

Instructor's Notes: Introduction to Jellyfish – Drifters of the Sea

Lesson Overview:

This lesson introduces students to jellyfish (phylum Cnidaria), focusing on their anatomy, life cycle, locomotion, feeding strategies, and ecological roles. It also explores their impact on human activities and the environment. Students should come away with an appreciation for jellyfish as more than just simple gelatinous animals, understanding their evolutionary success and role as environmental indicators.

Learning Objectives:

By the end of the lesson, students should be able to:

- Identify the characteristics of jellyfish and their classification within Cnidaria.
- Describe jellyfish body structure and specialized cells.
- Explain the stages of the jellyfish life cycle and their reproductive methods.
- Understand jellyfish movement, feeding, and defense mechanisms.
- Recognize the ecological importance of jellyfish and their responses to environmental changes.

Key Background Information:

1. Classification and Anatomy:

- Jellyfish are **invertebrate animals** in the **phylum Cnidaria**, which also includes sea anemones, corals, and hydras.
- True jellyfish belong to the **class Scyphozoa**, while similar organisms are found in classes **Cubozoa** (box jellies) and **Hydrozoa** (some colonial forms).
- Cnidarians have **radial symmetry**, a **nerve net**, **diploblastic** body structure (ectoderm and endoderm with mesoglea in between), and possess **cnidocytes**—specialized stinging

cells with nematocysts.

Key structures:

- **Mesoglea:** Jelly-like substance between cell layers providing support and buoyancy.
- **Gastrovascular cavity:** Central digestive compartment.
- **Cnidocytes:** Specialized cells that discharge stinging threads.
- **Statocysts:** Organs used for balance.
- **Nerve net:** Diffuse nerve arrangement without a central brain.

2. Life Cycle:

- Alternates between **sexual and asexual phases**.
- Major stages:
 - **Medusa (adult jellyfish)** – sexual reproduction (produces gametes).
 - **Planula larva** – free-swimming stage after fertilization.
 - **Polyp** – sessile stage.
 - **Strobila** – polyp that segments asexually.
 - **Ephyra** – immature medusa that grows into adult.
- **Strobilation** is the process by which polyps form ephyrae via asexual budding.

3. Locomotion and Feeding:

- Jellyfish swim via **pulsating contractions** of their bell.
- Mostly **planktonic**, drifting with currents.
- **Carnivorous** feeders; capture prey using tentacles lined with cnidocytes.
- Prey includes zooplankton, fish larvae, and even other jellyfish.

4. Defense and Predators:

- **Cnidocytes** act both for offense (hunting) and defense.
- Some species have **bioluminescence** to deter predators.
- Predators include sea turtles, sunfish (*Mola mola*), some seabirds, and other jellyfish.

5. Ecological Roles and Human Impacts:

- Jellyfish are both **predators and prey** in marine food webs.
- Important in **nutrient cycling**—break down organic matter and support microbial loops.
- Provide **microhabitats** for juvenile fish.
- **Environmental indicators**—blooms may signal ecosystem imbalance.

Jellyfish Blooms:

- Often caused by:
 - **Overfishing** of predators
 - **Climate change** (warmer waters)

- **Coastal development and eutrophication**

Impacts of blooms:

- Clog power plants
- Shut down fisheries
- Injure swimmers

Human responses:

- Jellyfish tracking programs
- Biotech interest in **fluorescent proteins** (e.g., GFP from Aequorea victoria)
- Use in food (e.g., in Asia) and cosmetics

