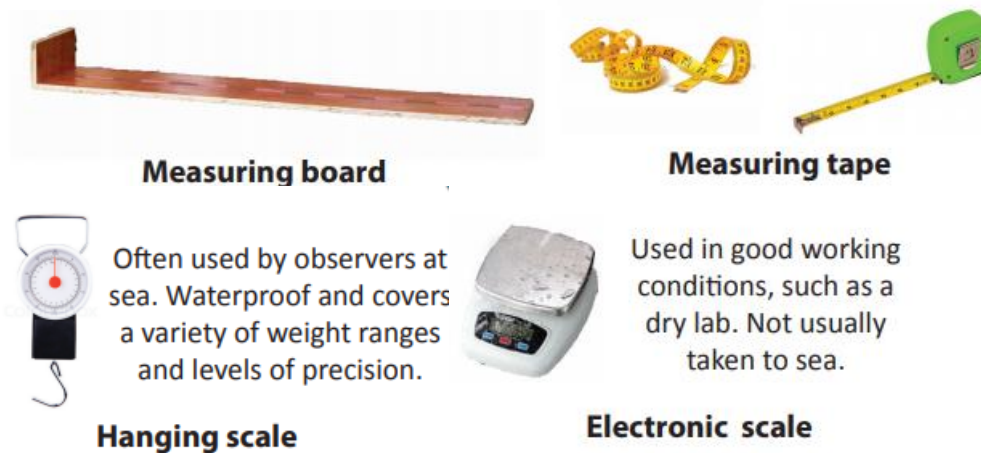


A. Collecting length and weight data

1. Equipment:



The best way to measure a cartilaginous fish is on a measuring board. If the size exceeds the size of the board, a measuring tape can be used, but attention should be paid not to follow the contour of the fish but to take an actual straight line measurement. Callipers may be the most convenient tool when a really accurate measurement is required.

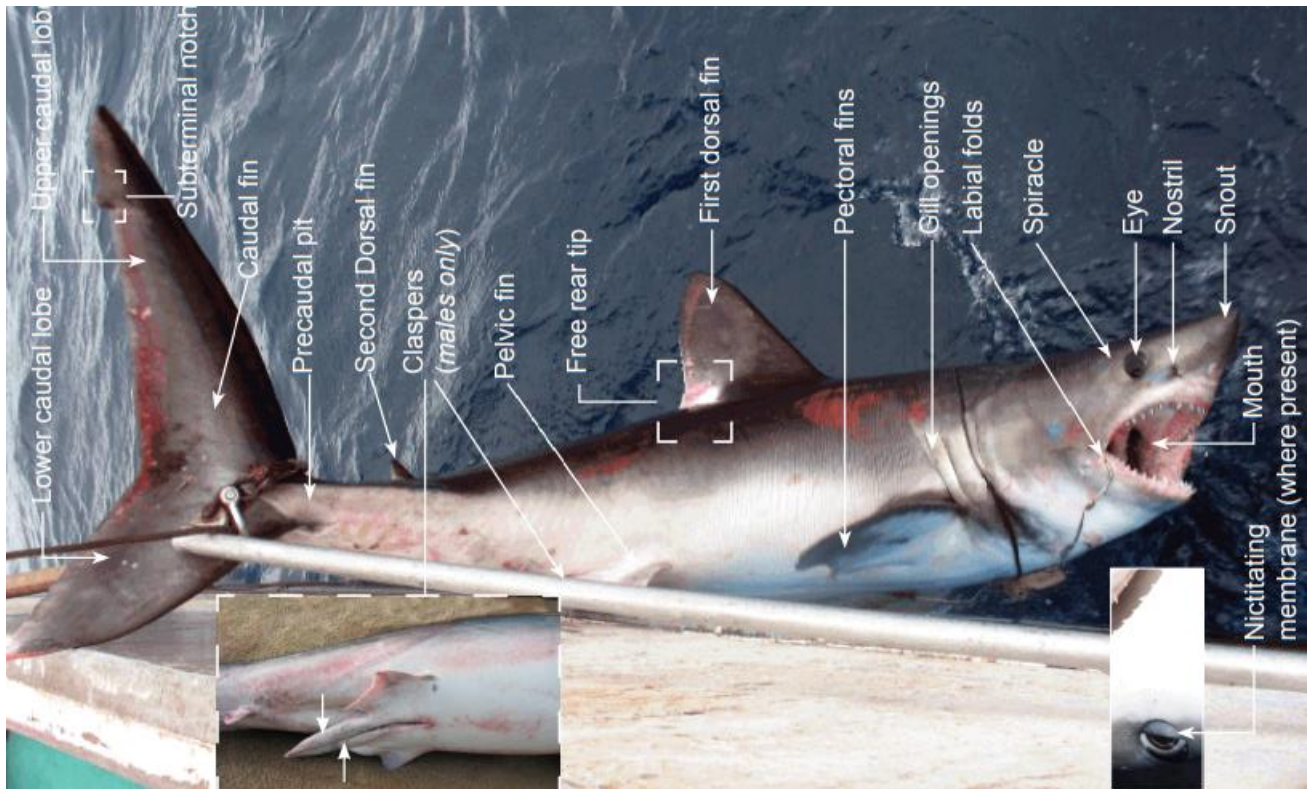
2. Procedure (sharks)

