



Red tides and participation in marine-based activities: Estimating the response of Southwest Florida residents

Kimberly L. Morgan^{a,*}, Sherry L. Larkin^b, Charles M. Adams^{b,c}

^a Agricultural Economics Department, Mississippi State University, 210 Howell Engineering Building, Mississippi State, MS 39762, United States

^b Department of Food and Resource Economics, Institute of Food and Agricultural Sciences, University of Florida, United States

^c Florida Sea Grant, University of Florida, United States

ARTICLE INFO

Article history:

Received 28 August 2009

Received in revised form 14 December 2009

Accepted 14 December 2009

Keywords:

Behavior

HABs

Harmful algal blooms

Multinomial logit

Probit

Red tides

ABSTRACT

Blooms of *Karenia brevis* (red tide) can kill marine life and irritate human respiratory systems. Knowing how and why participation in marine-based activities (beach-going, fishing, and coastal restaurant patronage) is affected during a red tide is fundamental to estimating the changes in use that occur. Using a sample of residents in Southwest Florida, participant choice models for each activity were estimated to determine the likelihood of alternate behavioral decisions during a red tide event. We find that factors influenced by extension activities have a larger impact than socioeconomic factors commonly hypothesized to affect individual response behavior.

© 2009 Elsevier B.V. All rights reserved.

1. Introduction

With over 22 million people participating in 2000, Florida was the leader for marine recreation in the United States (Leeworthy and Wiley, 2001). In particular, Florida led the nation as the number one saltwater fishing destination, with 4.7 million individuals spending 56 million days in 2000 (Leeworthy and Wiley, 2001). The annual value of recreational saltwater fishing alone is estimated to have generated \$3 billion in sales and expenditures in 2006, representing 27% of U.S. total (Kildow, 2008). In total, there are more than 4500 marine fishing access points and more than 2300 beach and shoreline access sites in Florida and over 77% of Florida's population resides in coastal counties (Divers et al., 2000; Kildow, 2008). It is not surprising then that Florida's economy, especially in Southwest Florida, is heavily dependent on marine-related recreation.

The continued attraction of Florida's marine recreational areas is predicated on the supply of high-quality marine ecosystems that provide healthy beach and recreational experiences. For beaches in particular, poor water quality has been found to reduce the value of a trip to the beach (Freeman, 1995). For example, visitors to 23 beaches in the United Kingdom indicated that the scenery, bathing

safety, and environmental quality (e.g., water quality and absence of sewage debris, litter and unpleasant odors) were the most important factors determining beach choice (Morgan, 1999). Ballance et al. (2000) found that cleanliness was the primary factor behind beach choice in Cape Peninsula, South Africa, and that up to 97% of the beach value could be lost by a decline in standards of cleanliness. While these results are likely not surprising, Pendleton et al. (2000) found that residents of Los Angeles, California, predominantly viewed the ocean as a place of pollution, not for swimming despite several heavily advertised and successful clean-up campaigns; the authors concluded that the perceptions of coastal water quality may be influenced more by the media than with current coastal education campaigns.

Using a combination of travel cost surveys and public opinion polls, these studies confirm the importance of high-quality water and beach conditions to participants in marine-related activities. They also revealed the potential power of perception over proof with respect to residents' knowledge of local water conditions. These are important findings for natural resource managers in Florida that must contend with periodic harmful algae blooms (HABs). These blooms (i.e., known as "red tides" due to the reddish color imparted in the water from the *Karenia brevis* algae species) are uniquely characterized by the release of neurotoxins, which can kill marine fish and mammals, render shellfish unsafe for consumption, and cause a suite of health impacts on humans including respiratory distress, nasal and eye irritations, and skin

* Corresponding author. Tel.: +1 662 325 0416; fax: +1 662 325 8777.

E-mail address: morgan@agecon.msstate.edu (K.L. Morgan).

rashes (Flewelling et al., 2005; Backer et al., 2003; Kirkpatrick et al., 2004).

Previous studies that have provided estimates of absolute economic losses as a result of harmful algal blooms in the United States have relied upon readily available secondary data. Three of the most recent studies (Anderson et al., 2000; Hoagland et al., 2002; Hoagland and Scatasta, 2006) used a combination of surveys from coastal state experts, literature reviews and individual calculations, to produce a seminal national review of economic implications associated with HAB occurrences from 1987 to 1992 on four economic sectors—public health, commercial fisheries, recreation/tourism, and monitoring/management. Available red tide loss estimates were aggregated and average annual shares were calculated for each sector. While these studies were seminal, the absence of estimates for all hypothesized losses (and measurements at different points in the value chain) will bias the absolute and relative impacts.

In perhaps the only study of the effects of red tide on recreation, Nunes and van den Bergh (2004) assessed the economic value of a program intended to prevent HABs at a famous beach resort in Holland. Following a joint travel cost and contingent valuation approach, the authors found that the program would be feasible only if it cost less than 225 million Euro (\$302 million in 2007). Their results also indicated that residents living closer to the beach placed a higher value on the HAB prevention program as compared to those that had relatively higher travel costs, which highlights the value of nature-based recreation to local residents.

