

Economic Impacts of Harmful Algal Blooms

Issue

Some harmful algae produce potent toxins which cause illness or death in humans and other organisms, including endangered species. Other harmful algae are non-toxic to humans and wildlife but degrade ecosystems by forming such large blooms that they can adversely affect corals, seagrasses, and organisms living on the sea-bottom. Human health and ecosystem impacts of harmful algal blooms (HABs), and management responses to lessen those impacts, can in turn have significant economic and sociocultural consequences.

Coastal HAB events have been estimated to have economic impacts in the United States of at least \$82 million/year with the majority of impacts in the public health and commercial fisheries sectors (Hoagland and Scatasta 2006). This estimate is conservative due, in part, to a lack of information about individual events, unquantified economic effects of environmental impacts, and a lack of documentation of sociocultural impacts (such as loss of cultural practices and values, increased reliance on social services, decreased recreational opportunities, and shifts in livelihoods). Moreover, unreported illnesses, reductions in property values, lost seafood sales due to unfounded consumer fears (the “halo effect”), and lost revenue from some untapped fisheries are just a few examples of economic effects not accounted for in this estimate. Impacts of a single event on individual economic sectors (e.g. commercial fisheries) can be large (see map on next page), highlighting the likelihood that this estimate is very conservative.

Economic effects of HABs in the U.S. are at least \$82 million/year*

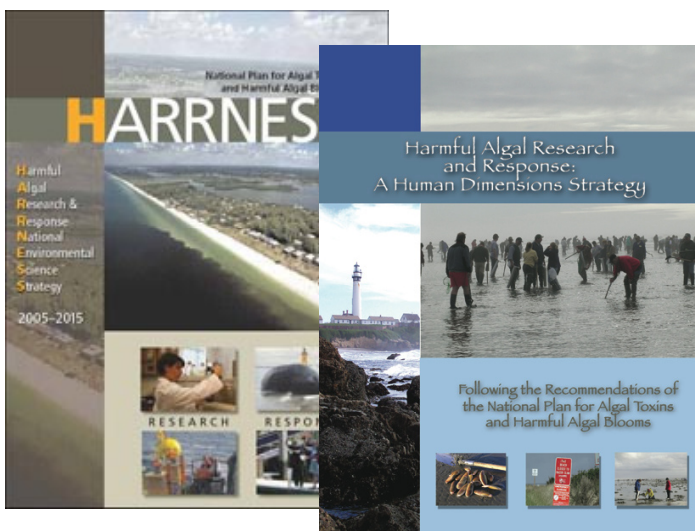
Commercial Fisheries Impacts: **\$38 million/year**

Public Health Costs of Illness: **\$37 million/year**

Recreation and Tourism Impacts: **\$4 million/year**

Coastal Monitoring and Management: **\$3 million/year**

*2005 dollars, Hoagland and Scatasta (2006). Based on subset of outbreaks in 1987-2000.



What is NOAA doing?

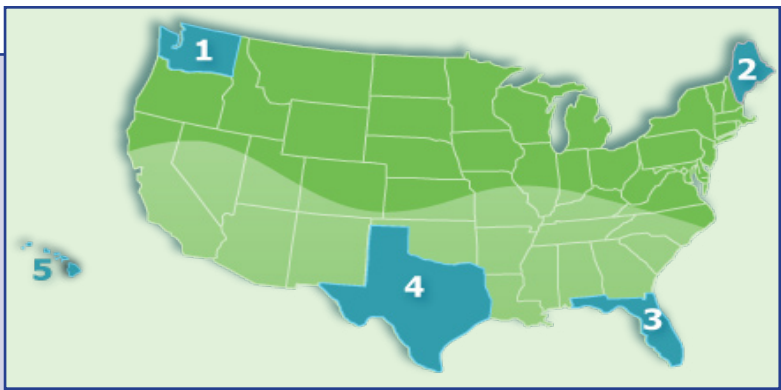
- NOAA, through extramural funding (ECOhab, MERhab, and CSCOR Event Response) and intramural research programs, is working to minimize public health, sociocultural, and economic impacts by improving prediction and monitoring, developing methods of control, and improving public understanding.
- NOAA is also funding research to assess economic impacts at local scales and to assess the costs and benefits of mitigation strategies, which were both identified by HARRNESS and HARR-HD as research needs to improve focus and cost-effectiveness of mitigation strategies.

