Harmful Algae 35 (2014) 38–45

Contents lists available at ScienceDirect

Harmful Algae

journal homepage: www.elsevier.com/locate/hal

Education and public outreach concerning freshwater harmful algal blooms in Southern Louisiana

Emily A. Smith [a,*], Pamela B. Blanchard [b], Sibel Bargu [a]

[a] Department of Oceanography and Coastal Sciences, Louisiana State University, Baton Rouge, LA 70803, USA
[b] School of Education, Louisiana State University, Baton Rouge, LA 70803, USA

ARTICLE INFO

Article history:
Received 15 January 2014
Received in revised form 27 March 2014
Accepted 28 March 2014

Keywords:
Cyanobacteria
Education and outreach
Harmful algal blooms
Louisiana

ABSTRACT

Scientific Literacy in America is very low compared to other developed countries. The public has a poor understanding of basic scientific principles (28% are considered scientifically literate) and outreach efforts to address this problem are limited. When looking at specific issues such as harmful algal blooms in freshwater systems there is hardly any active outreach programs. The basis for this study was to help the public understand what harmful algal blooms are and what visual indicators exist to warn of their presence. Initial surveys were conducted to find out what fishermen knew about algae and harmful algal blooms. The participants (age 11–70) had heard of algae (100%), but very few had heard of a harmful algal bloom (40%) and when the participants were pressed on the subject, few could define algae. An educational brochure was created from the baseline of data collected from the public and was distributed to the same fishing areas. A follow-up interview of these areas showed that the brochures were being taken by people, but finding those actual people proved difficult. Once brochures were viewed, many people were able to indicate something new they learned about algae such as algae produces oxygen. Scientists need to take a more active role in conveying their research to the public in order to increase scientific knowledge.

1. Introduction

1.1. Scientific literacy

A common theme of our society today is that education in the United States is not sufficient compared to other developed countries around the world. Areas of education that the United States consistently ranks low in are math and science (NCES, 2009). Within the education world, there are terms used to identify the specific areas that are deficient. "Scientific literacy" is a term that has been used to try and raise education standards around the country (Brown et al., 2005) and can have a different definition depending upon which agency is using the term. For example, The National Science Foundation defines scientific literacy as "the knowledge and understanding of scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity" (NCES, 1996). This allows for many interpretations and uses of scientific literacy. A more general definition is what the public should know and understand about science in order to live respectfully in the natural world (DeBoer, 2000).

There has been a common theme of education to improve scientific literacy in America and other countries for decades. In the past, the largest push for more effective science education in America was during the Cold War era Space race (Laugksch, 2000). In the years since, support for scientific literacy has waxed and waned dependent upon how much trust was put into the scientific community. In the 1980s when the United States thought that they were going to suffer from economic loss based on not having enough inventors, there was another surge to support scientific literacy (Prewitt, 1983). A recent survey to determine how scientifically literate Americans are was conducted by the California Academy of Sciences, using the NSF's definition, and found that 4 out of 5 adults do not even know basic scientific principles (2009). Couple this with the fact that Americans are more distrusting of scientists, and you have a lot of scientific knowledge being sheltered within the purely scientific community thereby contributing to the decline of scientific literacy in America (Mooney and Kirshenbaum, 2009).

* Corresponding author at: 1241 Energy, Coast and Environment Building, Louisiana State University, Baton Rouge, LA 70803, USA. Tel.: +1 225 733 7847.
E-mail address: esmi122@lsu.edu (E.A. Smith).

http://dx.doi.org/10.1016/j.hal.2014.03.008
1568-9883/

1.2. Harmful algal bloom outreach

Harmful algal blooms (HABs) are increasing in frequency and habitats. Initially HABs were observed mainly in marine systems, but in more recent years, their presence has been increasing in freshwater systems as well. This can be of concern to humans due to their higher chance of interacting with a freshwater or estuarine system verses a marine system. To help protect the public, national plans have been established to help understand HABs (Bauer, 2006). There are also several regional efforts to help monitor HABs, but despite the increase of events, few of these areas actively engage in public outreach. Oregon, California, Vermont, and Florida have active programs to alert the public about these events (Lewitus et al., 2003; Stone and Bress, 2007; Nierenberg et al., 2011).

Literature exists in large amounts about the types of effects that HABs have on human health, economic loss and damage to the environment (Chorus and Bartram, 1999; Ibelings and Chorus, 2007; Heisler et al., 2008). However, these studies are all written by scientists for scientists in scientific journals; and they are not translated to be understood by the public. The few regional efforts to provide information about HABs to the public (e.g., educational information, warning signs on beaches, etc.) have limited assessment to determine effectiveness (Fleming et al., 2007; Nierenberg et al., 2010, 2011). Of these regional efforts, Florida has been particularly active using state funds to support centers for HAB education (Kuhar et al., 2009).

