Random Sampling - Concepts

- How many beans are in this 5-gallon jar?
- how many by type?

Introduction

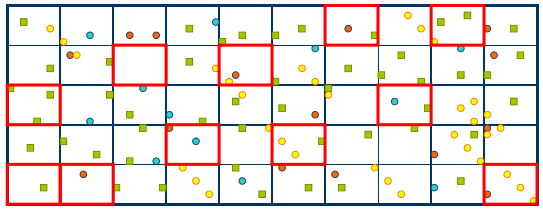
- Representative (random) sample
  - Removes subjectivity / bias
  - Increased confidence in data
- Needed for estimating population size / assessing health of fishery
- Needed for managing fisheries

Objectives

- Define random sampling & explain it's importance
- List three levels where sampling occurs
- Describe how to use the random sample and random number tables
- Explain the difference between a random sample and a systematic random sample
- Demonstrate ability to choose a random sample and document sampling methodology

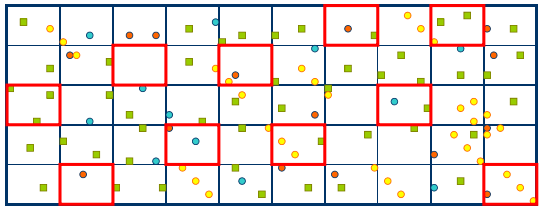
What is a "statistically representative" sample?

- General – "selection of individual observations intended to yield some knowledge about a population of concern"
- Subset – used to make reliable predictions of population



What is a "statistically representative sample?

Symbol	Count in Sample	Estimated (sample * 5)	Actual
Green square	8	40	50
Red circle	5	25	15
Yellow circle	7	35	33
Blue circle	2	10	12



What is a "statistically representative" sample?

- General – "selection of individual observations intended to yield some knowledge about a population of concern"
- Fisheries context –
  - Population = all commercial catch
  - Provides knowledge about fish population status
- Random sample - every member of the population (catch) has an equal probability of occurring in the sample

Sampling levels (strata)

- Fishery / gear type
- Vessel
- Trip
- Haul or net
- Species

Agency

Observer

Sampling guidelines

- Collect sample before sorting
- Do not hand pick
- Collect from multiple points
- Larger sample better (with exceptions)
- Selecting hauls – Random sample table (RST)

Hauls per day	RST	Target sample rate
1-2	None	100%
3-4	#1	70-75%
5+	#2	65%-70%

Random sample table (Logbook)

- Choose one table per trip
- Complete for each haul

Random Sample Table #2

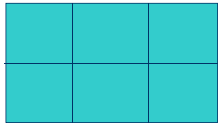
Date	Haul #	Samp?	Notes	Date	Haul #	Samp?	Notes
11-Nov-09	1	~~Y~~ N	watched 1st haul	12 NOV	9	Y	
11-Nov-09	2	Y		12 NOV	10	N	
11-NOV	3	Y		12 NOV	11	Y	
11-NOV	4	Y		13 NOV	12	Y	
11-NOV	5	N	Caught up on paper work	13 NOV	13	Y	
12-NOV	6	N		13 NOV	14	~~Y~~ N	Sea sick - weather
12 NOV	7	Y		13 NOV	15	N	
12 NOV	8	Y		13 NOV	16	N	

Sampling Description (Logbook)

- Complete for each vessel and each change in sampling strategy
- Flow of fish
- Sample design
  - Selecting hauls
  - Within-haul sampling
  - Lengths/weights/age structures
  - Specimen samples

Steps in Taking a Random Sample

1. Define population
2. Define sampling frame
   - Spatial – space or gear
   - Temporal
3. Define sample units

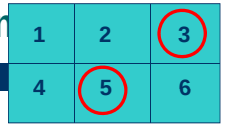


Steps in Taking a Random Sample

1. Define population
2. Define sampling frame
   - Spatial – space or gear
   - Temporal
3. Define sample units
4. Number sample units

1	2	3
4	5	6

Steps in Taking a Random



1. Define population
2. Define sampling frame
   - Spatial – space or gear
   - Temporal
3. Define sample units
4. Number sample units
5. Decide how many units to sample
6. Randomly choose units (random numbers)

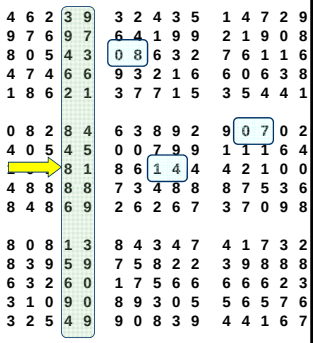
Random Systematic Sampling

- Knowledge of total sampling units ideal

5. Determine how many units you want to sample
6. Divide total units by # units you want to sample (n)
7. Select a random number between 1 and result of above (n)
8. Sample every n^{th} unit thereafter

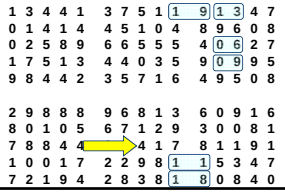
Random number table (RNT)

- Appendix 11 in manual
- Determine # digits
- Determine direction
- Enter at random point
- Example



Random sample - example

- 30 units – number in advance
- Target sample rate 20%
  - How many units? **6**
- Select 6 random numbers between 1 and 30

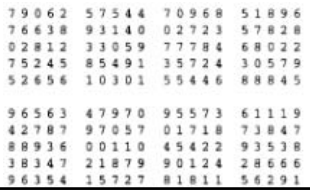


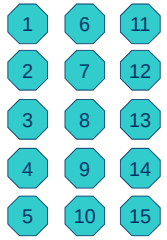
Random systematic sample - example

- 30 units – number in advance
- Target sample rate 20%
  - **30 units / 6 units = 5**
- Select random number between 1 and 5 > **1**
- Sample 1st unit & every 5th unit thereafter
  - Units **1, 6** (1+5), **11** (6+5), **16** (11+5), **21** (16+5), **26** (21+5)

Random sample – example 2

- 15 units
- Target sample rate 40%
  - How many units? **6**
- Select 6 random numbers between 1 and 15





Sample bias

- Catch stratification
  - In nets or bins
  - Across depth strata
- Crew sorting
- Collection location / mechanical bias – selection by hand, size of shovels, incline belts/doors
- Sample size

Activity #1

- Work in groups of 2
- Label units on handout 1 to 100
- Create a sampling plan based on the sample rate and type being handed out
- Circle the quadrants you sample
- 20 minutes
- Answer the questions on handout (homework)

Summary

- What is random sampling
- Why is random sampling important?
- List three levels (strata) where sampling occurs
- Where is the random sample table located?
- Demonstration - random number table (select 4 numbers between 1 and 20)

7	0	8	3	9	4	5	1	5	0	9	5	6	6	3	7	8	5	4	2	4	8	5	2	4
4	0	4	4	6	6	3	9	3	3	0	9	8	1	3	9	7	1	8	3	0	7	6	6	6
2	1	8	9	6	7	7	0	7	8	5	9	3	9	7	1	9	3	4	8	5	9	8	9	0
9	9	6	0	9	7	6	3	0	4	3	3	2	5	0	1	6	1	9	2	2	6	0	4	6
9	1	1	9	3	8	4	7	9	6	7	1	0	4	7	8	5	3	6	7	4	3	5	1	9

Summary

- What is random sampling
- Why is random sampling important?
- List three levels where sampling occurs
- Where is the random sample table located?
- Demonstrate how to use a random number table
- When should you use a random number table?
- What is the difference between a random sample and a systematic random sample?