- Place the shark on the measuring board lying on its right side, snout to the left;
- Gently press its snout against the headpiece;
- Make sure the mouth is closed, and the body and tail are straightened along the mid- line;
- Read the length according to the standard measurements described in the next page;
- The standard measurement units used are centimeters (cm).

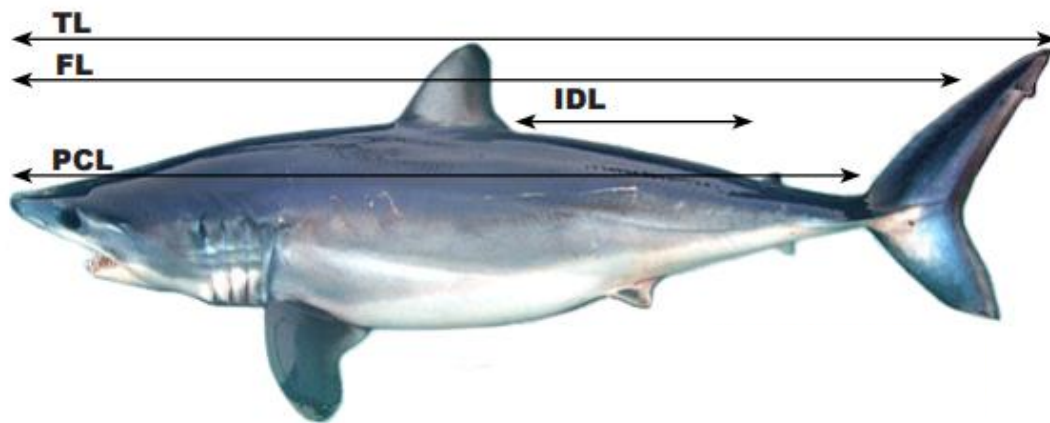
3. Procedure (batoids)

- Place the batoid on the measuring board gently pressing its left wingtip against the headpiece;
- Read the disc width as described in the next page;
- The standard measurement units used are centimeters (cm)

