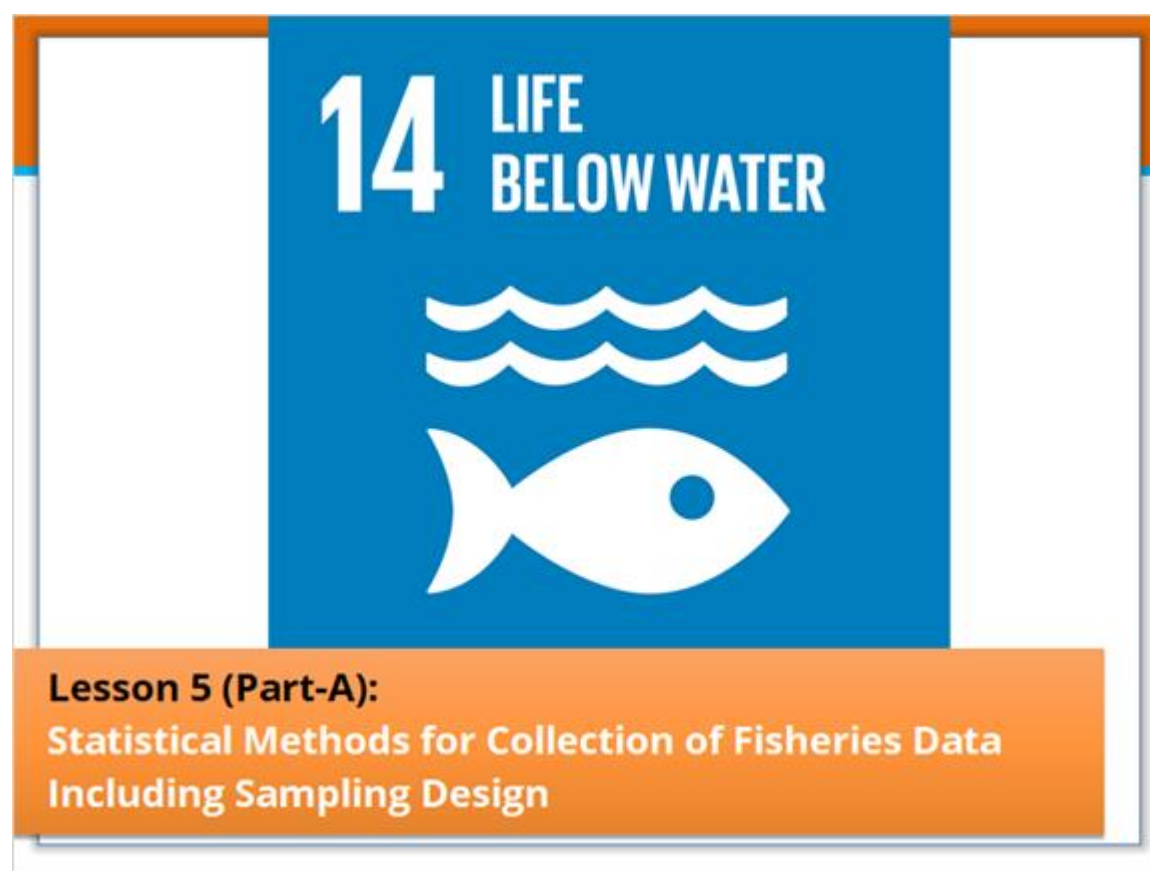# Fisheries and Aquaculture Statistics - Lesson5 (Part- A)

Lesson5 (Part-A)

5A.1 Lesson5 part-A Statistical Methods for Collection of Fisheries Data Including

Sampling Design

Notes:

To assess and monitor the state of natural resources (e.g. fish resources, aquatic ecosystems, water and land, aquatic genetic resources), and the performance and sustainability of fisheries, sound data is a pre-requisite. Sound data helps us plan an integrated approach across multiple goals addressing all dimensions of sustainable development - economic, social and environmental.

5A.2 Contents
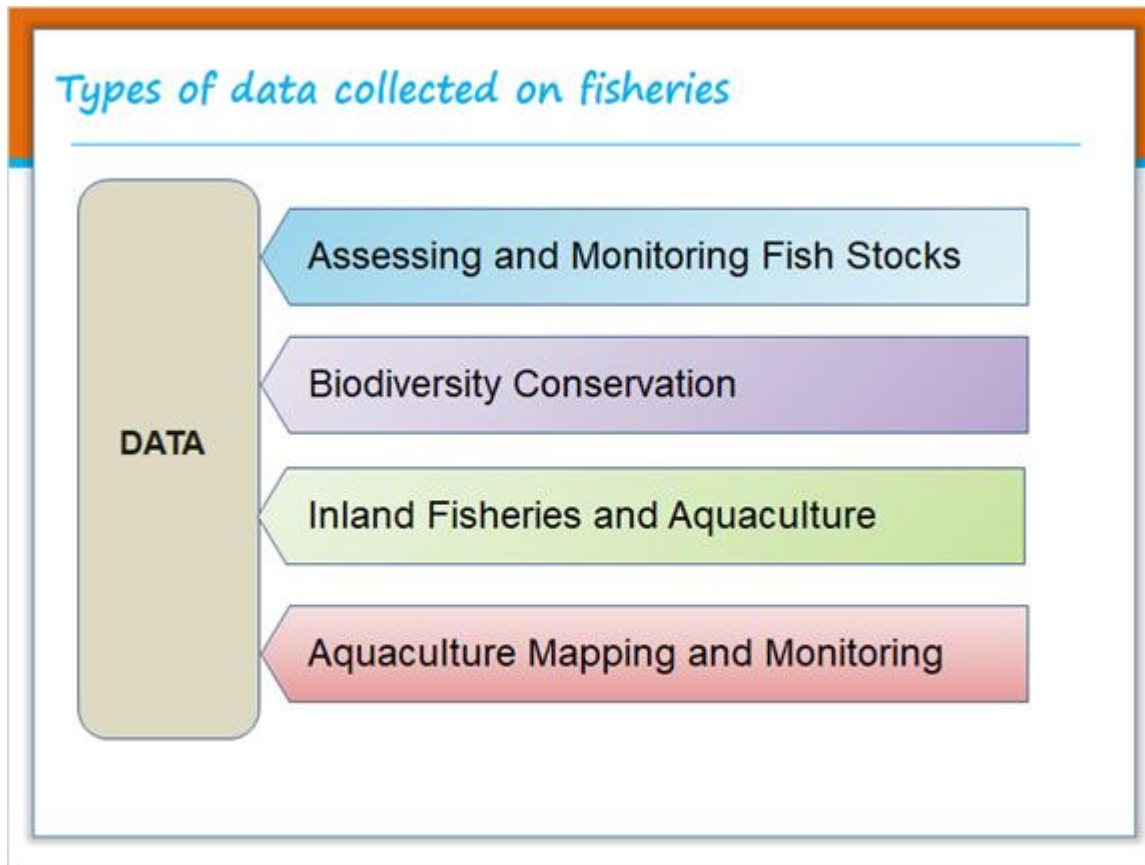

Notes:

