BIOLUMINESCENCE

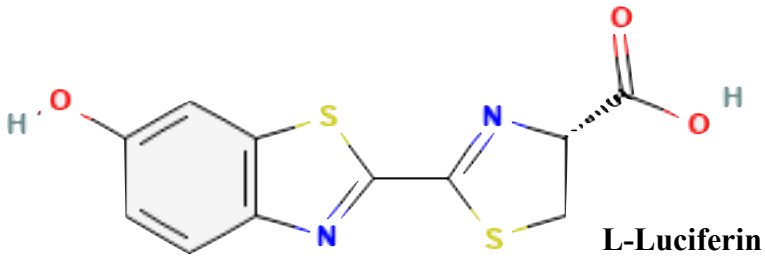
DEFINITION: Bioluminescence in fish refers to the ability of certain fish species to produce and emit light through biochemical reactions occurring within their bodies. This adaptation is particularly common in deep-sea fish, where sunlight does not penetrate, and bioluminescence serves various ecological functions.

Mechanism : Bioluminescence in fish is typically produced through a chemical reaction involving:
A. **Luciferin**: A light-emitting molecule. An indole derivative consisting of tryptamine, arginine and isoleucine.
B. **Luciferase**: An enzyme that catalyzes the oxidation of luciferin.
C. **Oxygen**: Required for the reaction to occur.
When luciferin reacts with oxygen in the presence of luciferase, energy is released in the form of light (blue or blue-green in fishes). Some fish produce their own luciferin and luciferase, while others acquire these chemicals through their diet or host symbiotic bacteria that produce light.

The biochemical process causing production of light: The **luciferin reaction** is the fundamental biochemical process responsible for bioluminescence in organisms, including fish, jellyfish, and fireflies.

This reaction involves the oxidation of a light-emitting molecule called **luciferin**, catalyzed by an enzyme called **luciferase**.

Luciferin + Luciferase ——> Oxyluciferin (emits light)



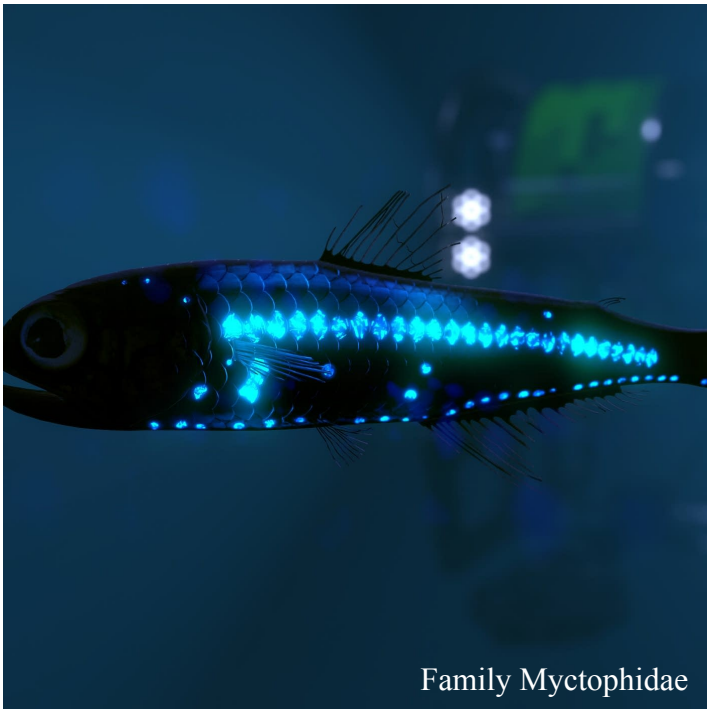
L-Luciferin

Types of Bioluminscence:
1. Results from the presence of luminous bacteria living in fishes in a symbiotic manner (**Photobacterium**).
2. Arises from self-luminous cells on the fishes (**photophores**)- specialised gland cells of the epidermis. Under nervous control

BIOLUMINESCENCE IN FISH

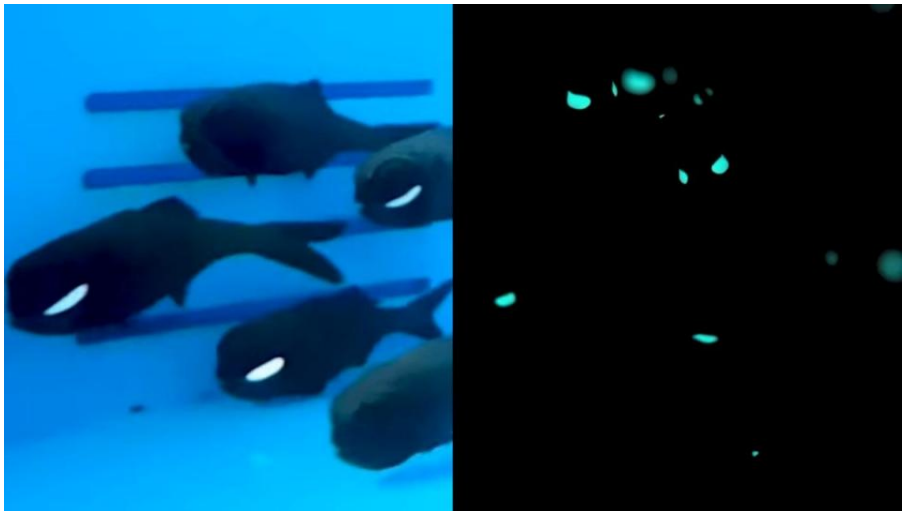
1. **Anglerfish** (order Lophiiformes): Known for their bioluminescent lures used to attract prey.

2. **Lanternfish** (family Myctophidae): Have light-producing organs (photophores) along their bodies for communication and camouflage.



3. **Viperfish** (genus Chauliodus): Use bioluminescence to attract prey and communicate.

4. **Flashlight Fish** (family Anomalopidae): Have bioluminescent organs under their eyes, which they can "turn on and off" using a shutter-like mechanism.



5. **Dragonfish** (family Stomiidae): Use red bioluminescence, which is invisible to most deep-sea creatures, to hunt v

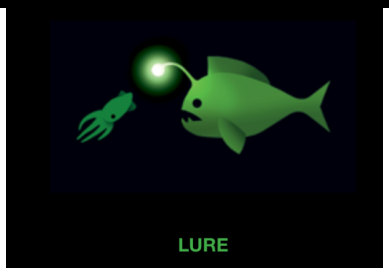
SIGNIFICANCE OF BIOLUMINESCENCE

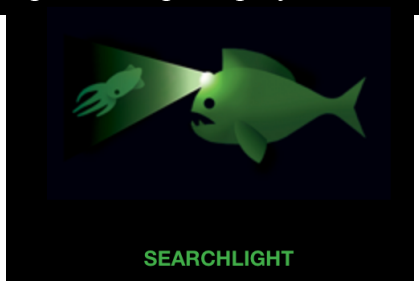
Bioluminescence serves several critical functions in fish, particularly in the deep sea, where light is scarce:

a. **Predation**:

Luring Prey: Some fish use bioluminescent lures to attract prey. For example, the anglerfish has a bioluminescent esca (a fleshy growth) on its head that acts as a fishing lure.

Illuminating Prey: Bioluminescence can help fish spot and capture prey in the dark.



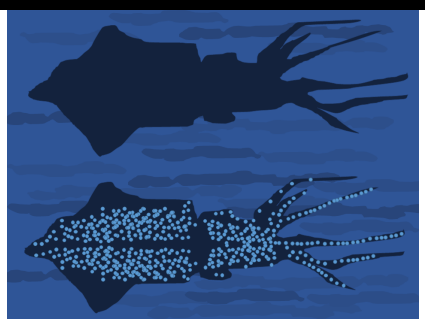


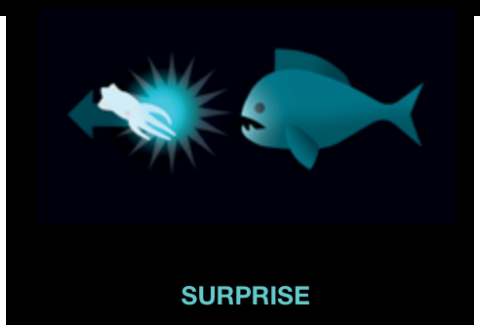
b. **Defense**:

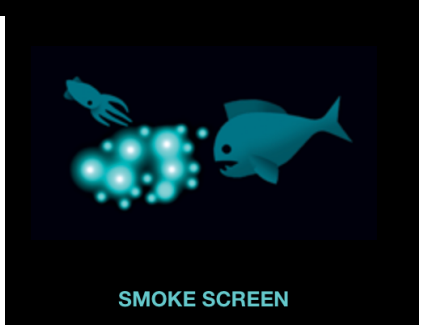
Counter-Illumination: Some fish use bioluminescence to camouflage themselves by matching the light coming from above, making them less visible to predators below.

Startling Predators: Sudden bursts of light can startle or confuse predators, allowing the fish to escape.

Smoke Screen: Some species release bioluminescent mucus or fluids to create a glowing cloud, distracting predators.







c. **Communication**:

Species Recognition: Bioluminescent patterns can help fish identify members of their own species, which is important for mating and social behavior.

Mating Signals: Some fish use bioluminescent displays to attract mates or signal readiness to reproduce.

c. **Camouflage**:

Ventral Bioluminescence: Some fish have light-producing organs on their undersides to blend in with the faint light from the surface, making them less visible to predators below.