



CARIBBEAN CURRENTS

Volume 6, Number 2
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Welcome...

...to **CARIBBEAN CURRENTS**, Volume Six, Number Two. This newsletter is edited by INFOTERRA/USA in its capacity as the Regional Service Centre (RSC) for INFOTERRA National Focal Points (NFPs) in the English and French-speaking Caribbean. Although the *CURRENTS* is assembled at INFOTERRA/USA, the content belongs to you, the readers. You are encouraged to send in any questions, comments, problems, or interesting issues relevant to the Region for inclusion in the *CURRENTS*. Please see the Guidelines for Contributions on page 5 for more information.

Each issue will feature a Directory of NFPs in the Region so that anyone with international environmental questions can contact their nearest resource. Please feel free to contact one another as well as your RSC for assistance or materials.

Please don't hesitate to share *CARIBBEAN CURRENTS* with your friends and colleagues, and to make copies as needed. The Currents should serve as an informational forum for anyone who lives, works, or is involved in environmental issues in the English and French-speaking Caribbean Region.

Algae Blooms

This issue's topic is algae blooms. An algae bloom is a sudden increase in the growth of phytoplankton causing them to accumulate into thick, visible patches near the surface of the water. While these blooms are usually not harmful, some algal species produce neurotoxins which kill zooplankton, fish, marine mammals and even humans.

The next issue of **CARIBBEAN CURRENTS** will look at recycling. Recycling is the use of materials, which would otherwise be discarded, to make new products. It helps conserve raw materials, reduce landfill waste, and decrease hazardous waste in the waste stream.

If you have any comments on this topic, or would like to contribute a short article or have a resources guide to share, please submit your contribution following the guidelines on page 5, as we would like to include it in the next or a future issue of *CURRENTS*. Please feel free to fax, write to, or call the RSC with any questions or comments you have. Thank you for your assistance.

Harmful Algal Blooms

By John Heisler - U.S. EPA Office of Water

Coastal waters worldwide have experienced a dramatic increase in harmful algal blooms (HAB) over a period that spans several decades. The blooms are considered harmful because they can be toxic to marine life and humans, or they can occur as non-toxic forms that cause extensive environmental change, and significant economic losses to coastal communities (Anderson *et al.*, 1993; Boesch *et al.*, 1997; Burkholder, 1998). Some may find it unbelievable that a microscopic organism (so small that thousands would fit comfortably in a single drop of water) could be responsible for the deaths of billions of fish and shellfish, but that is precisely what has happened. Although the organisms are microscopic, when they reproduce in large numbers, they become so concentrated that they can change the color of the water, such as in a red tide. Recently, there have been numerous press accounts of the harmful effects of HAB. This isn't a new problem -- there are recorded instances of HABs from thousands of years ago; however, over the past few decades, the instances have spread to virtually every coastline (Burkholder, 1998).

Many of the algae that cause harmful blooms get their energy from the sun, just like a plant, but where plants need millions of cells to make up a single organism, the algae are entire organisms made up of a single cell. When the algae "grow" they reproduce by the millions, so a bloom is made up of millions of individuals. Some form non-toxic blooms, but they can still cause problems. When algae reproduce to such high numbers that the cells growing at the top of the bloom, near the surface of the water, prevent sunlight from penetrating to the algae growing beneath them, the cells in the deep water die. As the dead algae decompose, the decomposition process removes dissolved oxygen from the water. Fish and shellfish need dissolved oxygen in the water to breathe, so when algae blooms result in low oxygen (hypoxia) or no-oxygen (anoxia) conditions, there are frequently fish kills and shellfish die-offs as a result.

Other harmful algae blooms produce toxins which can actually kill fish, shellfish, other marine organisms (including marine mammals and birds), and cause serious human health problems. These blooms may discolor large expanses of water, such as in a toxic red tide. But toxic blooms can be colorless -- as with the complex of *Pfiesteria* organisms. A toxic bloom may also occur in low concentrations, but still result in fish kills and human health effects, including death in some instances. A toxic bloom may come and go quickly, or it may persist over long periods (a red tide in the Gulf of Mexico lasted several months).