The Statistical Methods for Collection of Fisheries Data lesson, including Sampling Design, is split into 2 parts: - part A and part B. In this first part. A section A, the above topics are covered and concepts are briefly explained.

5A.3 Types of data collected on fisheries

Notes:

Fishery statistics are required for monitoring, surveillance and control of resource exploitation.

Hence, we compute data through the above resources.

5A.4 Assessing and Monitoring Fish Stocks

Notes:

Stock assessment is a data-demanding process, and one often undertaken in data-poor contexts. However, various methods using estimation procedures, including expert judgement, can help in precautionary management.

5A.5 Biodiversity Conservation

Biodiversity Conservation

In order to minimize adverse impacts of fishing on biodiversity (e.g. marine mammals in tuna fisheries, or sponges and corals in vulnerable marine ecosystems), data is required for designing management strategies. Such data include individual observations by catch species or "encounters" of indicator species during fishing operations.

Notes:

This activity generally requires deploying scientific observers to board vessels, or involving fishers in data collection.

5A.6 Monitoring Sustainability

Notes:

FAO recommends fishery inventories as a way to improve visibility of small-scale fisheries and related livelihoods in order to influence policy and management decisions.

5A.7 Inland Fisheries and Aquaculture

Notes:

The central framework of the System of Environmental-Economic Accounting (SEEA) of the United Nations serves as a global standard for monitoring sustainable natural-resource use.

5A.8 Aquaculture Mapping and Monitoring

Notes:

The mapping of aquaculture facilities can be performed accurately, regularly (i.e. minutes, days, months or years) and at selected scales by remote sensing. Remote sensing - using satellites, aircraft, drones or fixed sensors - enables observations of vast and often remote, inaccessible areas at a fraction of the cost of traditional surveys. Remote sensing provides a large range of observation data that complement and extend data acquired from in situ observations to support aquaculture management.

More advanced approaches based on image analysis require the use of Geographic Information Systems (GIS) or remote-sensing software and access to satellite images in their original format. Digital data (such as from remote sensing) pertaining to any aspect of aquaculture can be assembled in a GIS. These systems perform a wide range of spatial and statistical analyses, provide informed answers to fish farmers, local managers, government officials and other groups promoting sustainable aquaculture development.

5A.9 Methods of Collection

Methods of Collection

The Code of Conduct for Fisheries (code) provides a frame-work on fishery data collection:

"In order to ensure sustainable management of fisheries and to enable social and economic objectives to be achieved, sufficient knowledge of social, economic and institutional factors should be developed through data gathering, analysis and research."

Notes:

Fishery management requires consideration of a variety of issues, all of which must be addressed using information collected from biological, economic and sociocultural sources. The following slides present different aspects of fishery data collection.

5A.10 Type of data for different aspects
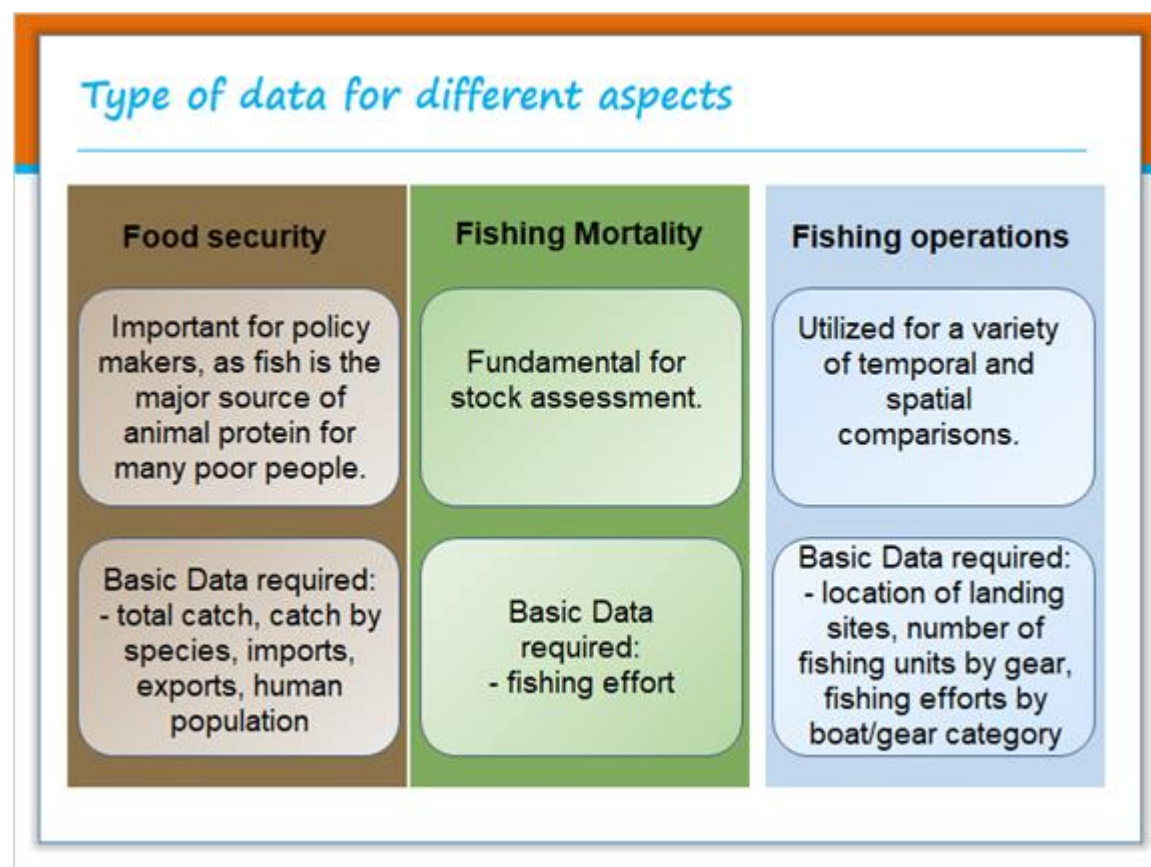
Notes:

The fishery data collection is based on a small group of concepts and approaches. These are general-purpose datasets that may be used for a variety of statistical applications. Fishery statistics, including data on fishers and fishing vessels, are essential to the monitoring and management of fisheries.

