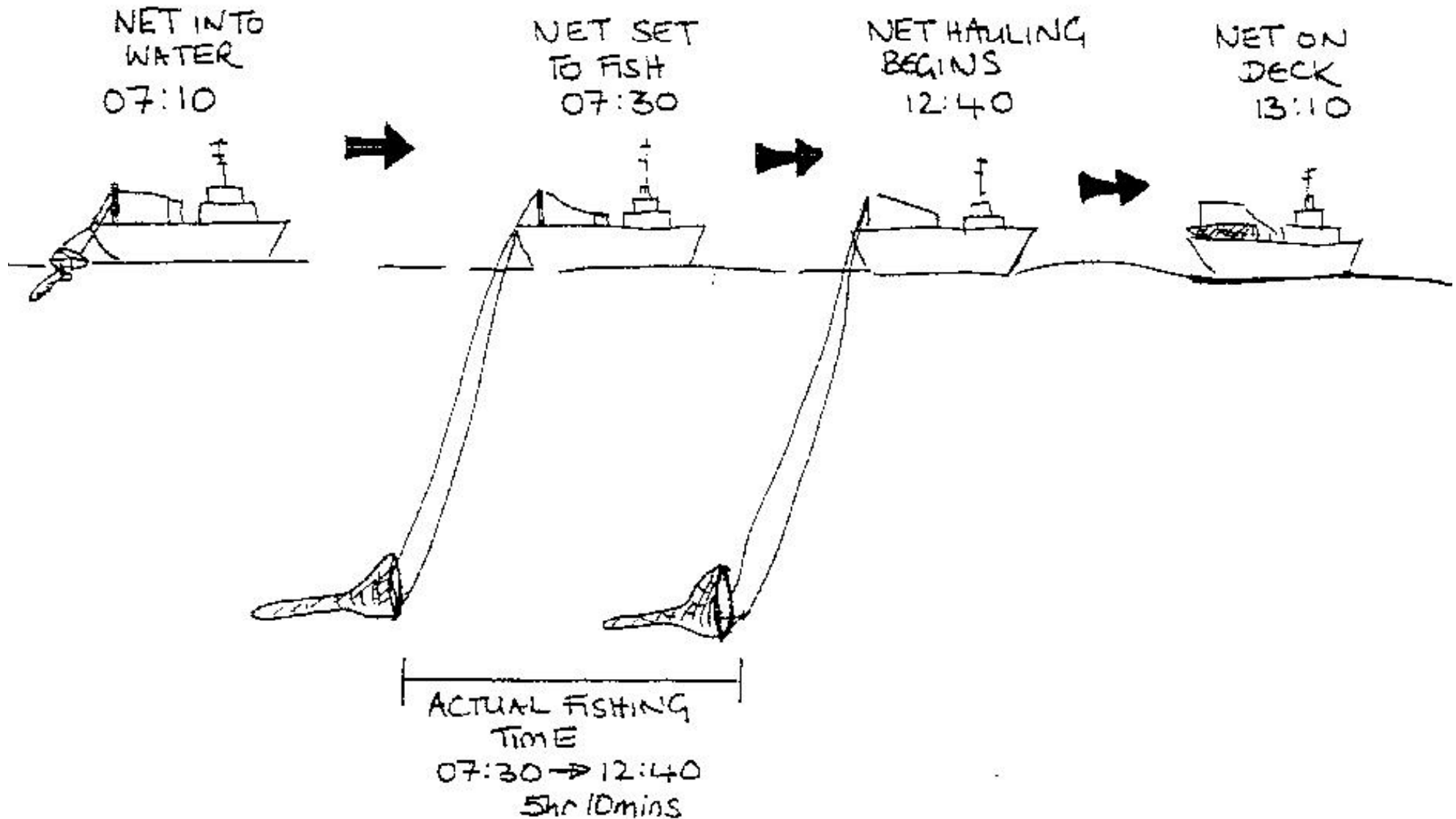
Trawl Effort / Total Catch form

Trawl Effort / Total Catch

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Trawl Effort / Total Catch form



Trawl Effort / Total Catch form

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Activity

- Working alone but you can discuss among yourselves
- 15 minutes then the rest is homework
- Turn in 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.