TOOL 3

2. ASSESS THREATS

CREEL AND MARKET SURVEYS

DATA TYPE:
Species present
Stock structure
Catch abundance
Landings and discards
Fishery description and fishing effort

SHARK PLAN OBJECTIVES:
2. Assess threats to shark populations
3. Identify and provide special attention, in particular to vulnerable or threatened shark stocks

WHY WOULD YOU USE THIS TOOL?
Creel and market surveys collect information on the sharks and rays being fished in a country, and monitor catches over time to detect any changes in the stocks.

CREEL SURVEYS
Market surveys aim to collect data on the catch when it is sold. Information is obtained from those selling sharks and rays direct to the public or to traders, whether for subsistence or commercial purposes. Like creel surveys, market surveys collect data on species catch composition and length or weight of the species, but the focus is on the economic value of the catch rather than the fishery description and effort.

MARKET SURVEYS

Both methods are particularly suitable for small-scale fisheries in developing countries as they’re inexpensive, require minimal equipment and can provide informative data. There are other fishery survey methods, such as on-board observers and research surveys, but these are more resource-intensive and are typically used in developed countries and large-scale commercial fisheries.

DATA USE
Data from these surveys can be used to assess the degree of threat of the fisheries to shark and ray populations by monitoring the species captured, the numbers/weights taken, and the level and area of fishing pressure. Changes in prices over time can reveal fluctuations in demand for shark products. The surveys also provide data on the stock structure of the species being captured by recording their sex, size and maturity stage.

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This combined biological and fisheries data informs stock assessments. These provide scientifically robust information to fisheries managers for the regulation of fisheries to ensure shark and ray stocks are fished sustainably.

Market and creel surveys are also useful for assessing the importance of sharks and rays to communities, regions and countries. Information on how much food security and livelihoods depend on sharks and rays is essential in forming sustainable fishery management plans.

**DESIGNING AN EFFECTIVE SURVEY**

Creel and market surveys are focused on collecting stock and catch data in coastal fisheries to provide advice to fisheries managers, fishers and local communities about the status of sharks and rays in their area. This information can then inform action and management strategies. It is important to clearly define the purpose of a survey, along with how the information will be used and by whom.

Fisheries, markets and cultural protocols vary widely, and it is important to note that there’s no such thing as a generic creel or market survey: each needs to be suited to its local context and appropriate for the interviewees. This tool describes the types of fishery and catch data that may be important to collect, along with some basic procedures for collecting it, but there are also regionally specific resources which include survey questionnaires and methods for approaching villagers, fishers and traders.

**USEFUL RESOURCES**

Some examples include:


**SURVEY DATA**

**GENERAL INFORMATION**

The following data should always be recorded:

- Name and location of landing or market site (place name and latitude/longitude if possible)
- Date
- Name of fisher/seller (optional, to retain confidentiality)
- Gender of fisher/seller
- Time of survey
- Name of data collector

**FISHERIES DATA**

Aim to describe the fishing fleets, fishing grounds and the importance of the fishery to the community/region/country.

**Relevant information includes:**

- Number of vessels
- Vessel home port and nationality
- Gear characteristics and selectivity (e.g. gillnet height and mesh size; hook type and size, distance between hooks and baits, if wire trace used; trawl net dimensions, cod-end mesh size)
- Seasonal patterns in fishing
- Fishing location in relation to distribution of shark and ray stocks and other fleets
- Type of habitat fished (e.g. coastal, coral reef, oceanic)
- Vessel power and size
- Navigational aids to assist fishing (e.g. GPS)
- Freezer/ice capability

**Background research on fishery:**

- Economic and social dependence on the fishery
- Costs and benefits to the community/region/country
- Fishery access/ownership
- Fishery history and local names for fishery areas
- Identity of fishery decision-makers
- Perceived challenges/issues faced by fisher community

**Individual vessel/fisher data:**

- Date(s) of fishing
- Location(s) of fishing
- Depth(s) fished
- Whether fishing alone or with others (if so, how many?)
- Name of main fisher (optional)
- Frequency of fishing trips
- Gear characteristics and selectivity (gillnet height and mesh size; hook type and size, distance between hooks and baits, if wire trace used; trawl net dimensions, cod-end mesh size)
- Day or night fishing
- Duration of fishing, including soak time for nets and lines or distance trawled
- If specific gear is used to catch sharks or rays
- Average number and weight of sharks and rays caught per fishing trip
- Species of sharks and rays caught
- Sex ratios of catch – what proportions are male/female?
- Fate and number of discarded sharks and rays (by species if possible, including size and sex)
- Shark and ray landing location and frequency
- Costs of fishing
- Average income from shark and ray catch

**CATCH DATA**

The key information to record is the number of each species, location and date. Sex, length and maturity are also important. If possible, each individual shark or ray landed should be examined, but where there are large numbers a sub-sample can be identified, measured and weighed. The optimum sub-sample size will depend on resources and the number of boats and animals involved.

Sharks are often processed at sea and may be headed, gutted and finned at landing. The form in which they’re landed needs to be noted, particularly when weights are used to record the catch: conversion factors can then be applied to estimate the biomass captured. Where possible, identify the species: if needed, photos can be taken for expert identification and tissue samples collected for genetic analysis (see % Taxonomy and % Genetics tools).

**MARKET DATA**

Market surveys should collect data that usually includes:

- Source of sharks and rays for sale
- Form of catch: whole/trunks/fins etc
- Whether vendor pays for the sharks and rays – and if so, how much
- Price of each shark or ray species (either wholesale or product)
- Costs of marketing: stall rental/electricity/wages etc
- Whether vendor processes the sharks and rays
- How long vendor has been selling sharks and rays
- Whether vendor sells sharks and rays elsewhere – and if so, where
- What percentage of vendor’s income is provided by the sale of sharks and rays
**GATHERING KEY DATA ON INDIVIDUAL SHARK AND RAY SPECIMENS**

### SPECIES IDENTIFICATION
Wherever possible, identify shark and rays in the catch or market by species (see Taxonomy tool). Record local names and match them to scientific names to develop a reliable list of species present.