5A.11 *The types of data for different aspects (Continued)*
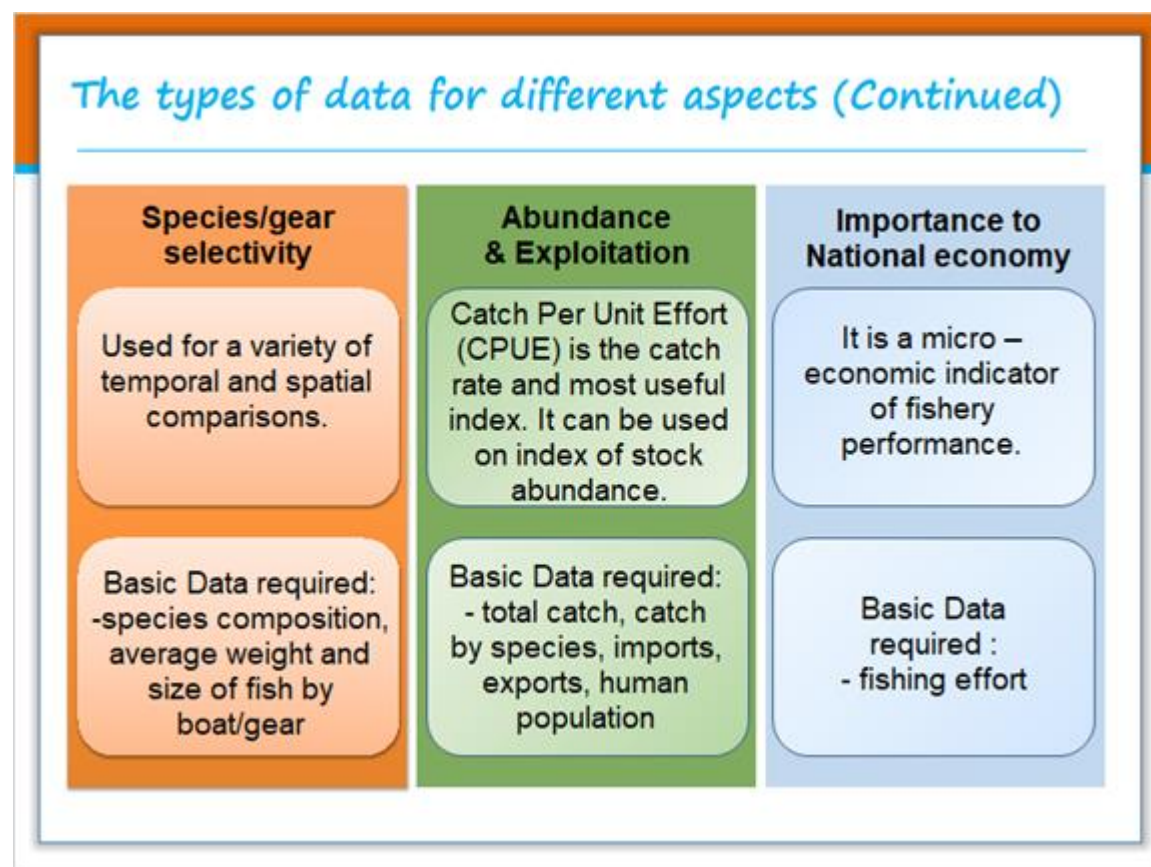
Notes:

Justification for regularly conducted and costly fishery surveys can be attributed to the long list of potential uses of basic fishery data, such as those mentioned on these slides. This slide mentions uses of data on species/ gear selectivity, abundance & exploitation and importance to national economy for fishery statistics.

5A.12 The types of data for different aspects (Continued)

The types of data for different aspects (Continued)