4. Standard measurements for sharks



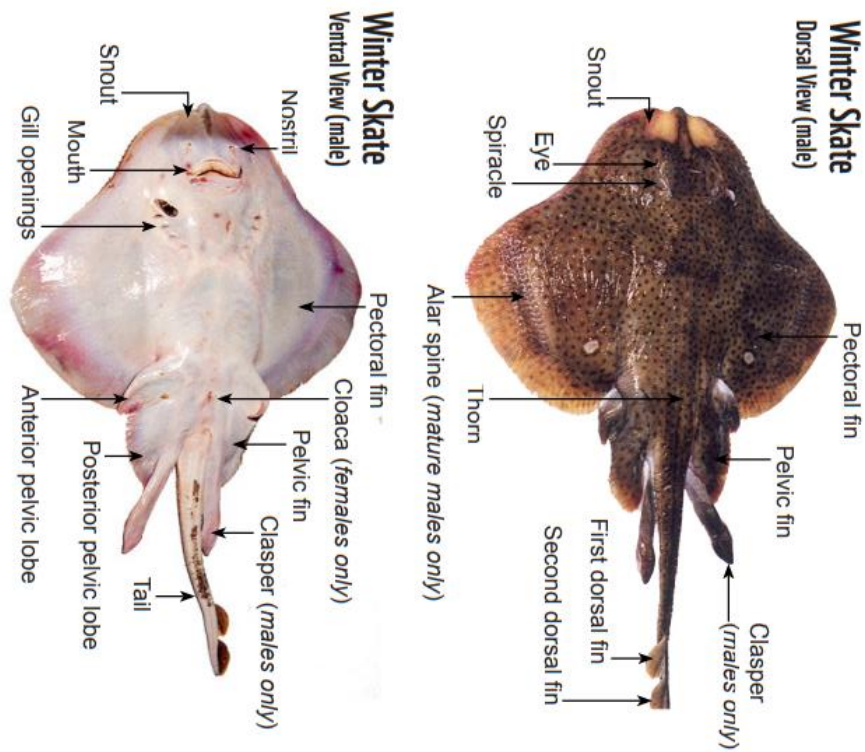
Characteristics of Sharks



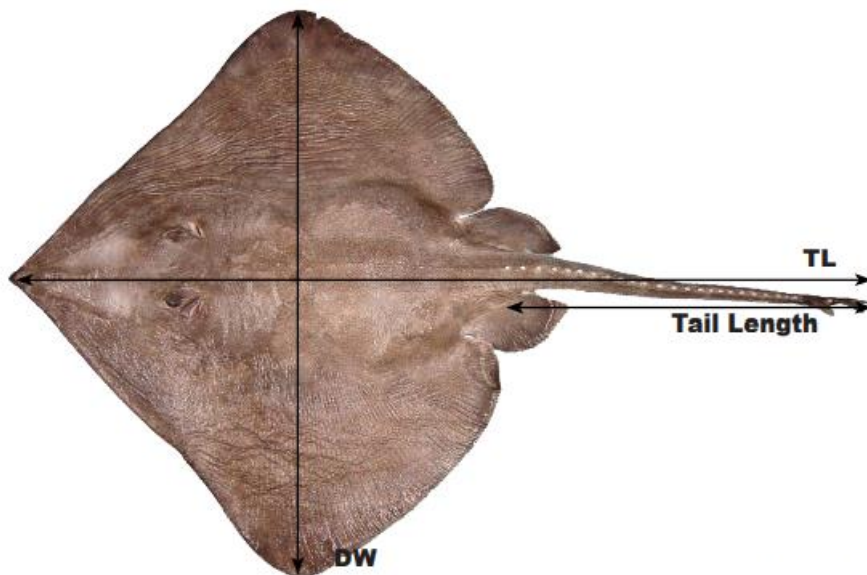
There are three standard measurements taken for sharks. These are:

- **NTL** = Natural total Length (tip of snout to extreme end of tail in a straight line).
- **FL** = Fork Length (tip of snout to fork in tail).
- **PCL** = Precaudal Length (tip of snout to precaudal notch).
- **IDL** = Inter-dorsal length. First dorsal to second dorsal fin.

5. Standard measurements for batoid fishes (rays)



Characteristics of Rays

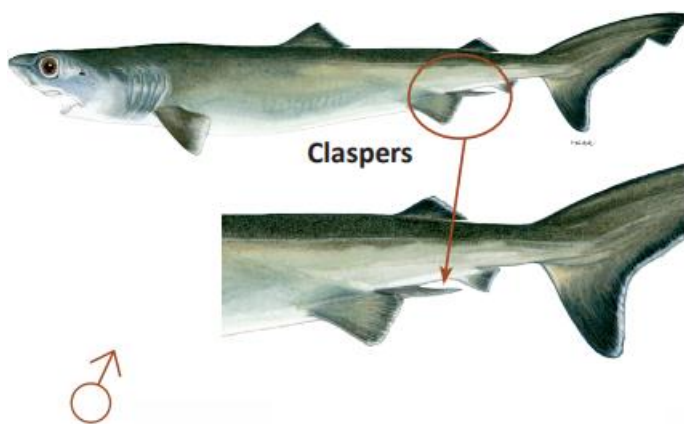


- Tail Length: Distance from center of cloaca to tip of tail.
- Total length (**TL**): Tip of snout to tip of tail.
- Disc Width (**DW**): Distance between tips of pectoral fins (or wings).