Some of the studies in Florida have looked at the effectiveness of HAB outreach materials. One study looked at improving a HAB hotline that citizens could call. The improvement allowed callers to talk to a specialist if they wanted and this option showed a 68% increase in satisfaction. However, this increase was based on only of people who called a HAB hotline, which were mainly older non-Hispanic white females (Fleming et al., 2007). Another study looked at the risk assessment of red tide compared to the perception of red tide, mainly focusing on if negative effects from red tide would change the activities of both tourists and Florida residents. The main finding from this study was that the more familiar people were with the topic of red tide, the better they were able to asses risk given different scenarios (Kuhar et al., 2009). A third study solely looked at what the general public knows about Florida red tide. The comparison focused on tourists and residents and their knowledge of general human health questions, red tide information, and if they knew where to get more information about red tide (i.e., were they aware of the current outreach efforts?) Perceptions of both tourists and residents were not accurate about what is safe to eat during a red tide. This fear of consumption of any seafood could potentially cause a negative economic impact on the region and associated industries, specifically fisheries (Nierenberg et al., 2010). Two of the studies encouraged additional outreach material to be evaluated after it is distributed in order to be more effective to communicating to the public.

1.3. Cyanobacteria in Louisiana

Cyanobacteria harmful algal blooms (CyanoHABs) are increasing in both frequency and geographic extent in which they are found (Paerl et al., 2001; Huisman and Hulot, 2005; Heisler et al., 2008; Jöhnk et al., 2008). A CyanoHAB can be harmful to humans and other animals mainly due to toxin production. Alternatively, it can result in surface scums that can block sunlight to lower water column (Codd, 1995). The common pathways for human exposure of cyanotoxins are through recreational use of waters, consumption of drinking water, or contaminated seafood (Carmichael, 2001; Codd et al., 2005). The effects of the toxins vary from rashes and other skin irritations in association with exposure during recreational use (Pilotto et al., 2004) to gastrointestinal distress as a result of consumption of seafood (Chorus and Bartram, 1999) or respiratory problems (Heise, 1949). Different countries have had to monitor their fresh water drinking supplies when a CyanoHAB occurs to insure that the public does not get exposed to cyanotoxins through their drinking water (Qin et al., 2010).

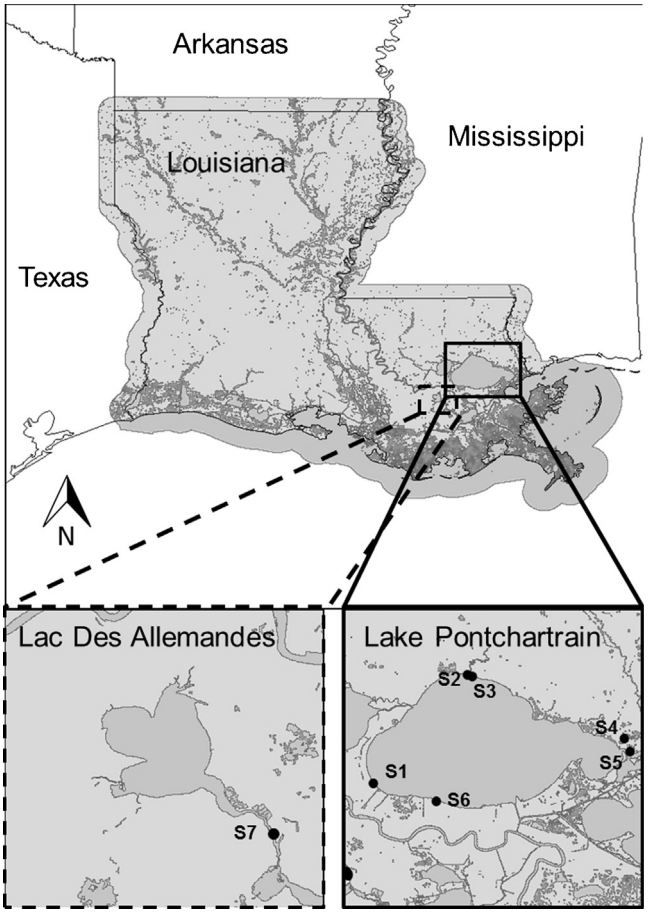

Fig. 1. Map of the interview locations around Lake Pontchartrain and Lake Des Allemandes. Site 1 (S1) is Frenier Landing in LaPlace; S2 is the Madisonville Pier; S3 is Sunset Point; S4 is Spanish Trail Road; S5 is the Rigolets Marina; S6 is Williams Blvd. pier; and S7 is the crab house at Lake Des Allemandes.

In Louisiana, CyanoHABs (specifically toxin-producing species) have been widely detected in several of the estuaries and their associated toxins have been found in seafood (White et al., 2009; Garcia et al., 2010; Bargu et al., 2011; Roy et al., 2013; Smith et al., 2014). Despite evidence of cyanobacterial presence, there has not been any funded outreach in association with HABs or CyanoHABs attempted in the state. Information needs to be provided to both the public and policy makers about the possible sources of contamination. The increase of occurrence of CyanoHABs and the need for more effective education for the public is vital. A study to find out baseline knowledge of the residents about algae and harmful algal blooms was then conducted.

2. Methods

The purpose of this project was to conduct initial surveys with fishermen to determine baseline knowledge about algae in general as well as harmful algal blooms. An educational brochure was then produced based on that information, and distributed to areas that fishermen frequent. Follow-up surveys were then conducted to determine if the educational brochure improved the baseline knowledge of fishermen concerning algae and harmful algal blooms.