The HARRNESS and HARR-HD reports, pictured above, identified a need for economic assessments of HAB impacts at local and regional scales and for assessing economic costs and benefits of management strategies.

1**Impacts on commercial, subsistence, and recreational fisheries in the Pacific Northwest:****\$10-12 million in 2002/03**

In 2002-03, high levels of domoic acid in razor clams along the Pacific Coast resulted in a season long closure of the fishery in Washington to protect human consumers from Amnesic Shellfish Poisoning (ASP). In addition, high toxin levels caused the first commercial Dungeness crab fishery closure due to algal toxins since 1991. This event resulted in at least \$10-12 million in lost revenue.

The oyster, Dungeness crab, and razor clam fisheries in Washington are cumulatively valued at \$72 million/year for the local economies and are important for commerce, recreation, and the culture of local tribes.

**2****Impacts of New England Red Tide on Commercial Fisheries in Maine and Massachusetts: \$23 million in 2005**

In 2005, an historic *Alexandrium fundyense* bloom (also called red tide) in New England resulted in extensive and, in some locations, unprecedented closures of shellfish harvesting to prevent paralytic shellfish poisoning (PSP) in human consumers. Closures are estimated to have caused approximately \$18 million in lost shellfish sales in Massachusetts (Jin et al. 2008) and \$4.9 million in Maine (Jin et al. 2008, Athearn 2007). These estimates do not account for indirect effects on business linked to the shellfish industry or reduced spending due to lost income. Furthermore, offshore shellfish fisheries that are indefinitely closed due to shellfish toxicity likely result in millions of dollars of lost revenue.

3***Karenia brevis* Impacts in Florida: \$19-32 million/year**

The Florida HAB species, *Karenia brevis* (also called red tide), blooms almost every year, most often off the west coast of Florida. *Karenia brevis* toxins can kill fish, birds, and marine mammals; are a threat to human health; and can cause respiratory irritation in beachgoers or people living or working near the water. Steidinger et al. (1999) estimated economic impacts from these blooms to be at least \$15-25 million per year (or \$19-32 million in 2007 dollars).

An exceptionally bad event in 1971, similar in magnitude but shorter in duration than the 2005 *Karenia* bloom, was estimated to cause about \$20 million in economic impacts (or \$100 million in 2007 dollars), primarily to the tourism industry (Habas and Gilbert 1974).

4**Impacts of *Karenia brevis* in Galveston, Texas: \$10 million in 2000**

In summer of 2000, a *Karenia brevis* outbreak and associated fish kills were reported in Texas coastal waters. The fish kills persisted in many areas through November. Most Texas coastal waters were closed to shellfish harvesting until the end of November to protect human consumers from Neurotoxic Shellfish Poisoning (NSP). Some areas remained closed until January 2001.

A case study of the 2000 red tide in Texas estimated that economic impacts were at least \$9.9 million in Galveston county alone due to commercial oyster fishery closures, lost tourism, and costs of beach cleanup (Evans and Jones 2001).

5**Impacts of Macroalgae in Maui, HI: \$20 million/year**

Macroalgal blooms, which adversely impact coral reefs and local aesthetics, are a recurring problem along the Kihei coast in Maui. These blooms potentially cost Hawaii more than \$20 million in lost revenue each year, due to reductions in real estate value and hotel business as well as increased clean-up costs (NOAA Economic Statistics Report). Van Beukering and Cesar (2004) estimated that continued algal blooms could result in additional losses of \$16 million annually over the next several decades.

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