The Caribbean is primarily susceptible to toxic algae species that cause ciguatera fish poisoning (CFP). In the Virgin Islands, nearly 50% of the adult human population are estimated to have been poisoned by CFP at least once. Algae in the group known as dinoflagellates, specifically, *Gambierdiscus toxicus*, grow on the surfaces of large, red and brown plant-like macroalgae (seaweed). The dinoflagellates produce chemicals that are transformed into ciguatoxin when the larger algae are grazed by small, herbivorous fish, who then are eaten by larger, predatory fish. As the predatory fish consume more and more of the algae-eating fish, they concentrate the toxin in their tissues. These fish are then eaten by humans, who are subsequently poisoned. Humans are first affected by CFP with gastrointestinal symptoms, then, neurologic problems set in which may persist for a short period (weeks), or they may become chronic problems that persist for years. CFP also occurs in the Pacific, but there the symptoms of the disease do not appear to include gastrointestinal problems (Anderson, 1995).

The human health concerns and living resource losses bring to mind an obvious question: what can be done to prevent these blooms? Recall that many of these organisms act like single-celled plants; also recall how plants respond to nutrient fertilizer -- they grow. The microscopic algae that cause HAB events also grow when they're provided nutrients. Over the past several decades, runoff from agricultural and residential sources have significantly increased the level of nutrients in coastal waters. Many of these nutrients originate far upstream in the watershed, and flow downstream to the coast. There is a growing body of evidence that suggests that this increase in coastal nutrient pollution is related to the increased frequency of HAB events.

The Federal government is coordinating among the relevant agencies to address these complex issues -- nutrient pollution and the increase in HAB. EPA and NOAA are among the agencies involved in funding research that addresses the causes of these harmful blooms. The research topics include the basic biology of the organisms, their ecology, and the relationship between nutrients and HAB events. EPA and USDA are among the agencies taking steps to help farmers and others control their releases of nutrients. But everyone can participate -- by reducing the amount of fertilizer applied to lawns or gardens, and managing manure from farm animals.

Literature Cited

Anderson, D.M. (ed). 1995. ECOHAB, The Ecology and Oceanography of Harmful Algal Blooms: A National Research Agenda. Woods Hole Oceanographic Institution, Woods Hole, MA. 66pp.

Anderson, D.M., S.B. Galloway and J.D. Joseph 1993. Marine Biotoxins and Harmful Algae: A National Plan. Woods Hole Oceanographic Institution Technical Report WHOI-93-02, NMFS and NOAA COP, Woods Hole, MA. 44pp.

Boesch, D.F., D.M. Anderson, R.A. Horner, S.E. Shumway, P.A. Testor and T.E. Whitledge. 1997. Harmful Algae Blooms in Coastal Waters: Options for Prevention, Control and Mitigation. NOAA Coastal Ocean Program Decision Analysis Series No. 10. NOAA Coastal Ocean Office, Silver Spring, MD. 46pp + appendix.

Burkholder, J.M. 1998. Implications of Harmful Microalgae and Heterotrophic Dinoflagellates in Management of Sustainable Marine Fisheries. Ecological Applications. vol. 8 (1). Supplement. p.S37-S62.



INTERNET SITES ON OCEANS

A few of many sources of electronic information on oceans.

Harmful Algae Page

<http://www.redtide.whoiledu/hab>

This site provides facts about harmful algal blooms, their effects and harmful algae bloom events in the news.

Ocean Information Resources on the World Wide Web

[http:// www.lehigh.edu/~injrl/subindex/oceans.html](http://www.lehigh.edu/~injrl/subindex/oceans.html)

This site provides links to ocean-related sites.

World of Algae

<http://www.botany.uwc.ac.za/algae/>

This page provides biological information on algae and links to relevant pages..

Dinoflagellates

<http://www.bio.metu.edu.tr/~e068685/proj.html>

This site provides general information about algae, references to literature about algae and specific information on the dinoflagellate species.

US Environmental Protection Agency Year of the Ocean Web Page

<http://www.epa.gov/OWOW/oceans/yoto>

This site provides links to conference information , ocean publications, and EPA water monitoring information.

The Laboratory of Phycotoxins and Harmful Marine Substances

<http://www.ifremer.fr/delpn/phycotoa.htm>

This site describes research projects being conducted at the University of Nantes and provides a list of publications by the lab.

OceanLink Marine Science Homepage

<http://oceanlink.island.net>

This site features contributions from several Canadian marine education organizations presenting information on marine biology, oceanography and pollution.

Ocean98--Conferences

<http://www.ocean98.org/conf1.htm>

This site provides information on and links to ocean-related conferences in 1998.

