MODULE 6: SAMPLING METHODS FOR THE
FISHERIES AND AQUACULTURE SURVEYS

SESSION 6.2:
SAMPLING DESIGNS FOR FISHERIES AND AQUACULTURE
SURVEYS

Regional Training Course on Sampling Methods for Producing Core Data Items for Agricultural and Rural Statistics

Jakarta, Indonesia, 29 Sep - 10 Oct 2014.
Given same budget, what makes sampling designs so different?

- Survey objectives: Discussed
- Statistical units: Frame
- Variation in the population: stratification
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Statistical units:
What should be selected? Sampling unit (s)
What should be observed? Observational unit(s)

- Fish from a catch?
- Vessels landing their catch at the port?
- Fishers?
- ....
Constructing a sampling frame

- Depends on infrastructure and information available on it

- Define target area (water bodies included)

- Primary fishery units (ports, landing sites, fishing fleets, fishers, markets & transportation routs)
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Often

- A “frame survey” is required
- Information is available from scattered sources (including registers)
How to stratify the population?

Purpose: to reduce the variability

Stratification

- Pre-defined (Major)
  - province, month, season, ..

- Based on criteria (Minor)
  - Fishing grounds, size of fisheries, ..
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**Examples of stratification criteria:**

<table>
<thead>
<tr>
<th>Spatial</th>
<th>Vessel/gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>Landings</td>
</tr>
<tr>
<td>Enterprises</td>
<td>Households</td>
</tr>
<tr>
<td>Trade</td>
<td>Environment</td>
</tr>
</tbody>
</table>
How do you balance? (examples)

Combine gears (two sizes of nets)
Reduction of sampling effort
Stratify in time
Stratify in space
Generate a size variable
How to generate a size variable?

- Size is a composite value of multiple variables

**Example:**

<table>
<thead>
<tr>
<th>Sites</th>
<th>fishing units</th>
<th>type1 gear</th>
<th>type2 gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Normalize each variable
2. Calculate total of normalized variables
3. Size of site is its percentage from grand total
4. Stratify based on the size value (by using cumulative size)
Sampling design (example of marine fishery)

Strata: Month-Zone

PSU: landing site-day

Calendar

Month

1

...

12

site1 site2 site3 site1 site2 site1 site2 site3 site4 site1 site2 site3 site1 site2 site3 ....

Zone1 Zone2 Zone3 Zone4 zone 5 ....

Region1 Region2 Region3

Country
Sampling design (example of marine fishery)

- Large zones may be self-representative (strata=month)

- Number of PSUs (sites-day) in each stratum = \( \text{# of sites} \times 30 \)
Selection procedure (Stage 1)

- Each month may be segmented into 3 or 6 parts for data collection purposes and samples taken systematically from each segment (say 16 days).

- In each zone, select a sample of sites and allot to the selected days.

- Better to allot each selected site two consecutive days and in each day collect data in different time periods (day and night landings).
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**Selection procedure** *(Stage 2)*

- In each selected site, select a sample of boats/crafts

- Decide a threshold for total enumerations, for instance:

<table>
<thead>
<tr>
<th>Number of units landed</th>
<th>Sampling rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>less than or equal to 15</td>
<td>100%</td>
</tr>
<tr>
<td>16 to 19 landed</td>
<td>first 10 and the balance 50%</td>
</tr>
<tr>
<td>20 to 29 landed</td>
<td>50%</td>
</tr>
<tr>
<td>30 to 39 landed</td>
<td>1 in 3</td>
</tr>
<tr>
<td>40 or more landed</td>
<td>1 in 4</td>
</tr>
</tbody>
</table>
Objective: to generate statistics on volume and value of aquaculture production

Sampling units: Aquafarms

Sampling frame: list of aquafarms from the relevant authority of created prior to the survey

Coverage: Normally define a cut-off of total production/area
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aquaculture survey design

- **Design:** Normally one-stage stratified sampling

- **Stratification:** Aquafarm type-Area

- **Self representative strata:** define a threshold like up to 15 aquafarm

- **Selection:** Sample aquafarms shall be selected through systematic random sampling