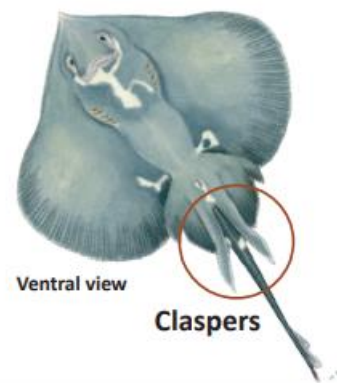
B. Sex determination in sharks and batoids

The sex of sharks and batoids can be determined by looking at the paired pelvic fins underneath the middle of the shark, as shown in the following drawings.

- **Male** sharks, batoids and chimaeras have tubular processes called claspers arising from the trailing margins of the pelvic fins. The claspers are the male's reproductive organs, used to internally fertilize the females. In juvenile males, the claspers will be present but may be small. **If You are unsure, do not guess.**

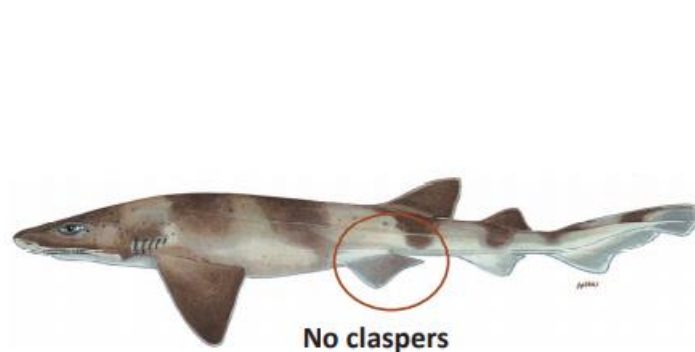


Male shark

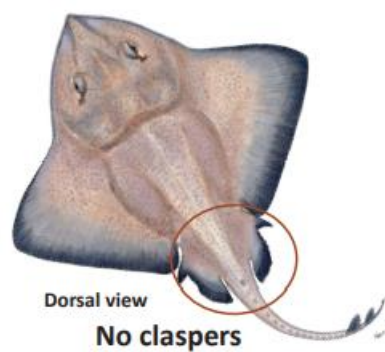


male ray

- **Female** sharks, batoids and chimaeras do not have claspers, just smooth-edged pelvic fins.



Female shark



female ray

C. Maturity stage determination


1. Maturity ranking of male sharks

Clasper length is an important parameter in accessing a species' length at maturity. Male specimens, can be ranked as:

Immature


Stage
1

New-borns: showing an umbilical scar.



Stage
2

Juveniles: claspers shorter than pelvic fins, uncalcified and flexible.



Developing

Stage
3

Adolescents: claspers extended but still not calcified.