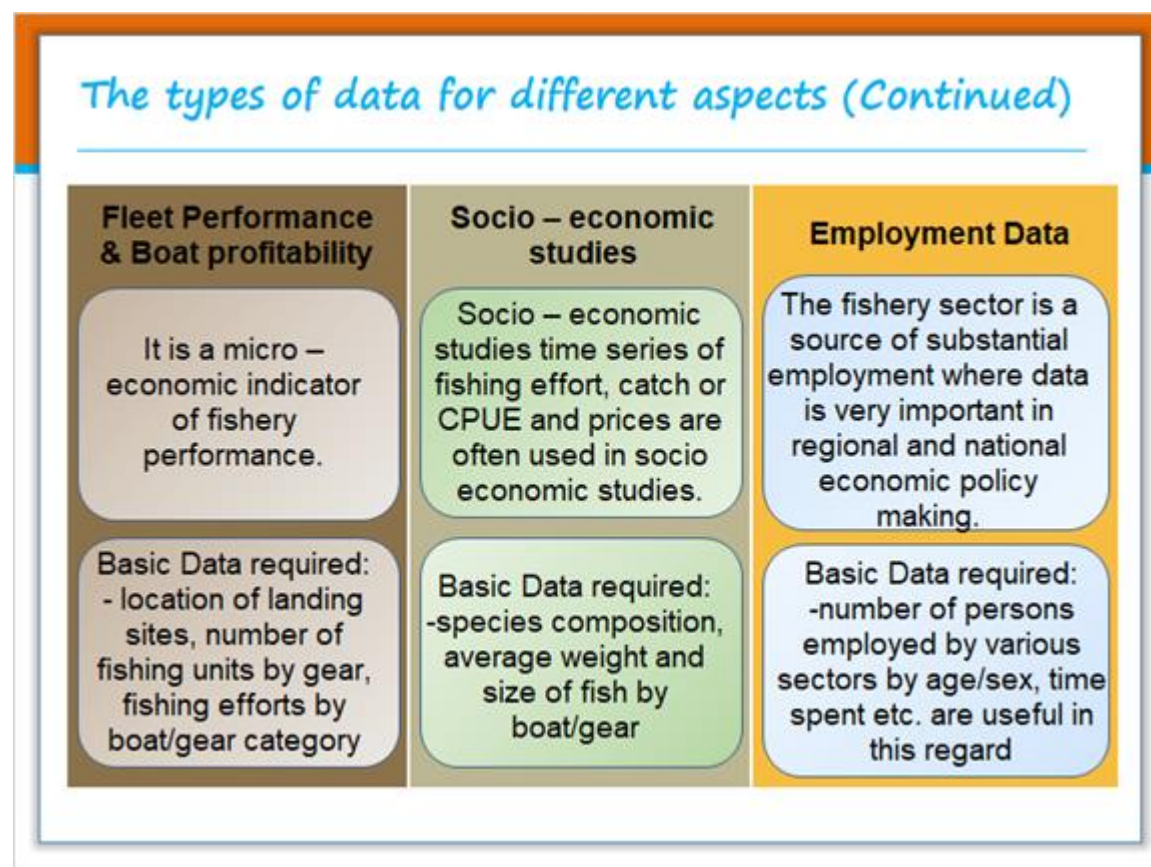| Fleet Performance & Boat profitability	Socio – economic studies	Employment Data
It is a micro – economic indicator of fishery performance.	Socio – economic studies time series of fishing effort, catch or CPUE and prices are often used in socio economic studies.	The fishery sector is a source of substantial employment where data is very important in regional and national economic policy making.
Basic Data required: - location of landing sites, number of fishing units by gear, fishing efforts by boat/gear category	Basic Data required: -species composition, average weight and size of fish by boat/gear	Basic Data required: -number of persons employed by various sectors by age/sex, time spent etc. are useful in this regard

Notes:

Here we have fleet performance & boat profitability, socio-economic studies and employment data for fishery statistics.

5A.13 The types of data for different aspects (Continued)
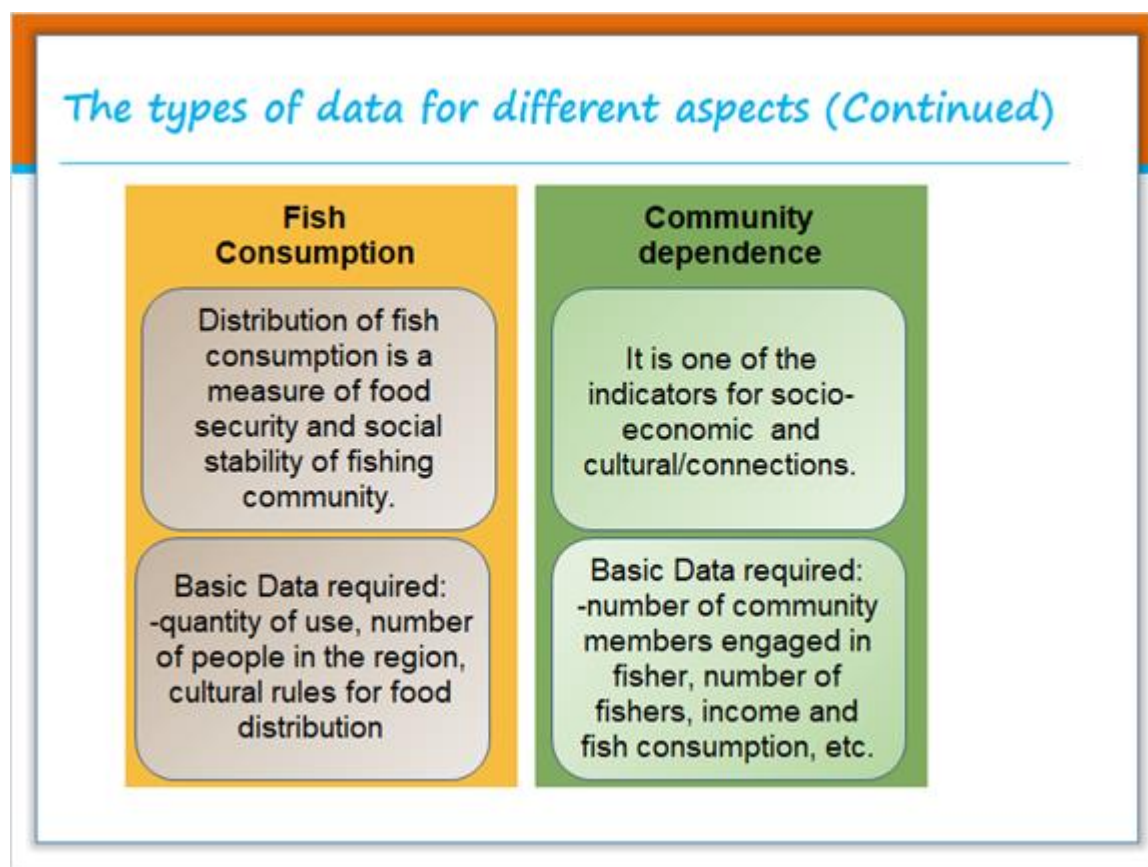
Notes:

Here, fish consumption and community dependence data for fishery statistics is mentioned.

5A.14 Stratification

Stratification

Stratification is the process of partitioning target data population (*e.g. fishing vessels*) into a number of homogeneous subsets based on their characteristics (*e.g. large, medium, small*).

Notes:

Stratification is generally undertaken for the following reasons:

a. Statistical purposes and to reduce the overall variability of estimates. For example, catch rates will differ greatly between vessels of similar type but of a different size. Therefore, sampling of each size separately will enable the preparation of meaningful statistics. If all vessels size classes are "lumped together": (i.e. not stratified), then we say the average catch estimate is not meaningful for any size classification.

b. Non-statistical purposes and when current estimates are not meaningful to users of the statistics. (e.g.- different geographic regions).

5A.15 What is Major and Minor Strata?

What is Major and Minor Strata?

Major Strata: - The first step is to divide the entire statistical area into administrative or reporting strata also called as major strata.

Within each major strata there exists "logical Strata".
An important fishing location itself constitutes a minor strata.

