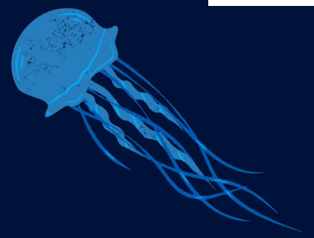
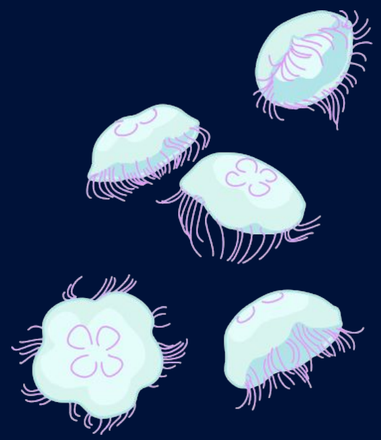
Introduction to Jellyfish – The Drifters of the Sea





AIM:

What are jellyfish, and how do their anatomy, life cycle, and ecological roles contribute to the function and diversity of marine ecosystems?

Do Now:

What might be the structural limitations of simple sponges that rely on direct flow into a central cavity? How could nature improve this? Consider how folding and complexity increase surface area in biology.

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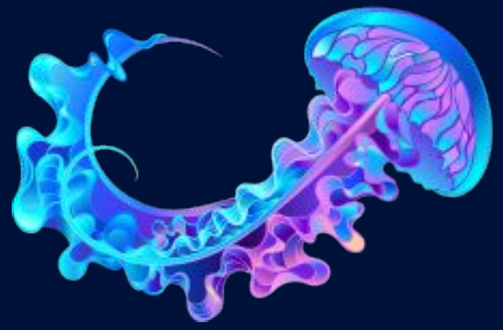
NGSS Standards

- HS-LS1-2 – Develop and use a model to illustrate the hierarchical organization of interacting systems within multicellular organisms.
- HS-LS4-1 – Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of evidence.
- HS-LS2-6 – Evaluate evidence that ecosystem dynamics are maintained through the cycling of matter and flow of energy.
- HS-ESS3-3 – Illustrate the relationships among Earth systems and how they are impacted by human activity.



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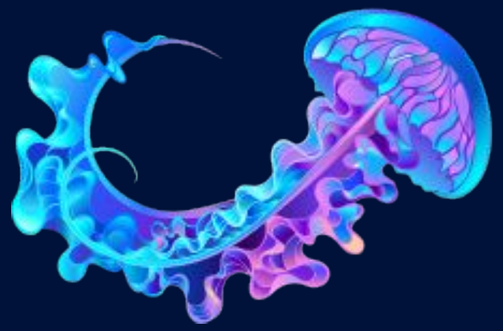
Objectives

- Identify the basic anatomy and classification of jellyfish.
- Describe the stages of the jellyfish life cycle.
- Explain how jellyfish move, feed, and defend themselves.
- Analyze the ecological roles of jellyfish in marine food webs.
- Evaluate human impacts on jellyfish populations and the consequences of jellyfish blooms.



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Taxonomy and Classification

Phylum Cnidaria

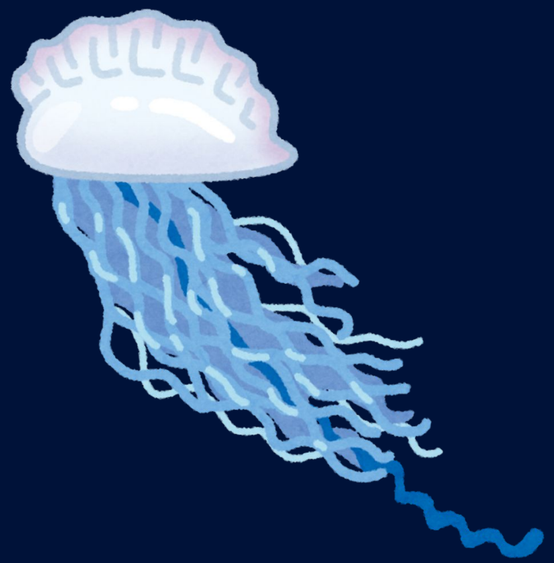
- Includes jellyfish, sea anemones, corals, and hydroids.
- Characterized by radial symmetry, stinging cells (cnidocytes), and simple body organization.

Class Scyphozoa (True Jellyfish)

- Free-swimming medusae dominate life cycle.
- Examples: Aurelia aurita (moon jelly), Chrysaora spp. (sea nettles)

Other Jellyfish-Like Organisms

- Class Cubozoa: box jellies, highly venomous, fast swimmers.
- Class Hydrozoa: colonial organisms (e.g., Portuguese man o’ war).
- Class Staurozoa: stalked jellyfish that attach to substrate.



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Anatomy and Body Structure

- Radially symmetrical, gelatinous body.
- Oral arms and tentacles extend downward from bell.

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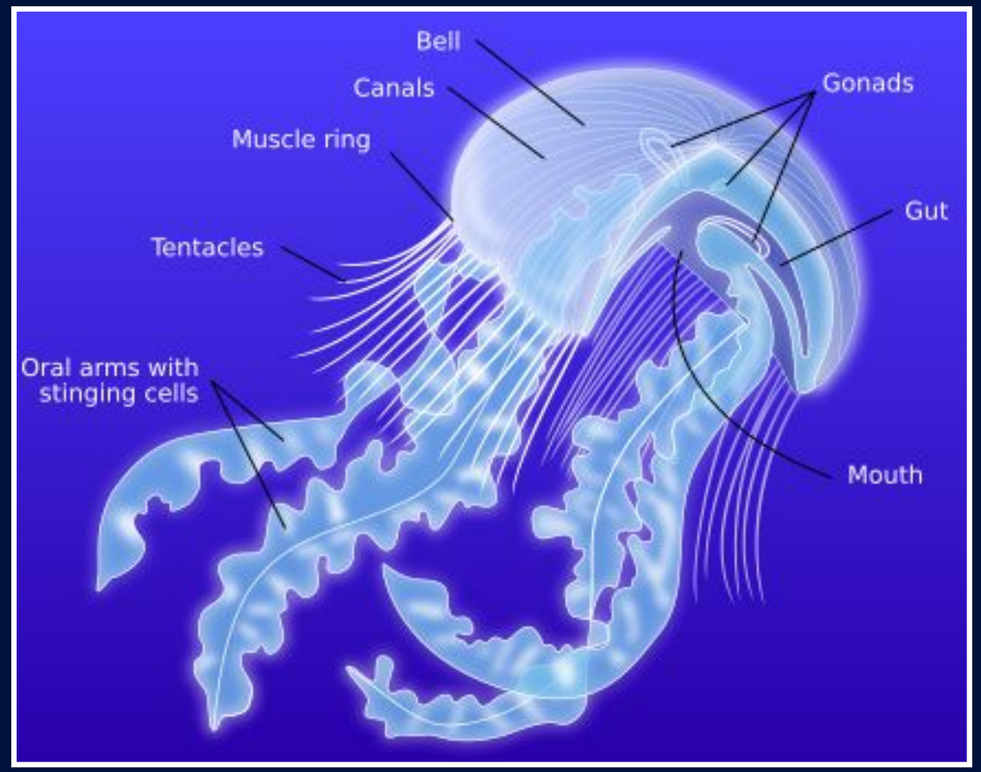
Anatomy and Body Structure

- Mesoglea: jelly-like layer for buoyancy.
- Gastrovascular cavity: simple digestive system.
- Mouth: central, located on the underside.
- Tentacles: contain cnidocytes with nematocysts (stinging cells).
- Nerve net: basic nervous system, no brain or centralized ganglia.
- Statocysts: help detect orientation in the water.



Wikipedia Contributors. “Jellyfish.” Wikipedia, Wikimedia Foundation, 21 Feb. 2019, en.wikipedia.org/wiki/Jellyfish.

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Anatomy and Body Structure: Locomotion

- Jet Propulsion: rhythmic contractions of the bell push water.
- Drift with currents; limited directional control.

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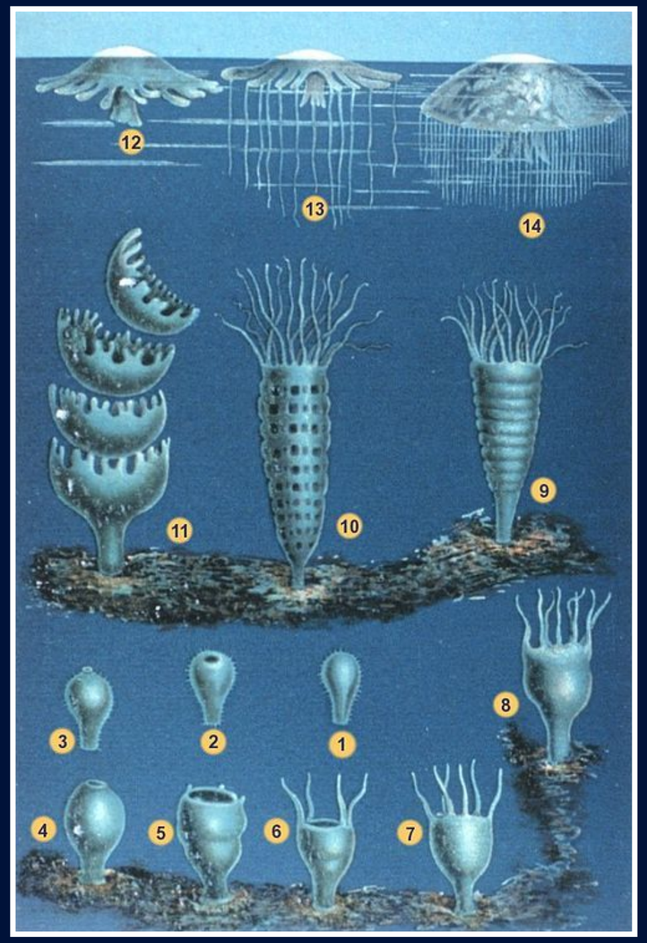
Jellyfish Life Cycle

- Medusa (adult jellyfish) – sexual reproduction.
- Fertilized egg develops into planula (free-swimming larva).
- Planula settles and becomes a polyp (sessile stage).
- Polyp undergoes strobilation → produces ephyra (juvenile medusae).
- Ephyra mature into adult medusae.



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1–3 Larva searches for site
4–8 Polyp grows
9–11 Polyp strobilates
12–14 Medusa grows

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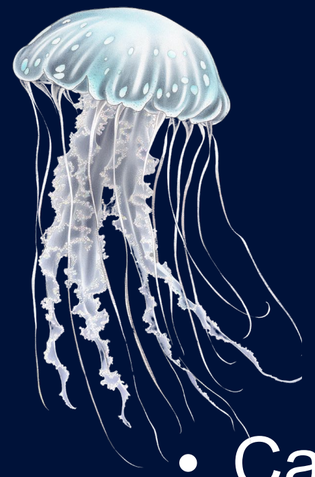
Reproductive Modes

- Sexual (gamete fusion in medusae).
- Asexual (budding and strobilation in polyps).
- Enables rapid population growth in favorable conditions.



Feeding, Predators, Defense

- Carnivores: feed on zooplankton, fish larvae, small crustaceans.
- Use tentacles to paralyze and capture prey.
- Transport prey to mouth with oral arms.

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Predators of Jellyfish

- Sea turtles, ocean sunfish, some seabirds and large fish.
- Some species are immune to jellyfish stings.

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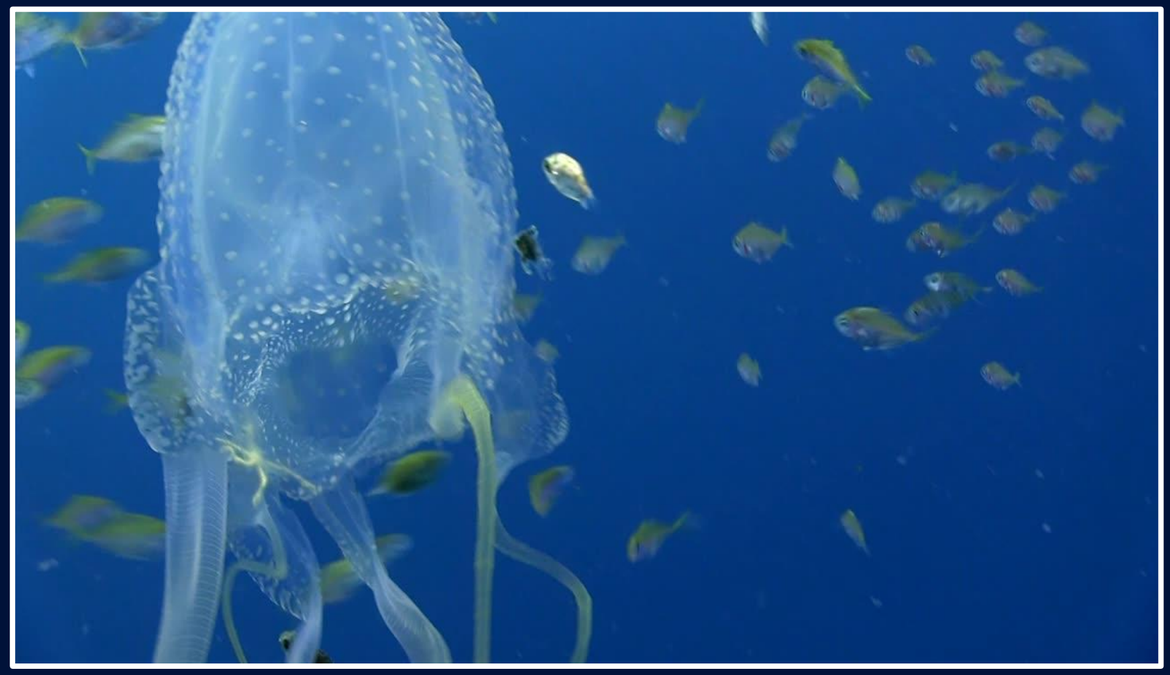
Defense Mechanisms

- Stinging cells (nematocysts) inject toxins.
- Transparency and drifting make them hard to detect.

Ecological Roles

- Control plankton populations.
- Serve as prey for specialized predators.
- Provide shelter for juvenile fish and crustaceans (commensalism).



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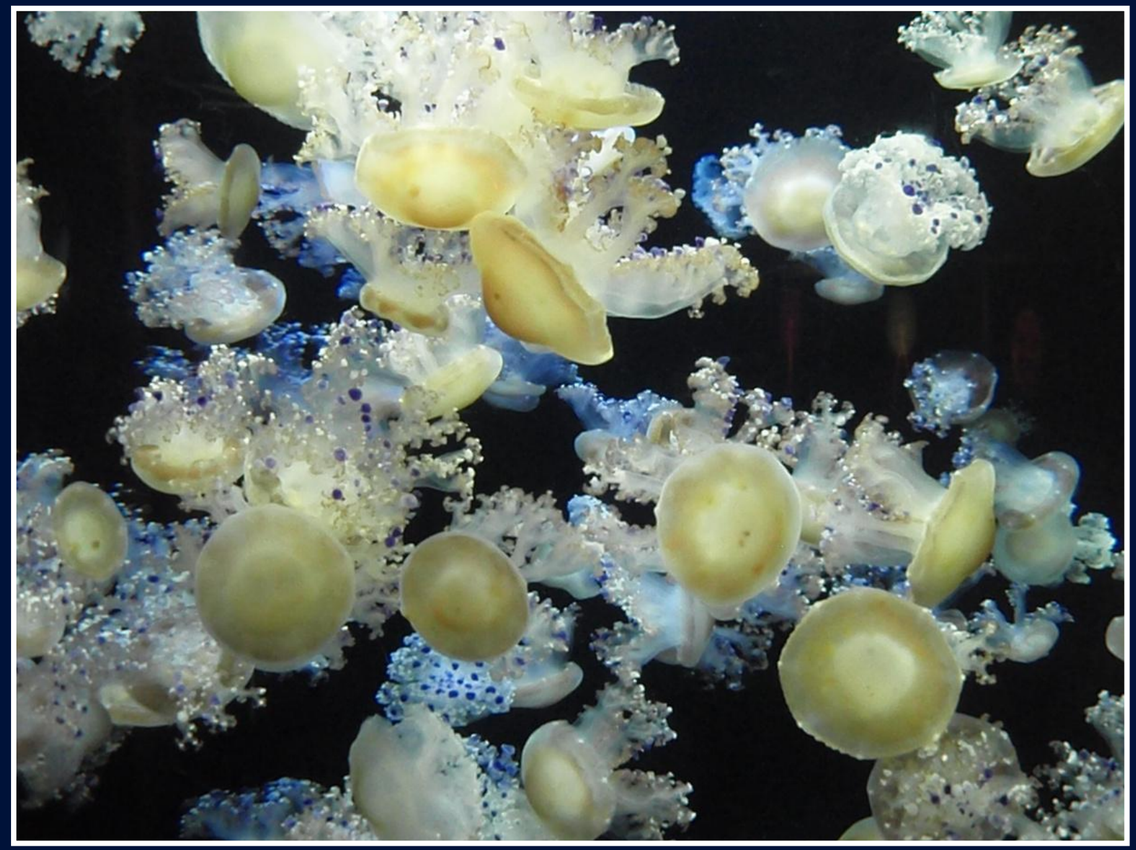
Environmental Indicators

- Sensitive to temperature, salinity, and nutrient levels.
- Shifts in jellyfish abundance may indicate changing ocean conditions.



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Jellyfish Blooms and Human Impact

- Overfishing of predators (e.g., sea turtles, tuna).
- Eutrophication: nutrient runoff → plankton boom → more jellyfish food.
- Climate change: warmer waters favor jellyfish reproduction.

Impacts of Blooms

- Clogging power plant intakes.
- Disrupting fisheries and tourism.
- Competing with fish larvae for food.

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Conservation and Research

- Monitoring blooms and tracking populations with satellites and citizen science.
- Exploring jellyfish uses in medical research and biotechnology.

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