Mature

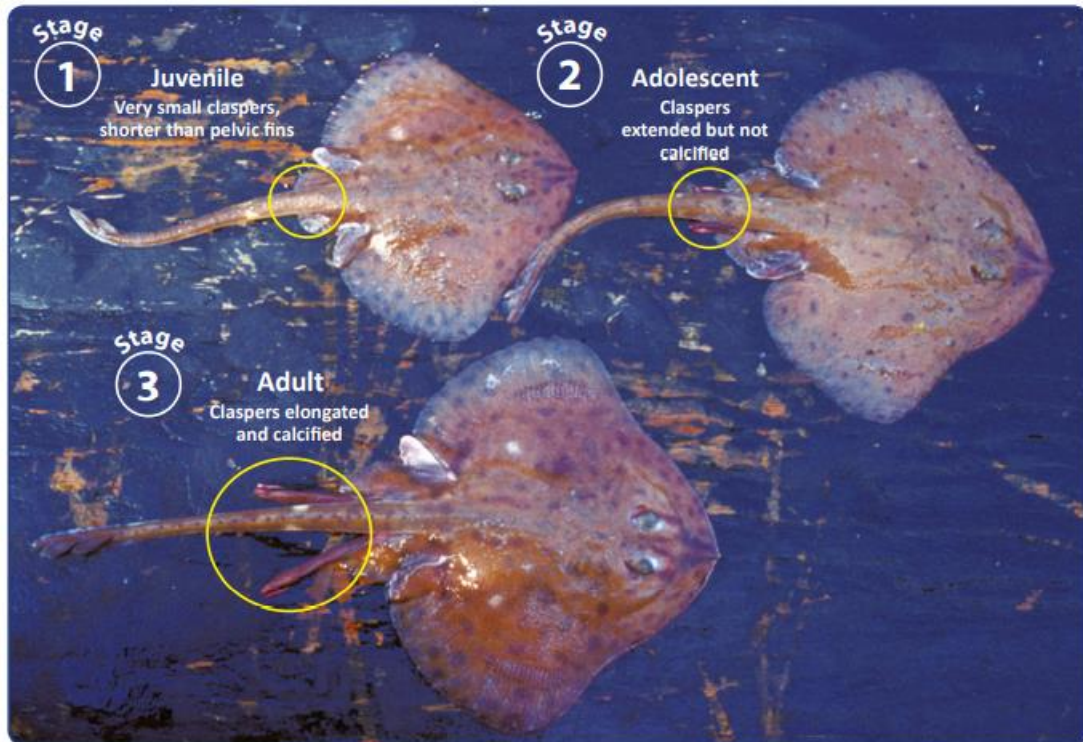
Stage
4

Adults: claspers rigid, fully calcified, and longer than pelvic fins (in some sharks they may only be as long as the pelvic fins).



2. Maturity ranking of male batoids

Males are considered mature when the claspers are elongated and calcified.



3. Maturity ranking of female sharks

In possible cases, the maturity stage of female sharks has to be determined after dissection and assessment of the development of the reproductive apparatus. Otherwise we determine the maturity stage by external observation of the global size.

Equipment



Procedure


- If the specimen is small, by using scissors (blunt tip inside the shark) open the fish by making a cut parallel to the spine forward from the anus;
- For large specimens, make an incision with a knife along the length of the body from pectoral fin to pelvic fin, then cut dorsally from each end of that incision. Fold the resulting flap of flesh up to open the body cavity. A shallow incision along the inside of the dorsal surface will prevent the flap of muscle from returning to its original position;
- Move stomach, liver and intestines to the side;
- The gonads can be located close to the spine below the intestines;
- Determine the fish's maturity stage based on the following scale.