Notes:

Estimates are always produced at the minor stratum level.

Logical Strata refers to any logical estimate within a large context, such as sub-periods within a month, fishing grounds or fishing vessels.

5A.16 What are Homeports and Landing Sites?

What are Homeports and Landing Sites?

Homeports –
They are the locations from which fishing boats operate.

Landing site –
It is the location at which boats land their catch.

Notes:

A landing site may be the same as the homeport or base port, but may also be different. Homeports report the number of fishing boats and gears in the frame survey to estimate fishing effort. Boat and gear activities are sampled from homeports or base ports. In contrast, catches and species composition, prices, etc. are sampled at landing sites.

5A.17 Data Collection

Data Collection

➤ Data collection is the recording of one or more data variables (catch, value, fishing duration etc.). This can be either by complete enumeration or sampling. Fisheries data usually collected by complete enumeration include vessel registers and infrastructure data.

Notes:

The applicability of either sampling or complete enumeration is determined by various criteria related to the type of data and existing financial and human constraint. Frame surveys and fishery census are a common form of data collection requiring complete enumeration.

Data Collection (continued)

➢ Data usually collected by the sample based approach include species composition, biological data and socio economic data.

Notes:

Data collection in fisheries is a large field, which may also deal with the theory of statistical analysis, design of relational databases, measurements of biological parameters, estimation of biological, technical or economic parameters, analyses of fisheries household surveys etc.

5A.19 A Sample Based Fishery
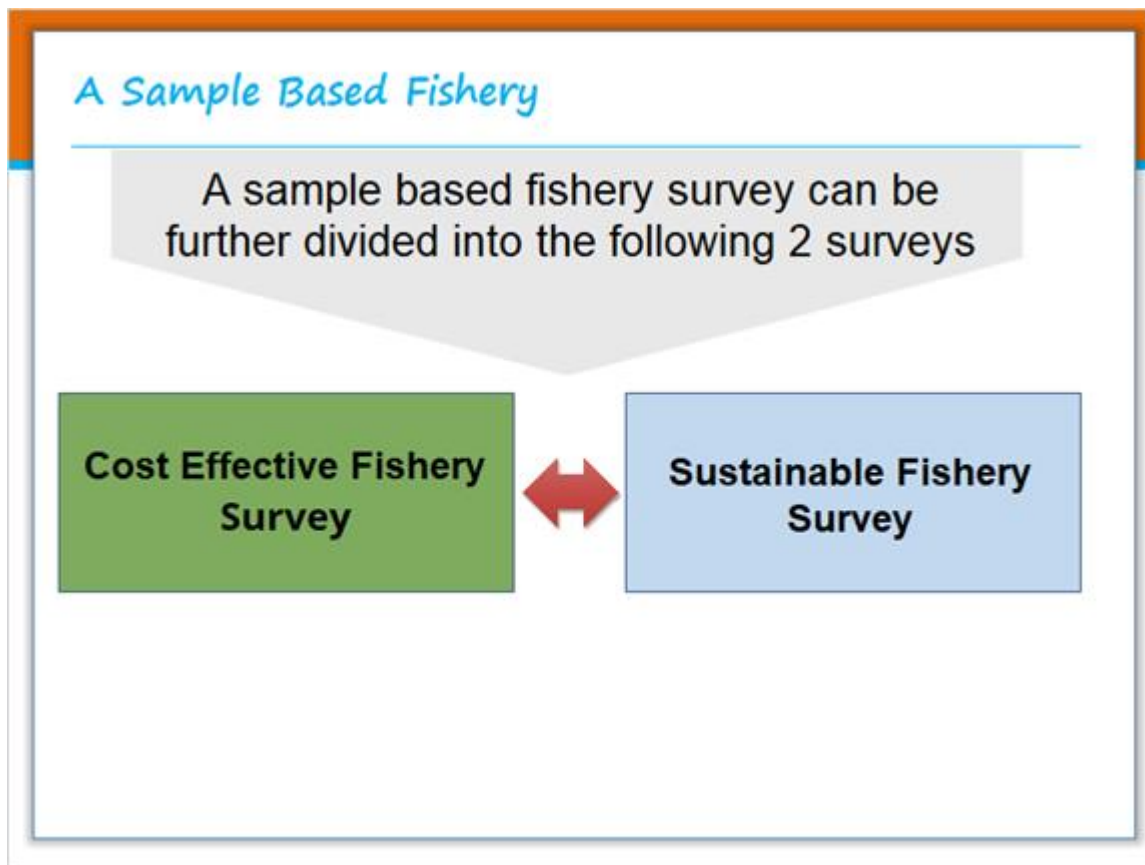
Notes:

 Regularly conducted fishery surveys are generally costly and include field, office, maintenance and other overhead costs relating to office infrastructure and operations. In many developing countries these total cost may constitute a major constraint on the effective development of fishery statistics.

Hence we make use of the above 2 surveys when:

- Sampling is used and all elements of the target population are difficult to record.

- A well designed sample survey can produce better results with more accuracy and precision than complete enumeration.

5A.20 Identifiers for the Surveys

Identifiers for the Surveys

| Cost Effective Fishery Survey	Sustainable Fishery Survey
• They are economical & are conducted in a timely manner. • When existing human and financial resources involved in data collection and processing are used efficiently • They respond to user (planners, managers, scientist) needs in a timely and reliable manner	• It's design is robust enough to permit continuity when changes occur to fisheries being statistically monitored • When training of field and office staff is appropriate and regular so that data collection and processing/analysis are safeguarded against staff changes and turnover • It has minimal or no dependence on external technical assistance.