Conferences on Current Ocean Research



May 25-29, 1998 -- *Education and Training in Integrated Coastal Area Management: The Mediterranean Prospect*, Genoa, Italy. You may contact 1998 Conference Secretariat, International Centre for Coastal and Ocean Policy Studies c/o University of Genoa, Department POLIS, Stradone di S. Agostino 37 16123 Genoa, Italy or Telephone 39 (10) 209-5840, E-mail: iccops@polis.unige.it.

June 1-4, 1998 -- *Coastal and Marginal Seas*, Paris, France. You may visit the Oceanography Society web site at <http://www.tos.org/paris1998.html>

August 30-September 3, 1998 -- *Third International Symposium on Aquatic Animal Health*, Baltimore, Maryland. You may contact the Symposium Office at telephone: (410) 955-3273, Fax: (410) 502-5068 or E-mail: wellfish@welchlink.jhu.edu.

NEW MULTILINGUAL THESAURUS OF ENVIRONMENTAL TERMS NOW AVAILABLE

The new Envoc/INFOTERRA Multilingual Thesaurus of Environmental Terms is now available. It has been revised to reflect emerging environmental concerns and new technologies. The thesaurus is available in Arabic, Chinese, English, French, Russian and Spanish. For more information, contact:

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Guidelines for Contributions to *CARIBBEAN CURRENTS*

Any organization or individual operating or involved in the English and French-speaking Caribbean Region is welcome to contribute to the newsletter. Contributions should be addressed to:

Caribbean Currents Coordinator
INFOTERRA/USA
U.S. Environmental Protection Agency
Headquarters Library, 3404
401 M Street, S.W.
Washington, D.C. 20460
UNITED STATES

Telephone: (202) 260-5917; Fax: (202) 260-3923; E-mail: library-infoterra@epamail.epa.gov

Please note that submissions should meet the following criteria:

- They should be relevant to environmental issues
- They must be of interest to or directly involve the Region
- They must not endorse or recommend any product or commercial service, explicitly or implicitly
- They must be brief--under 250 words; Bulletin Board requests should be under 100 words
- They must be received by the posted deadline (see below)

Please feel free to contact the *CARIBBEAN CURRENTS* coordinator if you are interested in submitting a longer article. You should contact the coordinator to discuss your topic and any size or content restrictions beforehand. Be aware that once your article is submitted, it is subject to editing as needed. Final decisions on editing and inclusion of any contributions are left to the INFOTERRA/USA Manager. Please contact INFOTERRA/USA using the address above to contribute any comments, questions, problems, or ideas.

DEADLINE FOR CONTRIBUTIONS TO Vol. 6, No. 3: June 8, 1998

Welcome to The *CARIBBEAN CURRENTS* Bulletin Board

Each issue, we will publish questions or concerns of interest to CURRENTS readers. Anyone who has materials or information that they are seeking or that they feel will be helpful should feel free to contribute. We will post queries and offerings of general interest on the Bulletin Board. You may respond by contacting the reader who has placed the item, or the RSC.

Bulletin Board



DOCUMENTS AVAILABLE

INFOTERRA/USA has free copies of the following publications available.

If you would like copies of any of these documents, please let us know.

- **EPA Office of Wastewater Management Publications Catalog July 1997** (*new edition*)
- **Catalog of Publications: Office of Science and Technology, 1997**, (EPA 820-B97001)
- **A Commitment to Address the Environmental and Development Problems of the Wider Caribbean** (Brochure)

To request copies of these documents, just write to INFOTERRA/USA using the contact information on page 7.



Information Needed on Recycling

The next issue of **Caribbean Currents** will focus on Recycling. We would be interested in receiving any information on projects or studies related to this issue.

These materials will also be kept on file for the benefit of researchers and visitors to INFOTERRA.

Please contact INFOTERRA/USA using the information on page 7 if you can provide any assistance. Thank you for your support!

Send your Bulletins to the RSC for publication in the next issue. See the Guidelines on page 5 for information on submitting items.

About the NFP Directory

This directory reflects changes and additions to the INFOTERRA Directory of National Focal Points distributed by INFOTERRA/PAC, dated January 1997. Please check this information to verify that it is correct and up-to-date. If you have any changes or corrections, please notify the RSC as soon as possible. We will be happy to relay the information to the PAC.

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