ALGAL BLOOM AND SEA LION AGGRESSION: ENVIRONMENT

NEWS: Neurotoxin released by algal bloom off Californian coast is making Sea Lions aggressive — here's why climate change is to be blamed

WHAT'S IN THE NEWS?

A harmful algal bloom off California's coast has triggered aggressive behavior in sea lions due to domoic acid toxicity, highlighting the ecological and health risks of such blooms. Rising global temperatures, nutrient pollution, and altered water conditions are increasing the frequency and severity of harmful algal blooms.

Context: California Algal Bloom and Sea Lion Aggression

- A massive algal bloom off the **coast of California** has caused **sea lions to exhibit unprecedented aggression** toward humans.
- The aggression is linked to exposure to a **marine neurotoxin called domoic acid**, secreted by the **Pseudo-nitzschia algae**.
- This toxin disrupts the brain functions of marine animals, leading to **neurological symptoms like confusion, seizures, and erratic behavior**.

What Are Algal Blooms?

- **Algae** are microscopic, plant-like organisms that live in **saltwater, freshwater, and brackish ecosystems**, using **photosynthesis** to generate energy.
- **Algal blooms** occur when algae grow rapidly and accumulate in dense quantities, often discoloring the water surface in hues of **green, blue-green, red, or brown**.
- Certain types of algae can produce **toxins**, turning the blooms into **Harmful Algal Blooms (HABs)** that pose risks to marine ecosystems and human health.

What Is a Harmful Algal Bloom (HAB)?

- A **HAB** is an algal bloom where **toxin-producing species** multiply excessively, affecting **water quality, aquatic life, and public health**.
- These blooms are often visible and can be **triggered by natural conditions or human activities**, such as pollution or climate change.
- They are also known as **"red tides"**, though not all red tides are harmful and not all HABs are red.

Causes of Algal Blooms

- **Environmental Factors**:
    - Algal growth is stimulated by **warmer water temperatures**, **high light intensity**, **altered salinity**, and **pH changes**.
    - These conditions are often present during **summer months** or in stagnant water bodies.
- **Nutrient Overload**:
    - Agricultural runoff containing **fertilizers, animal waste, and sewage** introduces excessive nutrients (especially nitrogen and phosphorus) into water bodies.
    - These nutrients fuel **rapid algal multiplication**, overwhelming natural ecological controls.
- **Climate Change**:
    - **Rising global temperatures** enhance the growth window for algae.
    - **Changing ocean currents**, **rainfall patterns**, and **extreme weather events** also redistribute nutrients and affect algal dispersion.
    - HABs have become more **frequent, intense, and long-lasting** due to climate variability.

Types of Harmful Algae and Their Impacts

- Different algae cause distinct types of HABs based on their environment, color, and toxin profile:

Organism	Water Type	Bloom Color	Toxin Produced	Human/Animal Health Effects
Alexandrium sp.	Saltwater	Red or brown	Saxitoxins	Gastrointestinal issues, muscle weakness, paralysis (paralytic shellfish poisoning)
Cyanobacteria	Freshwater	Blue-green	Cylindrospermopsin	Nausea, vomiting, liver damage, diarrhea
Gambierdiscus	Saltwater	Orange	Ciguatoxins	Stomach pain, nausea, neurotoxicity (Ciguatera fish poisoning)
Karenia brevis	Saltwater	Red	Brevetoxins	Respiratory distress, muscle cramps, seizures
Pseudo-nitzschia	Saltwater	Red or brown	Domoic acid	Vomiting, memory loss, confusion, seizures (amnesic shellfish poisoning)
Microcystis	Freshwater	Blue-	Microcystin	Liver damage, skin irritation,

Organism	Water Type	Bloom Color	Toxin Produced	Human/Animal Health Effects
		green		gastrointestinal illness

Ecological Impact of Algal Blooms

- **Oxygen Depletion (Hypoxia)**:
    - Decomposing algal biomass consumes dissolved oxygen in water, creating **dead zones** where aquatic life cannot survive.
    - This leads to **mass fish kills** and disrupts aquatic biodiversity.
- **Light Obstruction**:
    - Dense algal mats block **sunlight penetration**, reducing photosynthesis in **underwater aquatic plants**, leading to ecosystem collapse.
- **Marine Animal Deaths**:
    - Toxins from algae affect **fish, shellfish, dolphins, sea turtles, and sea lions**, causing illness, disorientation, or death.
    - Some species bioaccumulate these toxins, which then affect **predators higher in the food chain**.
- **Food Chain Disruption**:
    - Toxins pass through trophic levels—from plankton to fish to marine mammals and birds—causing **cascade effects** in marine ecosystems.

Human Health Impact of Harmful Algal Blooms

- **Toxin Exposure Pathways**:
    - Humans are exposed through **contaminated seafood**, **contact with toxic water**, or **inhalation of aerosols** near blooms.
- **Common Health Symptoms**:
    - Include **nausea, diarrhea, vomiting, memory loss, breathing issues**, and in severe cases, **seizures and paralysis**.
- **At-Risk Populations**:
    - Vulnerable groups such as **children, the elderly, and immunocompromised individuals** face higher risks.
    - Communities **dependent on seafood** are more exposed to chronic poisoning and economic hardship.

- **Economic Consequences**:
    - **Fisheries, aquaculture**, and **recreational tourism** suffer due to **waterway closures and health advisories**.
    - HABs can cause **millions in revenue losses**, particularly in coastal economies.

Conclusion

- The recent event in California reflects the growing **global threat of harmful algal blooms**, both to marine life and public health.
- Increasing incidents of HABs underscore the urgent need for **nutrient management, pollution control**, and **climate adaptation strategies**.
- Countries must enhance **marine ecosystem monitoring**, regulate **agricultural runoff**, and promote **community awareness** to mitigate HAB risks.

Source: **https://www.downtoearth.org.in/climate-change/neurotoxin-released-by-algal-bloom-off-californian-coast-is-making-sea-lions-aggressive-heres-why-climate-change-is-to-be-blamed**