While non-market valuation studies are necessary to evaluate policy proposals that improve environmental quality and, thus, recreational opportunities, information on actual behavioral responses is needed to accurately estimate any change in use of marine-related amenities. For red tides in particular, this information is needed to justify continued and proposed expenditures on prevention, control and mitigation strategies.

Behavioral responses can be evaluated with choice modeling. The majority of these models rely solely on the characteristics of the sites, such as varying catch rates, to explain the choice decision. Such a model specification entails the estimation of a conditional model, e.g., the choices are contingent upon the choice set (McFadden, 1973). Alternatively, if the choices are believed to be driven solely by the characteristics of the individuals, then it is most appropriate to estimate a multinomial model where the explanatory variables are individual, rather than alternative, characteristics (Maddala, 1983).

In the case of a red tide event, individuals are faced with an easily identifiable and well-defined set of responses with respect to marine-based recreational activities; they can elect to cut short the activity (i.e., decide the conditions are too unpleasant and finish early), delay the activity (e.g., postpone it from today to tomorrow), or relocate (i.e., move further up or down the coast). The observed responses are clearly dependent on the preferences and constraints of each individual and not the choice set since each response entails avoiding red tide conditions. As such, this paper uses a multinomial model to analyze the behavioral responses associated with red tide events. This analysis is expected to identify the factors that affected the underlying decision of whether an individual reacted to a red tide event and, if they did, what factors determined whether they cut short, delayed, or relocated their participation in specific marine-based activities.

The empirical analysis will use data from residents of two Southwest Florida counties that have experienced the most red tides. The probability-based models will be used to examine behavior both across all marine-based activities and for four specific activities, namely: beach-going, fishing from a boat or pier, and patronage of coastal restaurants. Results are important since resident responses are needed to guide extension efforts directed

at coastal residents. For red tide research in particular, results will be timely since red tides may be occurring with more frequency (Brand and Compton, 2007) and several potential control and mitigation strategies are currently under consideration (e.g., Casper et al., 2007; Robbins et al., 2006; Pierce et al., 2004; Schneider et al., 2003).

2. An application of choice modeling to red tide events

2.1. Data

A total of 1006 households in Sarasota and Manatee Counties in Southwest Florida were selected by random digit dialing in January 2001. One adult within each household was then randomly selected by asking to speak with the person over the age of 18 whose birthday was closest to the day of the interview. A call back procedure was employed to speak with the selected adult. Of those, 894 were aware of the term “red tide” and, as such, represent the sample population of residents to measure the impact of red tide events on their marine-based activities, namely: (1) saltwater fishing from a boat, (2) saltwater fishing from a pier or beach, (3) beach-going, and (4) patronage of restaurants located near beach or bay front areas. Several questions were asked to ascertain their level of knowledge concerning red tides in addition to traditional socioeconomic information. Collectively, these variables will be used to explain how (if at all) a resident reacted to a red tide in terms of altering their participation in, or their reaction to, such events during the previous 12 months.

A total of 755 respondents that were aware of red tide reported participating in at least one of the four activities during the previous year (January through December 2000) and, thus, constitute the target sample used in this analysis. Among this target sample, 88% recalled eating restaurants located near coastal waters at least once per month, 76% claimed to have spent at least 1 day per month at a local beach, and 32% and 28% of respondents indicated they had enjoyed saltwater fishing from a pier or boat on a monthly basis, respectively. Eighty percent of this target sample reported being full-time residents in the study area with an average length of residency in Florida of 16 years (Table 1). Seventy percent of all interviewees spent at least some time in college, while 18% reported a gross annual household income of at least \$75,000. Respondents averaged 55 years old, but reported ages ranged from 18 to 89 years old.

There exists a slight survey sample bias towards relatively older, female, and individuals with at least some college relative to the Census 2000 population statistics for these two Florida counties. Median ages in Manatee and Sarasota were 44 and 51 years of age, respectively, and each of these counties had 50 and 57% of residents claiming at least some college coursework. The greatest variation is evident in the Hispanic demographic, as just 4% of survey respondents were Hispanic relative to 9.3% and 1.8% Census populations in Manatee and Sarasota counties, respectively. With respect to income, the respondent profiles are quite similar, with Manatee and Sarasota county residents averaging 18 and 22% of households with annual incomes exceeding \$75,000, respectively, compared to 18% noted by survey respondents.

Sixty-six percent of the target sample indicated that the presence of a red tide event impacted their participation in at least one of the four marine-based activities during the previous 12 months (i.e., January 2000 through December 2000). This period of recall included the presence of red tide events. The statewide red tide monitoring program recorded *K. brevis* at measures exceeding 5000 cells/l in January and September through December in 2000 (Fish and Wildlife Research Institute, 2003). The complementary monitoring program from the National Oceanic and Atmospheric Administration also recorded cell count measurements in excess of

Download English Version:

<https://daneshyari.com/en/article/4545794>

Download Persian Version:

<https://daneshyari.com/article/4545794>

[Daneshyari.com](https://daneshyari.com)