### MALE OR FEMALE?

#### SIZE

**Length – sharks**

There are different ways to measure the length of a shark. Total length (stretched) is most common, where the shark’s body is straightened with the top of the tail in line with the body. Fork length is used in some larger sharks with less flexible tails, while precaudal length can be used if the tail is damaged. In all cases lie the tape flat, not along the body (the latter will curve the tape and give an inaccurate measurement).

Coastal species for which total length is measured include all sharks, sawfishes (Pristidae), wedgefishes (Rhinidae), guitarfishes (Rhinobatidae), giant guitarfishes (Glaucostegidae) and electric rays (Narcinidae, Narkinidae, Hypnidae, Torpedinidae).

**Disc width – rays**

Make sure the ray is lying flat, with the dorsal (top) side facing up. Coastal rays for which disc width is measured include stringrays (Dasyatidae), eagle rays (Myliobatidae), pelagic eagle rays (Aetobatidae), butterfly rays (Gymnuridae), cownose rays (Rhinopteridae), mantas and devil rays (Mobulidae).

### MALE

An external examination of the claspers is the simplest way of determining male maturity. Two criteria are involved:

1. The length of the clasper in relation to the pelvic fin tip
2. The degree of development (hardness) of the clasper

#### MATURITY

There are different processes for determining the maturity stage of male and female specimens.

In case of uncertainty, take photos for expert confirmation – don’t forget to clearly label each specimen with a unique sample number (see Labels).

### FEMALE

Female maturity can’t be determined externally – dissection is required in order to examine internal reproductive organs. Typically, one of five stages of maturity will be recorded:

1. Juvenile, immature – uteri very thin, ovaries small and without yolked (yellow) eggs
2. Adolescent, maturing – uteri slightly enlarged at one end, ovaries becoming larger and small yolked eggs visible
3. Adult, mature – clasper extending past pelvic fin tip, hard along entire length
4. Adult, mature – clasper extending past pelvic fin tip, not completely hard, still flexible

### WEIGHT

For sharks and rays weighing up to 10kg, hanging scales are best – a basket can be used, with the scales adjusted for its weight. For large species, weights are estimated – ensure estimates are noted as such.

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**Fig 1:** Male shark with claspers. (Source: NOAA)

**Fig 2:** Female shark. Claspers absent. (Source: NOAA)

**Fig 3:** Length measurements of a shark.

**Fig 4:** Disc width measurement of a ray.

**Fig 5:** 1. Juvenile immature male. (Source: W. White and L. Baje 2014)

**Fig 6:** 2. Adolescent immature male. (Source: White. W. and Baje. L 2014)

**Fig 7:** 3. Adult mature male. (Source: C. Rigby)

**Fig 8:** 1. Juvenile immature female
Pregnant females: if a female specimen is found to be pregnant on dissection, it’s important to record data on the litter:
- Number of embryos in each uterus
- Number of male and female embryos
- Length of each embryo

**LABELED**

It’s essential to label individual sharks and rays when samples are taken or whole animals are kept for later examination. Labels should also be included when photos of specimens are taken at landing sites or markets (see **Taxonomy tool** – photo).

Each individual animal or sample needs a USI so that site and biological data can be linked to individual specimens in later processing.

The same numbering system should be used across the survey, and work equally for whole animals, photos, and parts such as fin clips or embryos.

**EXAMPLE**

**Town and port name:** use two initials to represent the place, e.g. AB-Port on 1 May 2018.

**Animal number:** sequential number (start at 1, give each animal a unique number)

**Animal number:** 01052018

**Animal number:** 01052018-1 is the USI for the first individual animal sampled at AB Port on 1 May 2018.

Write each USI on the datasheet and give each animal a unique sequential number.

**If possible, freeze vertebrae.** If not, clean vertebrae of flesh as soon as possible – depending on size 5-10 minutes in mild household bleach will speed the process.

If a genetic sample is required for the survey, see the **Genetics** tool.

**MOBILE MONITORING**

There are many apps and programs available for recording data on mobile phones or tablets. Some free options may have restrictions on user numbers or form submissions, so it’s important to consider a survey’s size and scope before choosing which tool to use.

**Options include:**
- **Open Data Kit (ODK)** offers a free open source suite of data collection tools to use including the ODK app, called ODK Collect. ODK offers an Excel template for form creation – a free step-by-step guide is available from **Blue Ventures toolkits**. The guide also includes tips on choosing and training data collectors, selecting equipment and troubleshooting in remote regions.
- **Ona** ([https://ona.io](https://ona.io)) and **Survey CTO** ([www.surveycto.com](http://www.surveycto.com)) allow forms to be built quickly and simply and then connected to an online server.
- **Tails** was developed for small-scale tuna fishers in Pacific to record fishery data, but it can also be used to record details of a large number of shark species taken as bycatch.

**EQUIPMENT**

No specialist equipment is needed to conduct a creel or market survey.

- **Sharp knife**
- **Plastic ziplock bags**

**TECHNICAL LEVEL – EASY**

It’s advisable to appoint a survey team leader and ensure that each team member has had some training in their role. Volunteers can conduct interviews if they follow appropriate cultural protocols.

**COST – MODERATE**

Many identification guides can be downloaded from websites for free. Labour costs and expenses for transfers to market and survey sites will depend on the scope of the work, but may be high in some cases. The other main cost of surveys is likely to be related to phone running and software licensing.