Scallop Cleaning, Ageing, and Archiving Protocols

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Scallop Samples

1. Bags of scallops from a collection trip are placed in the walk-in cold storage in the Davis Hall Lab or a freezer in Andrews Lab 125 until ready for processing.
2. Processing of scallop shells will occur either in the Davis Hall Lab or the Andrews Lab.
3. All shell samples need to be tracked through the Shell Tracking spreadsheet. A template can be found in the Scallop Aging Shared Space under the Shell Tracking folder. For samples brought back from a trip, the number of scallops in a bag are recorded on the Tracking Sheet.

Cleaning of Scallop Shells

1. The top (dorsal) shell valves are placed in a large bin with water and 1 capful of bleach and are left to soak overnight. Each bin contains the contents of 1 bag (shells from 1 station). The waterproof label can be placed on top of the closed bin or can be left in the solution overnight with the shells.
2. The next day, the top (dorsal) shell valves are cleaned. Deformed and broken shells are discarded at this time (Figure 1). Shells are also discarded if a full measurement from the hinge to the outer margin of the shell is not feasible due to edge breakage (Figure 2).

Figure 1: Examples of deformed or broken shells that would be discarded during the cleaning process.

Figure 2: Examples of shells with broken edges that would be discarded during the cleaning process.

3. Shells are cleaned by hand with a brush (plastic bristles in order to not scratch each shell). All fouling is removed, including worms, barnacles, algae, etc., and conchiolin blisters are broken open and cleaned out (Figure 3).

Figure 3: Cleaned shell with all fouling removed from the surface.

4. Resilia ligaments are removed using tweezers or a fingernail, after which a toothbrush or similar brush is used to scrub the remaining ligament tissue from the inner surface of the resilia. Care is taken not to abrade the delicate surface of the resilia beneath the ligament.
5. Scallops and their corresponding labels are placed in drying trays and set out to dry overnight in the lab (Figure 4).

Figure 4: Shells from one station with their station label are left to dry overnight in a drying tray.

6. After drying, the scallops are labeled with the StationID and a shell identification number for that station using a permanent marker on the interior surface of the shell.
7. Scallops from each station are placed back into their labeled collection bags along with the loose labels and are ready to be aged. If a new bag is required, the StationID will be written on the outside of the bag in permanent marker.
8. The number of scallops cleaned and placed back into bags is recorded on the Tracking Sheet. The number of shells discarded during this process and the reason for discard should be recorded in the comments section.

Scallop Shell Ageing

External Ring Measurement Method

1. Ageing is completed in either Andrews 316 or the Davis Hall Lab.
2. Each bag of shells is aged individually. Depending on the project, the number of shells aged from each bag can vary.
3. Individuals trained in scallop ageing will age scallops together. The external annual lines are marked on the shell with a pencil and all individuals agree/discuss potential age lines (Figure 5). Shells where the external lines are not clear due to surface abrasion will not be aged using the external ring method (Figure 6). Once the external ring markings of the shell are agreed on, the aged shell will be labeled with the StationID and shell identification number (if not already labeled). Once labeled, the shells from one bag are set on a tray and measured.
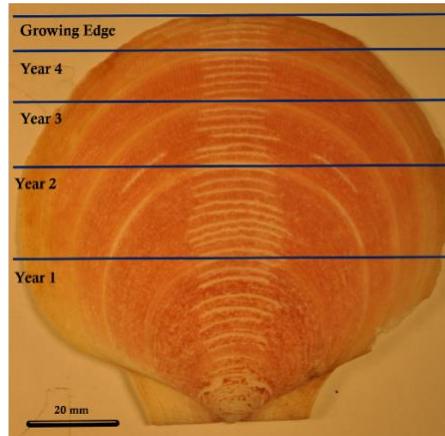
Figure 5: Shell with external rings indicated by blue lines.

Figure 6: Examples of shells with abraded surfaces that would not be aged using the external ring method.

4. Measurements are performed using the FEED app for data collection on the Mann Lab Microsoft Surface Pro or a desktop computer in Davis Hall with Digital Calipers. The FEED app version used is named ScallopAgeing_V0102 and located on the Shared Space. Each growth line increment (mm) and total height (mm) are measured for each scallop shell. The resilium age is also recorded in the app (see next sub-section).
    a. The FEED app has data entry fields for all data collected (Figure 7).
        i. In the Station Level - The StationID is entered as the Station field. For example, 202001001. The Station ID is coded as the first four digits are the year, the next two are the cruise number, and the last three are the station number.
        ii. In the Shell Number Level - The shell number of each scallop is entered in Shell Num field. The total shell height in mm of each scallop is measured once in the Shell Height field, which is next to the shell number field. The Checks field below indicates if the Station, Shell Num, or Shell Height fields are blank. If any field is blank, data must be entered into field to continue.

iii. In the Methods and Increments Level - The Method field is a dropdown box to indicate the type of age method used. Enter E for the external ring method and R for the resilia age method. The Resilia field is the age for a scallop aged using the resilia method, and data are only entered in this field if the resilia method is used. Each external increment line is measured from the umbo to the external age line. The measurements are recorded in the corresponding fields named Incr 1 – Incr 15. Each sequential external ring measurement is entered into the next Incr field. For example, the first external line measurement is recorded in the Incr 1 field and the next external line is recorded in the Incr 2 field. The last increment number is the last external increment age line. Slope, Y intercept, R – squared, k, and Linf are automatically calculated based on input data and can be used as checks on external ring line assessment and measurement of external rings. The lower Checks field indicates if any sequential Incr measurement is less than the previous measurement. If there is an error, the error needs to be corrected before advancing to the next scallop.

Figure 7: FEED app used for entering scallop age data, ScallopAgeing_V0102.

5. Once all shells are aged and measured, they are placed back in their bag, and the bag is replaced into the appropriately labeled tub in order to be placed in the Molluscan Ecology Collection.
6. The number of scallops aged using the external ring method is recorded on the Tracking Sheet. The number of shells that were not aged using the external ring method and the reason for not aging these shells should be recorded in the comments section.

Resilia Method

1. Ageing is done in either Andrews 316 or the Davis Hall Lab.
2. Each bag of shells is aged using the resilia method one at a time. Depending on the project, the number of shells resilia aged from each bag can vary.

3. Both ageing methods can be completed on an individual scallop. If the ageing methods are completed at different times, the StationID, Shell Num, and Shell Height need to be reentered when entering data for the ageing method being recorded at a later date.
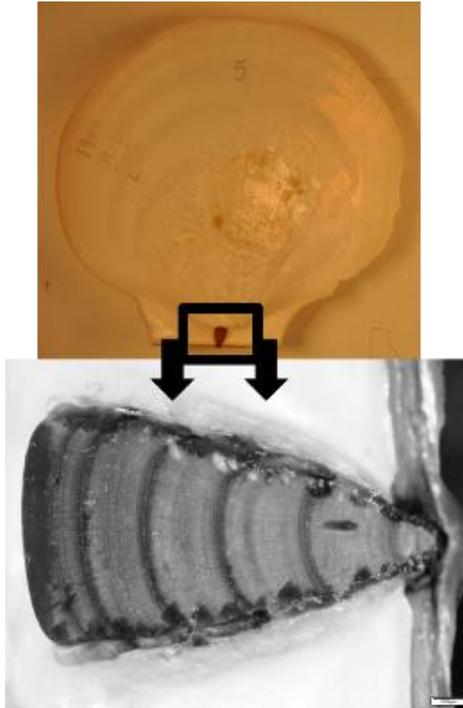

Figure 8: Location of the resilium in the hinge of the shell.

4. The resilium is located in the hinge of the shell (Figure 8). Count resilia lines using a dissecting scope, hand glass, or microscope camera (Figure 9). Shells with a damaged or cracked resilium will not be aged using the resilia method.
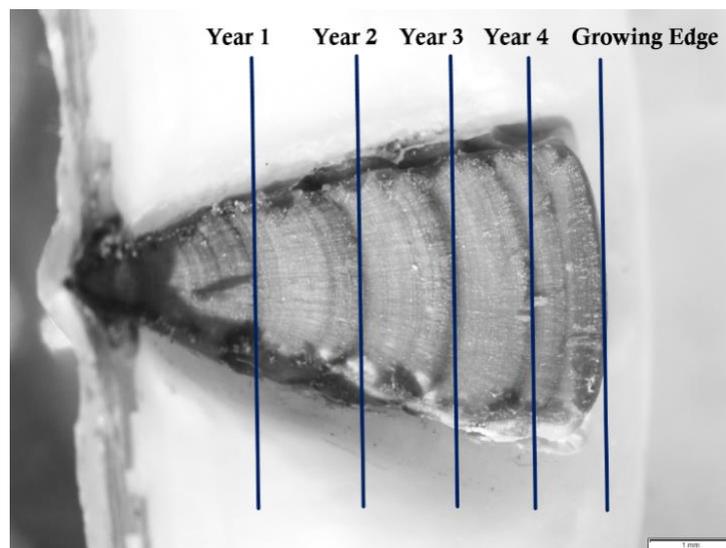

Figure 9: Resilium with annual lines indicated by blue lines.

5. Follow similar protocols for entering data into FEED, as described above, in the External Ring Method section for the StationID, Shell Num, and Shell Height (Figure 10). The only fields where data are entered in FEED for this method in the Methods and Increments Level are the Method and Resilia fields. Enter a R in the Methods field or use the drop-down box. Enter the age of the scallop determined using the resilia method in the Resilia field.
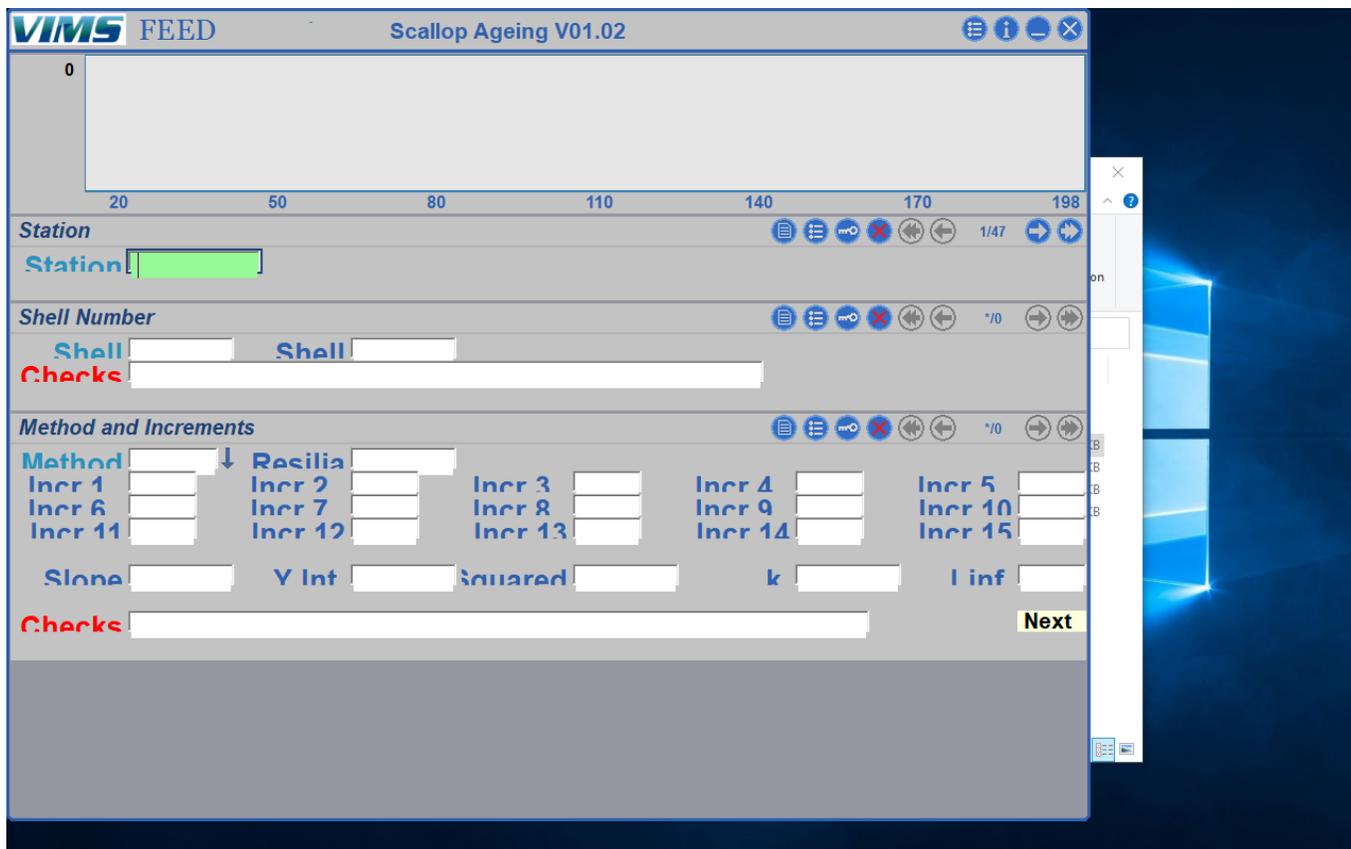
Figure 10: FEED app used for entering scallop age data, ScallopAgeing_V0102.

6. Once all shells are aged and measured, they are placed back in their bag and in their appropriately labeled tub in order to be placed in the Molluscan Ecology Collection.
7. The number of scallops aged using the resilia method is recorded on the Tracking Sheet. The number of shells that were not aged using the resilia method and the reason for not aging these shells should be recorded in the comments section. If no age information could be obtained from a shell due to abrasion of the external rings and a damaged resilium, the shell will be discarded.

Archiving of Scallop Shells

1. Scallop bags are placed in appropriate size tubs based on their year and project. Only 10 shells (at least 1 from each size range) from each bag are kept for archiving. The rest of the shells from the bag are discarded. This is done to ensure adequate space in the Molluscan Ecology Collection Room (Andrews 116).
2. The number of scallops archived is recorded on the Tracking Sheet. The number shells discarded during this process and the reason for discard should be recorded in the comments section.
3. Each tub is given a sequential identification number. See Molluscan Collection Manager for this number.
4. The tub (with identification number) is then placed on the "Scallop Shelves" (shelves in the middle of the room) in the Molluscan Ecology Collection Room. Each position on the shelves has a letter and number to identify them. The scallop shelf positions are K1 – 6 (top rows), L1 – 6 (2nd rows), M1 – 6 (3rd rows), N1 – 6 (4th rows), and O1 – 6 (bottom rows). These shelf letter and number combinations help determine the location of each tub in the archive.
5. When removing and returning contents from each tub, each bag/item must be noted on the "Sign in/out Form" in the "Molluscan Ecology Collection Binder" as well as a form located inside the tub within a sheet protector.
6. In order to find scallops, each bag of scallops is labeled with a StationID (ex. 201805001). This StationID can be looked up in the "Molluscan Ecology Collection Binder" that is located in the archive room. Each tub is labeled

on the outside and on the inside with the StationIDs from the samples that are contained in that tub. Below is an example of how the binder is set up. If we are looking for StationID 201805001, we can find it in location L3 in the collection room. Its tub number is 145.

Tub Number	Collection Location	Shell Type	Project	Year/Date	Contents
145	L3	Placopecten magellanicus	Scallop Density Survey	2018	Tows: 201805001, 201805002, 201805003, 201805004, 201805005, 201805006, 201805007, 201805008, 201805009, 201805010, 201805011, 201805012, 201805013, 201805014, 201805015, 201805017, 201805018, 201805019, 201805020, 201805021, 201805022

QA/QC

1. Once shells have been aged and data entered into FEED, data are quality controlled (QA/QC) and then uploaded into the appropriate project database.
2. QA/QC may require some shells to be re-aged. If shells are not available, then these data are removed from the database.
3. Scallops aged during sea scallop resource surveys are uploaded into the Survey_Database. Other age data will be uploaded into the appropriate project-specific database.
4. Shell tracking information should be entered into an Excel file if information is collected on a paper copy during the process. The files should be renamed with the CruiseID and saved in the Shell Tracking folder on the Scallop Aging Shared Space.

Shared Space

1. All software, protocols, shell tracking information, and project-specific databases are housed on the Scallop Aging Shared Space.