Notes:

These points assist in identifying when a sample based fishery survey is called a Cost Effective Fishery Survey or a Sustainable Fishery Survey.
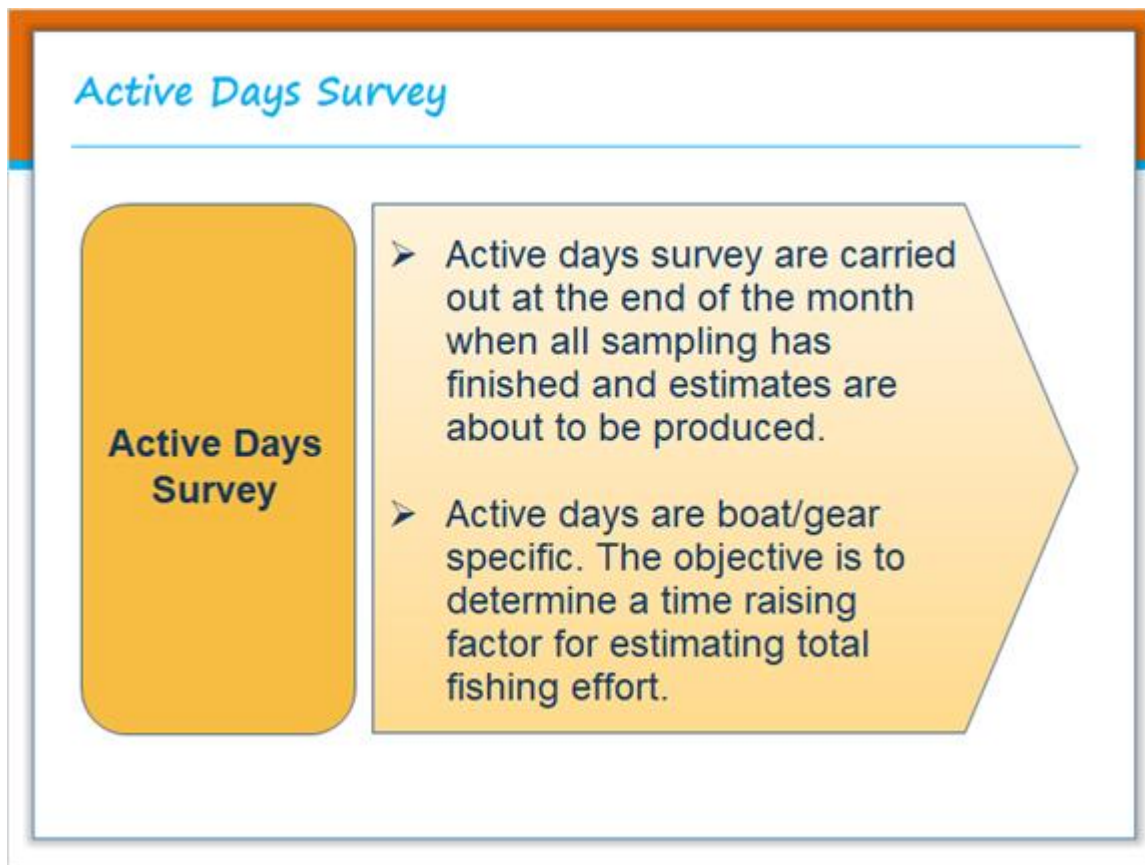
5A.21 Generic Surveys
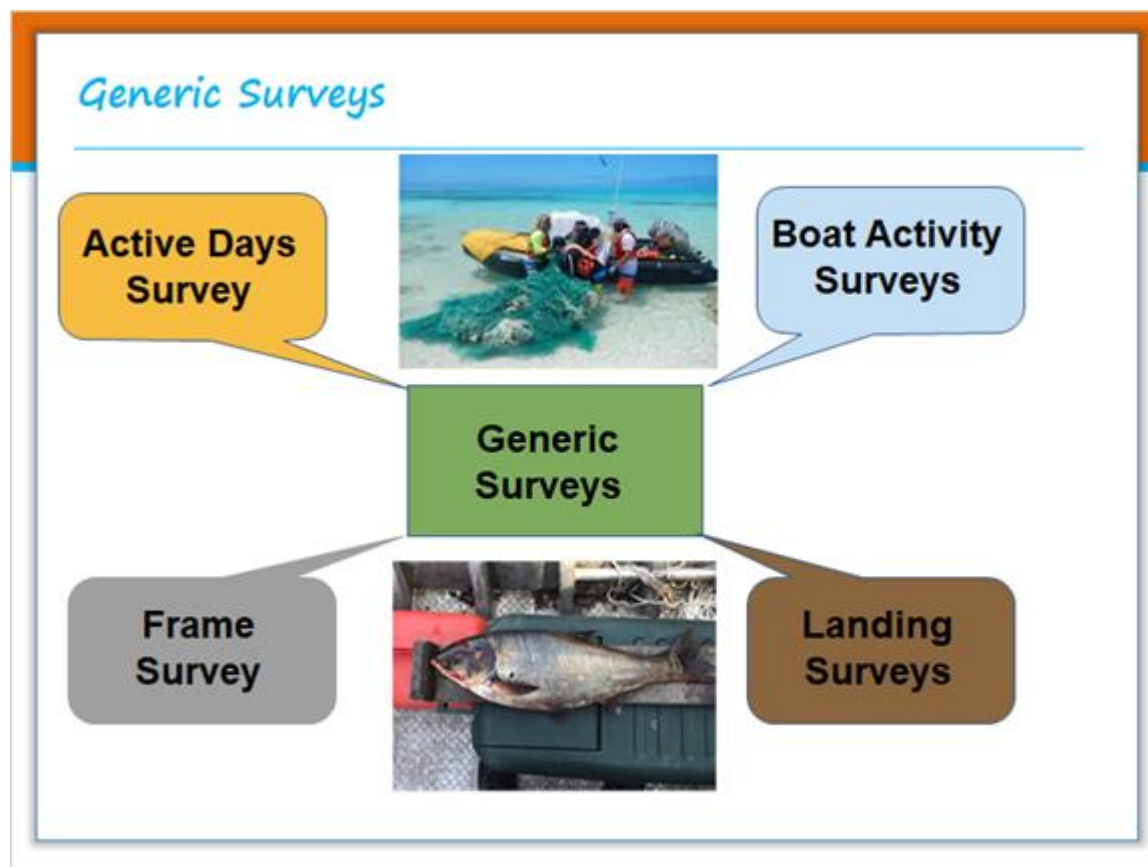
Notes:

There are four generic surveys that are useful for fishery statistics. Catch estimation can be made through the use of these 4 different survey types, combined with census estimates when necessary.

5A.22 Active Days Survey

Notes:

The Active Days Survey characteristics are:

- Formulated using calendar days of a month and subtracting days (or fractions of days) for which it is known or assumed, little or no fishing has taken place.

- Not accounting for individual variability of boat activities (Which is the role of the Boat Activity Coefficient BAC) and refers to the number of days there are no reasons to assume fishing activities are below normal level.