Immature

Stage

1


New-borns: showing an umbilical scar



Stage

2

Juveniles: lacking differentiation of ovaries




Stage

3

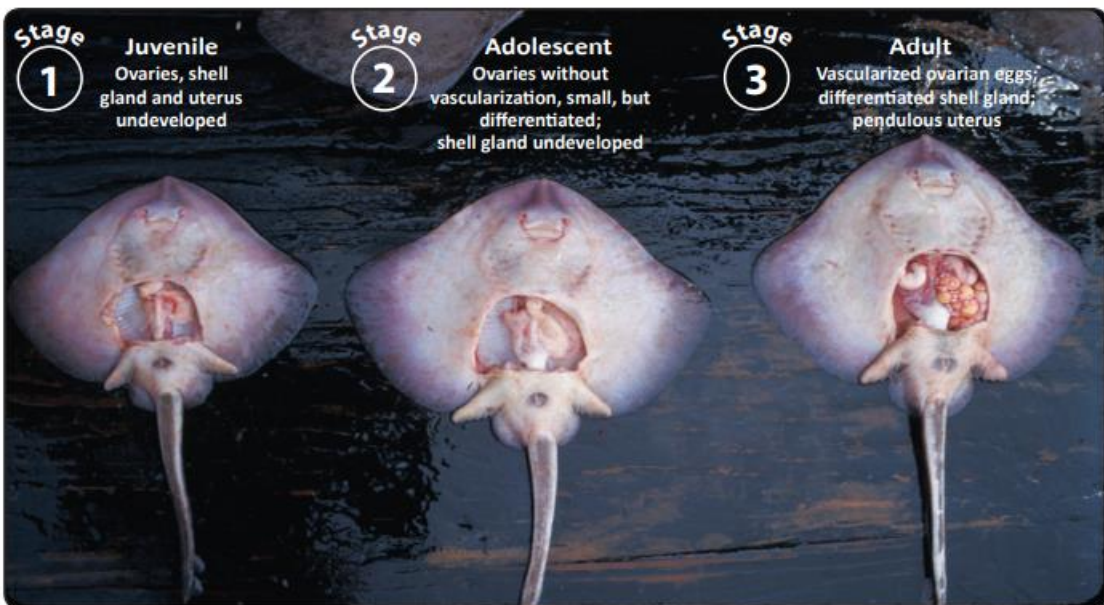
Developing

Adolescents: some differentiation of oocytes





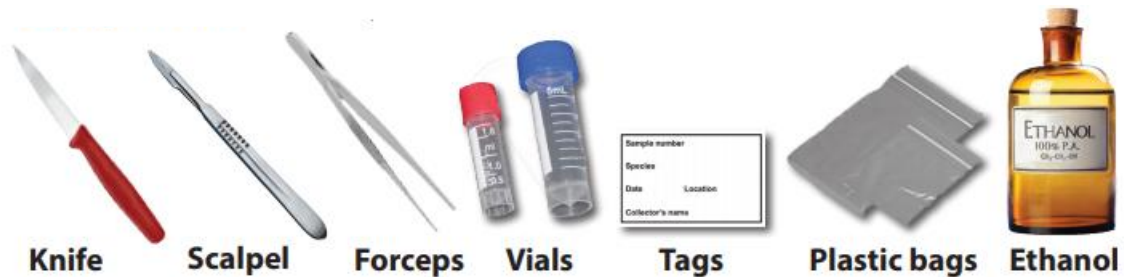
4. Maturity ranking of female batoids



D. Collection of tissue for genetic analysis

Genetics is a useful tool in defining a species as distinct on a molecular level.

1. Equipment



2. Procedure



A dermal punch is the preferred method for collecting a genetic sample from a live animal, because it yields a better tissue sample and is less damaging to the animal. When using a dermal punch on live sharks the best location from which to obtain a muscle tissue sample is the trunk area just below the dorsal fin. This is the easiest area to sample and is the least damaging to the shark. Place the tissue sample into a small glass or plastic vial containing high strength (95%) ethanol. The ethanol will preserve the tissue and the DNA at room temperature, so does not need to be refrigerated. It is crucial that wet tissue samples be completely immersed and not exposed to air (vial should be filled to the top). Label each vial with a permanent (Sharpie) marker. Ensure that each sample can be identified later by including the following information on each label: locality, sample number, collection date, and species. The date of collection, detailed locality information (accurate description of locality is critical - include GPS info if possible), collector(s) name, species, type of collection (e.g. fin clip), length, and sex, should be written on data sheets. Samples must be kept out of extreme sun/heat, especially those in ethanol, as this may damage the DNA. To take a fin clip from a shark, you will need a strong blade and/or clippers. A scalpel will not work. Make two cuts into the pectoral fin in a V-shape to remove a pea-sized wedge.

E. How to take photos

Taking photos of cartilaginous fish specimens is important as it can allow other experts to properly identify a species. Photos are easy to share and usually show the individual in the best possible conditions.

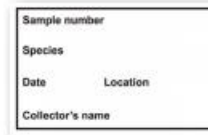
1. Equipment



Digital camera



Ruler



Tags



Coloured background

2. Photos of shark specimens

- Place a ruler or other measuring scale alongside the specimen; if no ruler is available, then some other object to show a size relationship.
- A handwritten label that includes the sample number, the date, location, and other relevant capture information, and may include the person's name is desirable.
- Plain coloured or an artificial background contrasting the specimen's color is fine.
- The following photos should be taken: Digital camera Ruler Tags Coloured background

A full lateral view of the specimen facing to the left. It is important to have the entire shark in the picture making sure that the entire caudal fin and snout is included (make sure that this photo shows a straight on view and not a ventral or dorsal view and an effort should be made to have the dorsal fins surface parallel to the ground).



In possible cases, a lateral, dorsal and ventral view of the head from the snout tip to the gills.



A close up of the pelvic-fin region, dorsal fins (both in the same photo in order to compare the relative size and shape of the fins), caudal fin and pectoral fin. A photo of the ventral side including both the pectoral and pelvic fins can be useful.



Take photos of any detail that looks unusual or descriptive. Close-ups of the teeth are also helpful, especially for the sharks of the genus *Carcharhinus*.



Dermal denticles

Teeth

Parasites

3. Photos of batoid specimens

The following photos should be taken:

As total upper and lower views.



F. Recording information

Having a common language in the data sheet is necessary as it facilitates the future analysis.

The data sheet writes down:

- **M** (for fish determined to be male)
- **F** (for fish determined to be female)
- The maturity stage should be annotated by writing the number corresponding to the estimated stage close to the above mentioned codes. For example, a pregnant female should be annotated as **F5**, a developing male as **M4**.
- If the gonad is checked but is too small or immature to confidently determine the sex, the observer should record: **I** Indeterminate.
- Finally, use **U** Unknown when, due to lack of time or damage to the fish, the sex cannot be determined.