Harmful algal blooms

Both saltwater and freshwater wetlands

Wildlife ✓
Livestock ✓
Human ✓

Synonyms: Cyanobacterial blooms, exceptional algal blooms, HABs, micro-algal blooms, phycotoxins, phytoplankton blooms, red tide toxicosis, red tides, toxic algae

KEY FACTS

What are harmful algal blooms (HABs)?

Blooms of toxin-producing algae which may kill fish, shellfish, other wildlife and livestock and cause illness and sometimes death in humans. High biomass harmful algal blooms (HABs) cause harmful effects when they occur in high concentrations, and cause discolouration of the water *e.g.* 'red tides'. Low biomass HABs cause harm when they occur in low concentrations and do not necessarily cause discolouration of the water, which can appear clear.

Causal agent

Toxin-producing species of algae, including: *Alexandrium fundyense*, *Dinophysis spp*, *Gambierdiscus toxicus, Gymnodinium catenatum, Karenia brevis, Karenia brevisulcatum, Karlodinium veneficum, Lyngbya, Pfiesteria piscicda, Pfiesteria, Prorocentrum lima, Protoperidinium crassipes, Pseudo-nitzchia and Pyrodinium bahamense* var. *compressum*

Species affected

Many aquatic species, marine and terrestrial mammals, birds and humans.

Geographic distribution

Occurs worldwide.

Environment

Occur in both saltwater and freshwater environments, particularly where there are high nutrient levels (in particular high levels of nitrogen and phosphorus) but can also occur frequently in low nutrient environments.

TRANSMISSION AND SPREAD

How are algal blooms caused?

Algal blooms are a natural phenomenon, however, they occur more commonly when offshore algal populations are transported to inshore regions or following agricultural run-off and other pollution events of freshwater and marine wetlands. These events can cause increased nutrient loading of phosphorous and nitrogen which then encourages the growth of algae, including toxin-producing algae in the case of HABs.

How do algal blooms cause harm?

- Production of toxins. Toxins may kill fish or shellfish directly, or may cause human illnesses following consumption of contaminated seafood. Livestock may drink contaminated water or lick themselves after bodily exposure and become ill.
- Mechanical damage to aquatic life such as blocking gills of fish.
- Affecting water quality by causing oxygen depletion from respiration and bacterial degradation, and blocking of sunlight.

IDENTIFICATION AND RESPONSE

Field signs

Sudden mortality of a broad range of taxa *e.g.* birds, amphibians, fish and/or marine mammals. This may appear in conjunction with occurrence of a marine reddish/orange tide or freshwater bloom (which initially appear green and may later turn blue sometimes forming a scum/foam in the water). Signs such as irritation of the skin, vomiting, paralysis, lethargy and loss of muscle co-ordination may be observed in birds. Birds and domestic

mammals that ingest toxic blooms of *Microcystis* may develop necrotic lesions and haemorrhages in the liver. Not all toxic algal blooms are visibly noticeable and so a sample of organisms from the bloom may be useful or necessary for diagnosis.

Recommended action if suspected

Contact and seek assistance from animal and human health professionals immediately if there is any illness in birds, fish, marine mammals and/or people. Report suspected cases to local or national authorities.

Diagnosis

Confirmative diagnosis is difficult and relies on circumstantial evidence and supportive clinical and pathologic findings. There are also currently no established toxic thresholds for wildlife species and even when these exist it may be difficult to assess their significance.

Collection of algal samples may be necessary for diagnosis. Collect samples during the die-off event as soon as possible after carcases are found. Contact a diagnostic laboratory for advice on appropriate sample collection and transport.

PREVENTION AND CONTROL IN WETLANDS

Overall

Reduce the release of nutrients into waterways

- Use vegetated buffer zones. Plants such as reeds and willow, and constructed treatment wetland systems can remove sediments and pollutants especially in places which release high volumes of nutrients, such as animal and human sewage outlets.
- Reduce the use of fertilisers.
- Improve animal waste control.
- Improve sewage treatment.

Note that control methods remain largely untested on major blooms.

Monitoring and surveillance

Careful monitoring and early detection of potentially toxic algal blooms could allow time to initiate actions to prevent or reduce harmful effects *e.g.* bird mortality.

- Monitor for changes in nutrient load of water discharges, particularly sewage discharges (including septic tanks and cesspits) and agriculture.
- Patrol to observe and map discoloured water or dead fish for early detection of potentially toxic algal blooms.

Livestock

Keep livestock from drinking/bathing in lakes with blooms.

Wildlife

If possible, try to reduce access to contaminated areas *e.g.* using streamers and flags to dissuade birds from using an affected wetland and consider moving endangered species to safe areas with no HABs.

Humans

- Do not fish in an algal bloom/discoloured water and never eat fish which are dead when caught.
- Be aware of intoxication symptoms when eating shellfish and fish. If symptoms are experienced, keep sample of the food for toxicity tests.
- When swimming, look for warnings of algal blooms and avoid swimming if you cannot see your feet when the water level is at your knees.
- Wear rubber/latex gloves when handling carcases associated with HABs.

