Standard Operating Procedure (SOP)

Title: Analyzing Oyster Growth, Water Temperature, Salinity, and pH Levels in Vertical Oyster Cages Submerged in the Indian River Lagoon monitored by Stella Maris Environmental Research

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Approved By: Ashley Chelberg, President of Stella Maris Environmental Research

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1. Purpose

This SOP provides standardized procedures for analyzing oyster health (spat count, number of juveniles, adults), water temperature, salinity, and pH levels in oyster cages submerged in the Indian River Lagoon. The purpose is to ensure consistency and accuracy in data collection to monitor the health of oyster populations and water quality.

2. Scope

This procedure applies to all personnel involved in monitoring and data collection related to oyster cultivation within the Indian River Lagoon at Hubbs SeaWorld Research Institute.

3. Responsibilities

- **Field Technician:** Responsible for data collection, sample handling, and ensuring equipment is properly calibrated and maintained.
- **Data Analyst/Participants:** Responsible for analyzing collected data and maintaining records.
- **Supervisor (can be the same individual as field technician):** Responsible for overseeing the process, reviewing data for accuracy, and ensuring compliance with this SOP.

4. Materials and Equipment

- Oyster cages
- Phone (that has access to local weather conditions)
- Electronic data logger (Google Sheets Excel document) - Can also be the phone.
- Thermometer (digital or glass)
- Refractometer (for salinity measurement)
- pH meter
- GPS device (for location accuracy) – Can also be the phone.
- Personal protective equipment (PPE): gloves, water shoes

5. Procedure

5.1 Preparation

1. **Review Site Conditions:**
    - Check weather and tide conditions before going into the field. Document these conditions before getting in the water.
    - Ensure all equipment is calibrated and functioning correctly.
2. **Labeling and Documentation:**
    - Label each oyster cage clearly with a unique identifier.
    - Record the date, time, and GPS coordinates of each cage location.

5.2 Field Sampling

5.2.1 Oyster Spat Analysis

1. **Retrieve Oyster Cages:**
    - Carefully lift the oyster cage from the water to minimize stress on the oysters.
    - With the cage suspended, look for observable spat on exposed shells.
2. **Spat Counting:**

    - Identify how many shells are showing signs of spat accumulation
        1. 0-5 observable shells: little to no spat count
        2. 5-10 observable shells: moderate spat count
        3. 10+ observable shells: high spat count
    - Document whether the spat is showing signs of growth or is dead.
    - Record the spat count on the datasheet or electronic data logger.

3. Juvenile Oyster Counting:
    - Identify if oysters have reached the juvenile stage
        1. Document how many visible juvenile oysters are observed in each cage.
4. Adult Oyster Counting:
    - Identify if oysters have reached the adult stage
        1. Document how many visible adult oysters are observed in each cage.

5.2.2 Water Temperature Measurement

1. **Measure Temperature:**
    - Submerge the thermometer into the water near the oyster cage, ensuring it is fully immersed.
    - Allow the thermometer to stabilize before reading the temperature.
    - Record the temperature in degrees Celsius (°C).

5.2.3 Water Salinity Measurement

1. **Measure Salinity:**
    - Submerge the refractometer's prism and close the cover to get a water sample.
    - Look through the refractometer to read the salinity level in parts per thousand (ppt).
    - Record the salinity value.

5.2.4 Water pH Measurement

1. **Measure pH:**
    - Submerge the pH meter in the water. Swirl the tip of the device for 5 seconds while submerged.
    - Record the pH value.

5.3 Data Recording and Handling

1. **Verify Data Entries:**
    - Double-check all recorded data for accuracy before leaving the field.
    - Transfer data from field sheets to the digital database if using paper forms.
2. **Clean and Store Equipment:**
    - Rinse all equipment with fresh water and allow it to dry before storage.
    - Store data sheets or electronic devices securely.

6. Data Analysis

1. **Compile Data:**
    - Organize data by date, location, and parameter (spat count, temperature, salinity, pH).
2. **Analyze Trends:**
    - Assess the relationship between environmental parameters and oyster spat growth.
    - Identify any anomalies or patterns that may indicate environmental stress.
3. **Report Findings:**
    - Prepare a summary report with data visualizations (e.g., graphs) and observations.
    - Submit the report to the supervisor for review.

7. Quality Control

- **Calibration:** Ensure all instruments are calibrated before use.
- **Field Duplicates:** Collect duplicate samples periodically to ensure consistency.
- **Data Review:** The supervisor should review all data for accuracy before analysis.

8. Health and Safety

- Always wear appropriate PPE.
- Be cautious when handling oyster cages to avoid cuts or infections.

9. References

- Manufacturer's manuals for thermometer, refractometer, and pH meter.
- Local environmental regulations and guidelines for water quality monitoring.

10. Revision History

- **Version 1.0:** Initial SOP release on 08.01.2024.

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This SOP should be reviewed annually and revised as necessary to reflect new methodologies or changes in environmental conditions.