

LIFE IN THE ESTUARY

FOR SEA: Investigating Marine Science - Grade 3

Table of Contents

Introduction	1
Conceptual Scheme	9
Marine Aquaria	15
Bibliography	19
Successful Fieldtripping.....	29



Unit I: Estuaries

- 1. Where Rivers Meet the Sea 37**
 Students make a physical model of fresh and salt water layering in an estuary.
- 2. Waterborne 43**
 A student reading with embedded questions about buoyancy of ships in different waters (e.g., fresh, salt, warm, cold).
- 3. Plimsoll Floats 53**
 Students shape boats of modeling clay and test their boats' abilities to carry a load in fresh water and in salt water.
- 4. The Great Boat Float..... 61**
 A take home activity in which family members shape boats from aluminum foil and test buoyancy in fresh and salt water.
- 5. Tide's In/Tide's Out..... 69**
 Students make a paper model which includes a graph of tide heights vs. time of day.
- 6. Time and Tides 83**
 Students learn to read a tide table and to describe tidal differences using a 24 hour clock.

Unit 2: Plants and Crabs

- 1. Whose Home? 91**
 Each student takes on a role (i.e., moon, water, eelgrass, crab...) enacting movements and behaviors representing the rise and fall of the tides.

- 2. In the Eelgrass Bed 103**
Students working in groups explore the eelgrass food web using a picture sheet, animal fact cards, and a reading with embedded questions.
- 3. What Grows There? 117**
Some plants can tolerate salt water. Students experiment by irrigating seedlings, some with fresh water, some with salty.
- 4. Crab City 125**
This reading provides a look at how humans make a living along our coasts and how marine animals are adapted to their environments.
- 5. Crabs 141**
This activity reviews material introduced in “Crab City” by providing a crab diagram for labeling, and questions about the diagram.
- 6. What a Story! 145**
Students order the mixed-up events in a story which follows the life of crabs from egg to our dinner table.
- 7. Scrambled Crab 149**
Students unscramble the mixed-up letters of crab terms, using the definitions of the terms as clues.
- 8. Observing the Living Crab 153**
Students observe crabs swimming, walking, digging, hunting, and eating.

Unit 3: Shrimp

- 1. Shrimp - No Small Wonder 161**
This reading focuses on shrimp anatomy and life cycle while continuing a look at how humans make a living along our coasts. Students make calculations regarding costs of shrimping.
- 2. Only Half The Story 171**
Students choose words about shrimp biology and fishing from a list to fill in blanks in a story.
- 3. The Shrimp Boats Are A-Coming 175**
Commercial shrimping provides livelihoods for many people. Students practice solving word problems, including challenge problems involving calculating averages and percents.
- 4. How Hot Is Too Hot? 183**
Students experiment to see how varying an environmental factor (temperature) affects hatching rate for brine shrimp eggs.

- 5. Observing Brine Shrimp** 191
 Students use hand lenses and/or microscopes to observe compound eyes, gills, swimming behavior, response to light, and more.

Unit 4: Birds

- 1. Who Flies There?** 199
 Students sort bird pictures into groups with common characteristics to gain an appreciation of diversity.
- 2. An Assortment of Beaks** 205
 Students, equipped with one of four “beaks” (spoon, scissor, clothespin, or tweezer), take on the role of foraging birds and gather “food” types.
- 3. Beaks and Feet** 211
 Students match a set of beak and feet cards, representing a variety of estuarine birds, with different food types and feeding areas.
- 4. Who’s Hiding There?** 219
 Students search for camouflaged objects and relate their experience to bird survival in an estuary.
- 5. Dangerous Journeys** 229
 Students assume the roles of ducks, wind storm, predators, and hunters to examine migration hazards.
- 6. Migrating Down the Flyway** 237
 Students examine factors which limit or favor migration survival, measure migration distance on a map, then calculate migration duration.

Unit 5: Food Webs

- 1. Who’s For Dinner?** 247
 Students play a card game in which each card represents an organism, and can only be “taken” by a card of the next food web level.
- 2. Pyramids in the Marsh** 269
 Students calculate grams of food needed by each member of a marsh food chain/pyramid.
- 3. Construct an Estuary** 277
 Students review adaptations and interactions by constructing a habitat model. Stuffed-crab plans included.

Unit 6: Clams

- 1. Shell Sort 281**
Students use size, shape, texture, color and weight to sort and classify shells. A student-made balance (ruler on an eraser) helps gauge weight.
- 2. More Than a Few Clams 287**
This reading, with crossword puzzle review, introduces clam biology, harvesting and marketing.
- 3. Regulating the Harvest 299**
This puzzle describes the reasons for rules such as filling in the holes made by clam diggers, and leaving oyster shells at the beach.
- 4. Goopy Ducks? 309**
Students use math skills to explore geoduck growth, population size, and rate and impact of harvesting.
- 5. Insides Out 317**
Students construct, label, and explore relationships between parts of a three dimensional paper model of a clam.
- 6. Open Sesame 331**
Steamed clams, from the beach or supermarket, give students an opportunity to match actual structures with models and drawings presented in preceding lessons.
- 7. Write All About It! A Creative Clam Story..... 339**
Students practice creative writing skills as they synthesize a clam story. The stage is set by showing a picture of a clam and its predator.

Unit 7: Oysters

- 1. Oysters on the Half Shell 343**
Students are full of insightful questions after being challenged to find a particular half shell, and then its mate, in a pile of oyster shells.
- 2. Folding Oysters 351**
Students put together oyster finger puppets while learning about oyster anatomy and physiology.
- 3. The Oyster Story 359**
A student reading with embedded questions about oyster aquaculture, harvesting and marketing provides a logical follow-up to “Oysters on the Half Shell”.

- 4. Red Tides 369**
Students learn what Red Tide is and isn't, and how to avoid poisoning.
- 5. Shellfish at Risk 379**
Students play a board game matching contamination SOURCES, the PROBLEMS these lead to, and the SOLUTIONS people can employ.
- 6. Red Sea Star Cafe 395**
In this participatory simulation, students work as teams to “open” and “operate” a seafood restaurant.

Unit 8: People and Estuaries

- 1. Where Have All the Salt Marshes Gone? 405**
Students role play salt-marsh species faced with a shrinking habitat.
- 2. National Estuaries of Significance..... 413**
Students create metaphors denoting the features of estuaries, and use clues, such as salt or fresh water sources, to locate reserves on a map.