IMPORTANCE

Effect on wildlife

May cause mass mortality of aquatic species (including turtles and marine mammals such as manatees and dolphins), especially fish and shellfish, and accounts for more than half of unusual marine mortality events. Ingestion of toxin may not cause mortality but have other less obvious physiological effects such as affecting immune, neurological and reproductive capability.

Effect on livestock

Mostly not harmful unless ingested through eating contaminated seafood/fish, drinking contaminated water or licking their coats following exposure to the skin.

Effect on humans

Mostly not harmful unless ingested through eating contaminated seafood/fish or drinking contaminated water. Some organisms irritate the skin and others release toxic compounds into the water and, if aerosolised by wave action, these compounds may cause problems when inhaled.

Economic importance

May have significant economic impacts on freshwater and marine aquaculture industries, fisheries and coastal tourism.

FURTHER INFORMATION

Useful publications and websites

- Asia Pacific Economic Program, Singapore, and Intergovernmental Oceanographic Commission. Technical Series No. 59, (2001). **Monitoring and management strategies for harmful algal blooms in coastal waters**. www.whoi.edu/fileserver.do?id=24193&pt=10&p=19155. [Accessed March 2012].
- Friend, M. & Franson, J.C. (2001). **Algal toxins**. In: Field manual of wildlife diseases: general field procedures and diseases of birds. E. A. Ciganovich (ed.). pp. 263-266. U.S. Department of the Interior and U.S. Geological Survey, Washington, DC. www.nwhc.usgs.gov/publications/field_manual/chapter_36.pdf [Accessed March 2012].
- NOAA Coastal Ocean Program Decision Analysis Series No. 10. **Harmful algal blooms in coastal waters: options for prevention, control, and mitigation**. (1997). www.cop.noaa.gov/pubs/das/das10.pdf [Accessed March 2012].
- Intergovernmental Oceanographic Commission (IOC) of UNESCO: Harmful Algal Bloom Programme ioc-unesco.org/hab/ [Accessed March 2012]
- Wildpro. **Blue-green algae toxicity in waterfowl**. http://wildpro.twycrosszoo.org/S/00dis/toxic/Biotoxin/Blue-Green_Algae_Toxicity.htm [Accessed March 2012].

Contacts

- **IOC Science and Communication Centre on Harmful Algae**. University of Copenhagen, Øster Farimagsgade 2D, 1353 Copenhagen K, Denmark. hab.ioc@unesco.org ☎ Tel: +45 33134446, Fax: +45 33134447.
- **IOC-IEO Science and Communication Centre on Harmful Algae**. Instituto Español de Oceanografía, Centro Oceanografico de Vigo, Cabo Estay-Canido, 36390 Vigo, Spain. vigohab@vi.ieo.es ☎ Tel: +34 986492111 ; Fax: +34 986492003.
- **Regional HAB networks:**
  - IOC FANSA: an IOC regional working group and network on harmful algal blooms in South America. www.ioc-unesco.org/hab/index.php?option=com_oe&task=viewDoclistRecord&doclistID=60 [Accessed March 2012].
  - IOC ANCA: the regional working group and network on harmful algae in the Caribbean. www.ioc-unesco.org/hab/index.php?option=com_oe&task=viewDoclistRecord&doclistID=61 [Accessed March 2012].

- IOC HANA – An IOC working group and network on harmful algae in North Africa (HANA). This list contains HANA working documents and HAB profiles of North African countries participating in HANA. www.ioc-unesco.org/hab/index.php?option=com_oe&task=viewDoclistRecord&doclistID=63 [Accessed March 2012].
- EUROHAB - The European Commission cluster of HAB research projects: cordis.europa.eu/eesd/ka3/cluster5.htm [Accessed March 2012].
- HARRNESS – US national plan for algal toxins and harmful algal blooms. www.esa.org/HARRNESS [Accessed March 2012].
- ECOHAB – US National Research Agenda on the Ecology and Oceanography of Harmful Algal Blooms. http://www.whoi.edu/science/B/redtide/nationplan/ECOHAB/ECOHABhtml.html
- IOC Western Pacific Network – WESTPAC/HAB (IOC Sub-Commission for the Western Pacific / Harmful Algal Blooms). www.ioc-unesco.org/hab/index.php?option=com_content&task=view&id=20&Itemid=0
- IOC-ICES Northern Atlantic network - WGHABD (ICES-IOC Working Group on Harmful Algal Bloom Dynamics). www.ioc-unesco.org/hab/index.php?option=com_content&task=view&id=11&Itemid=0
- CEOHAB - Chinese Ecology and Oceanography of Harmful Algal Blooms Programme. www.china-hab.cn/english

Samples whereby species are difficult to identify or species that requires special techniques can be sent to: www.ioc-unesco.org/hab/index.php?option=com_content&task=view&id=15&Itemid=0