- Non-active days, examples include periods of bad weather, national or religious holidays and standard non-working days, such as Fridays, Saturdays, Sundays, market days, etc.

- Active Days can be either area and boat/gear-specific and are formulated for each minor stratum combination and boat/gear type. For example, bad weather may affect boats using purse seine and not beach seines located in the same area, or bad weather

may affect gillnet fishing in one area but not in another.

- Determining Active Days is simplified if sampling (landings and/or effort) frequency covers 12-15 days of the month, giving sufficient days for low or zero activity to be sampled. In this case the total number of days in the month is used as the raising factor.

5A.23 Frame Survey
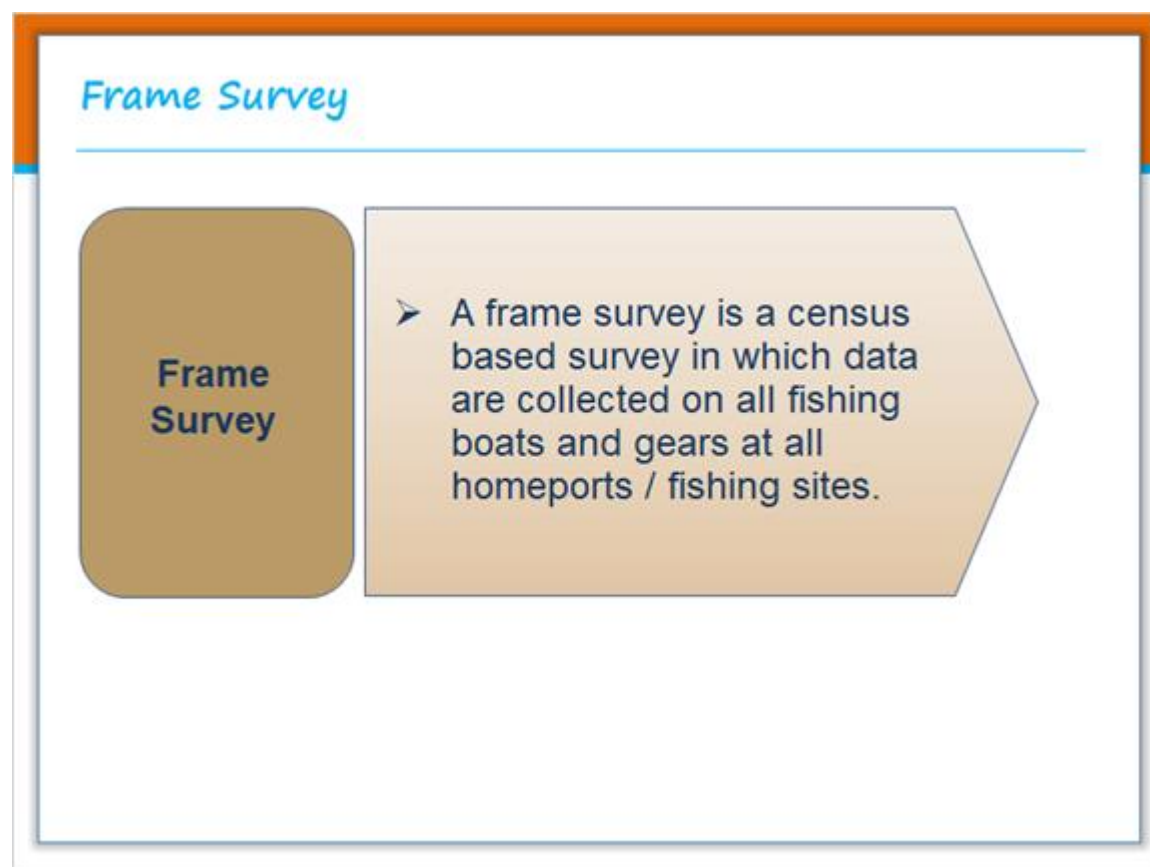
Notes:

Prior to implementing a frame survey, the user must decide on framework regarding homeports and boat/gear types to the covered.

Frame Survey basic characteristics:

- Must be conducted to cover all homeports, and fishing boats and gears in accordance with pre-set survey standards and categories and is thus, a census-based approach.

- Should be conducted as often as possible to record any fundamental changes to the distribution of boats and gear. In practice, however, it may only be conducted on a yearly basis.

- In addition to estimation of fishing effort, the data can also provide much other useful information on the socio-economics of fishing communities and for planning field data collection operations, such as periods of landings, standard days of little or no activity, sequential or concurrent use of gears, fishing grounds, etc.

5A.24 Landing Surveys
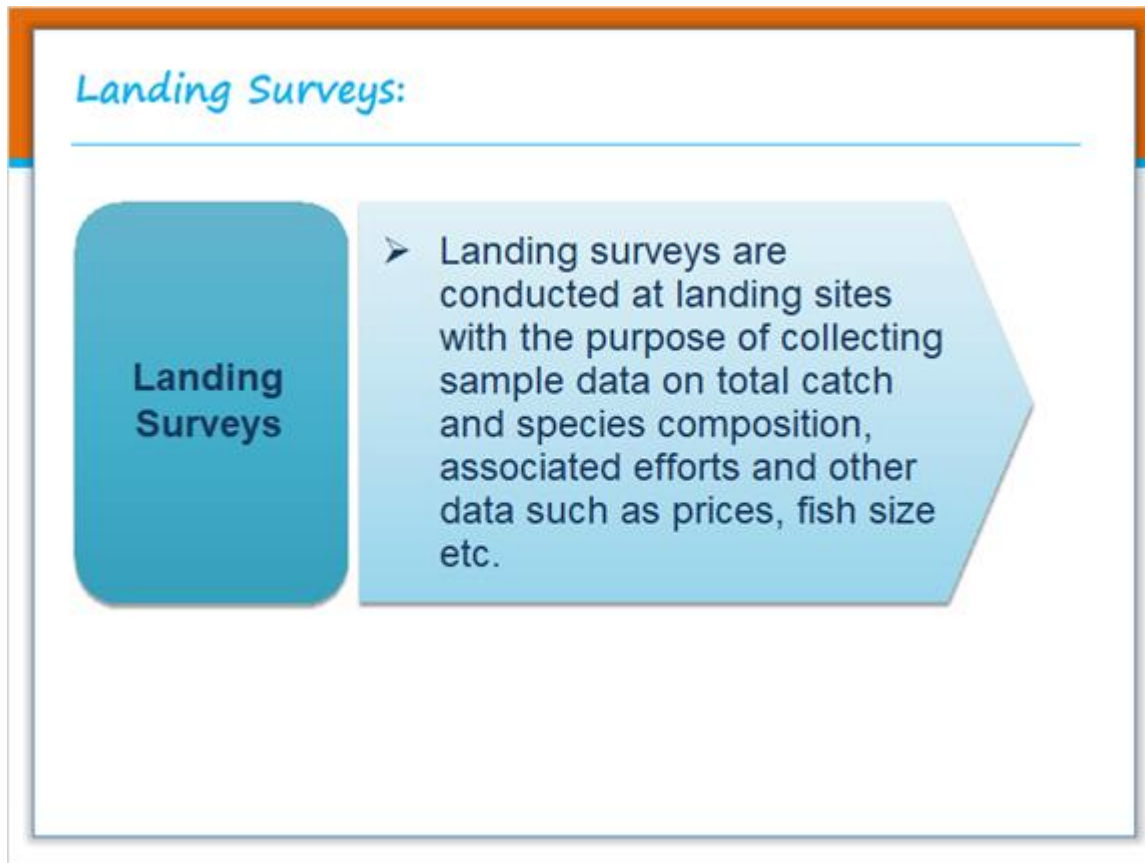
Notes:

The primary objectives are to formulate, or sample, overall Catch Per Unit Efforts (CPUEs) and species proportions within the context of a minor stratum. landing population size is usually set at the theoretical maximum number of landings occurring in a calendar month and a specific boat/gear category.

Landing surveys share the following characteristics:

- Always conducted at landing sites and may record landings of boats operating from different home port locations.
- Landings are reported separately for each boat/gear category and in accordance with survey standards.
- It requires skilled staff for species identification and accurate recording of fish weights.

5A.25 Boat Activity Survey
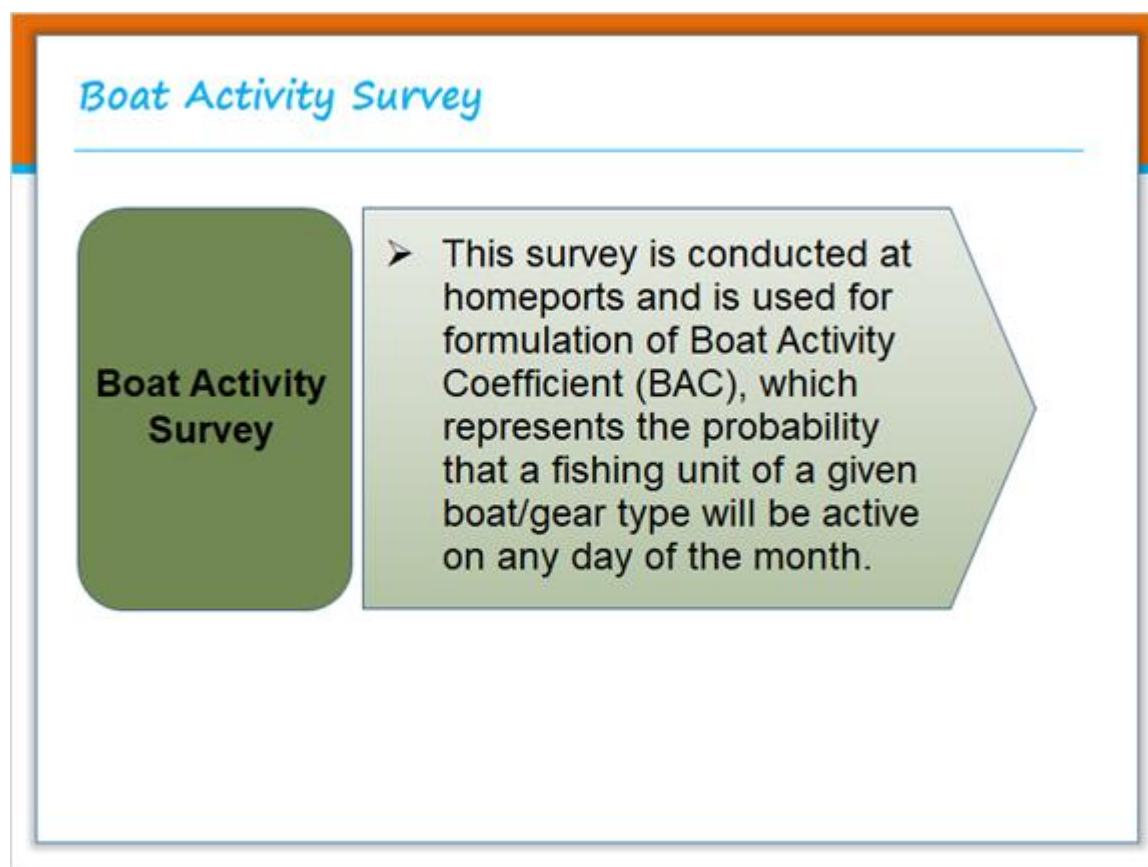
Notes:

The target data population for this survey is the activity status of all operating boats on all days of the reference month.

Boat Activity Survey (BAC) characteristics include:

- Homeport conducted surveys.

- Separate BACs for each boat/gear category in accordance with survey standards.

- Accounting for individual variability of boat activities determined by examining a number of boats and finding out how many have been active on a given day.

5A.26 Implementation of generic surveys for collection of data

Notes:

Data are sometimes collected by complete enumeration (large scale fisheries) and sometimes by sampling of small scale fisheries include CPUE, fishing effort, price, cost etc. Frame survey and fishery census are a common category of data collection for which the complete enumeration is required.

References

1. Sample based fishery survey – A technical Handbook – FAO.

2. Guidelines to Enhance small – scale fisheries and Aquaculture Statistics through a Household Approach – FAO – March 2017.

3. Allison E, Franz, N; Fueuta villa, C, west lune & William annexure R. 2011.

4. Greening small scale fisheries & Aquaculture.

5. Eurostat 2008.
    1. Survey sampling reference guidelines. Introduction to sample design and estimate techniques.

Notes:

5A.28 End of Lesson

Notes: