

RED TIDE

INTRODUCTION

- Red tide is a phenomenon caused by microscopic algae blooms, during which algae become so numerous that they discolour coastal waters (hence the name “red tide”).
- Red tides are not necessarily red and many have no discolouration at all.
- They are unrelated to movements of the tides.
- Red tide is a common name for a phenomenon more correctly known as an algal bloom.

- Not all red tides produce toxins.
- When contaminated or toxin laden fish are consumed by humans it causes serious health problems such as paralysis, diarrhea, amnesia etc. after which the toxic episodes are known.
- There are approximately 4,000 species of microscopic algae in the oceans with about 300 of these being identified with periodic explosions of growth or blooms.
- These single species blooms are what discolour the water surface changing it to colours of red, brown, yellow, purple, green or white depending on the species of algae.
- When these have properties that are considered harmful to humans and other life, they called “Harmful Algal Blooms”.

RED TIDES AND TOXINS

- Dinoflagellates are usually regarded as the causative organisms, but not all red tides are caused by dinoflagellates and not all dinoflagellates cause red tides.
- Furthermore, not all red-tide forming algae are toxic. Even the colour factor is variable: so-called 'red tides' may be brown, yellow, green, etc.
- Surface waters of these blooms usually have 1-20 million cells per litre and some are associated with the production of toxins, resulting in fish kills and mortality of other marine organisms.

Toxic blooms of dinoflagellates fall into three categories:

- (1) blooms that kill fish but few invertebrates;
 - (2) blooms that kill primarily invertebrates;
 - (3) blooms that kill few marine organisms,
- The toxins are concentrated within the siphons, digestive glands, or mantle cavities of filter-feeding bivalve mollusc such as clams, oysters, and scallops, causing paralytic shellfish poisoning.
 - The most notorious PSP-causing dinoflagellate on the Pacific coast of north America is *Gonyaulax catenella*, which produces a neurotoxin called saxitoxin that is 100,000 times more potent than cocaine.

- Saxitoxin acts to prevent normal transmission across neuromuscular synapses by interfering with the movement of sodium ions through excitable membranes.
- Mussels may become too toxic for human consumption when concentrations of *Gonyaulax catenella* reach only 100-200 cells per millilitre, but concentrations of 23-30,000 cells per litre will be necessary before a bloom is apparent to the unaided eye.
- Normally, the toxicity in the mussels disappears within 2-3 weeks after a bloom, but much longer retention times have been found.

CAUSES OF ALGAL BLOOMS

- In some places there appears to be a strong correlation between the occurrence of upwelling (nutrient-rich waters that comes from deep water) and such blooms.
- Heavy rainfall on the land, the runoff washing phosphates into the sea and also lowering the salinity, which favour dinoflagellates growth.
- It is also thought that Vitamin B₁₂, which is required by most dinoflagellates, may also be washed into the sea from the soil and salt-marsh areas.
- Humic substances have also been suggested as possible causative agents

- Red tides are caused by increase in nutrients that algae need, usually due to farm runoff, causing an overpopulation.
- The frequency and severity of algal blooms in some parts of the world have been linked to increased nutrient loading from human activities.
- In other areas, algal blooms are a seasonal occurrence resulting from coastal upwelling, a natural result of the movement of certain ocean currents.

- Coastal water pollution produced by humans and systematic increase in sea water temperature have also been implicated as contributing factors in red tides.
- Some algal blooms on the Pacific coast have also been linked to occurrences of large-scale climatic oscillations such as El Niño events.
- **Countries affected by these algal bloom events include:** Argentina, Australia, Brazil, Canada, Chile, Denmark, England, France, Guatemala, Hong Kong, India, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, New Guinea, Peru, the Philippines, Romania, Russia, Scotland, Spain, Sweden, Thailand, the United States, and Venezuela.

IMPACTS

- Some toxic species can cause a variety of human ailments, contracted either through inhaling airborne toxins, skin contact or, more commonly, eating contaminated shellfish.
- These toxins may cause amnesia, stomach cramps, nausea, memory loss, paralysis and even death.
- Other species can cause physical damage, as the blooms of species which contain barbs that lodge among gill tissues of fish, causing death.
- Such blooms can cause a great deal of financial damage by killing farmed fish, which are grown in crowded aquaculture pens.
- HABs can cause substantial economic losses to coastal communities through loss of tourism and impact on commercial fishing.