Mar. Sci. Tech. Bull. 3 (2013):13-15

MARINE SCIENCE AND TECHNOLOGY BULLETIN

The Environmental and Socio-Economical Effects of a Biologic Problem: Mucilage

Ragip Ertug YENTUR[1], Yesim BUYUKATES[1*], Ozcan OZEN[1], Aytac ALTIN[2]

[1]Faculty of Marine Sciences and Technology, Canakkale Onsekiz Mart Universıty, Canakkale, TURKEY

[2]School of Applied Sciences at Gokceada, Canakkale Onsekiz Mart Universıty, Canakkale, TURKEY

ARTICLE INFO

Article history:

Received: 12.12.2013
Received in revised form: 20.12.2013
Accepted : 23.12.2013
Available online : 31.12.2013

Keywords:

Dardanelles Strait
Guzelyali
Abide
Mucilage

ABSTRACT

This study was conducted at two stations, Guzelyali and Abide, selected in the shoreline of Dardanelles Strait. Monthly observations were performed between October 2008 and August 2009 to investigate the effects and causes of mucilage, which is an important ecological problem. In order to determine the causes of mucilage, atmospheric data were collected. The results suggested that sudden temperature variations, wind speed and rainfall may have direct effects on the continuance of mucilage. Except summer, mucilage has been observed all through the year. Biologic and socio-economic effects of mucilage were also investigated in this study. Mucilage has a negative effect, especially on flora and fauna in the marine ecosystem. Additionally, there are many socio-economic problems on fisheries, tourism activities and human health. Therefore, although it is not possible to control the mucilage occurrence, the effects of this problem on marine environment, biodiversity and economy can be mitigated by using some protection aspects such as the control of anthropogenic effects causing eutrophication, fishing period and etc.

Introduction

The substrates in aquatic coastal habitats are important areas for biodiversity of species due to variety of their shapes. These areas which are important on ecosystem for productivity, growth, feeding and surviving of fish species, may have encounter many biological problems such as climate change and invasive species. Additionally, another biological problem for aquatic habitats is mucilage which also occurred at Dardanelles Strait and Marmara Sea in 2007-2008. Mucilage is an accumulation of organic materials occurred by various aquatic organisms depending on existent climate and trophic conditions including gelatinous ekzopolymeric particles produced by organisms such as phytoplankton in stress (Degobbis et al. 1995; Innamorati et al. 1995; Vollenweider and Rinaldi 1995; Mecozzi et al. 2001).

*Corresponding author
E-mail ybuyukates@comu.edu.tr (Y. Buyukates)
Tel:+: +90 286 218 00 18 fax: +90 286 218 05 43

Mucilage can be detrimental for invertebrates and fishes since it blocks the gills, diffuse to substrate, cover the feeding and protection area in coastal aquatic ecosystem. Additionally, it has negative effects on tourism activities and fisheries industry by blocking filtering systems of boats and nets' mesh (Marchetti 1990; Stachowitsch et al. 1990; Artüz 2008). During the mucilage occurrence, false layer of water column can be observed as well, which may have negative effects for production, feeding and migration of fish species (Figure 1). Studies showed that atmospheric conditions are also effective on mucilage occurrence and distribution (Rinaldi et al. 1995; Mecozzi et al. 2001). Therefore, to investigate the effects and causes of mucilage, atmospheric data were collected, biologic and socio-economic effects of mucilage were also determined in this study.

Material and Methods

This study was conducted at two stations, Guzelyali (40°, 02''.350' N, 26°, 20''.302' E) and Abide (40°, 05''.467' N, 26°, 20''.831' E), selected in the shoreline of

Dardanelles Strait (Figure 2). Monthly observations were performed between October 2008 and August 2009.

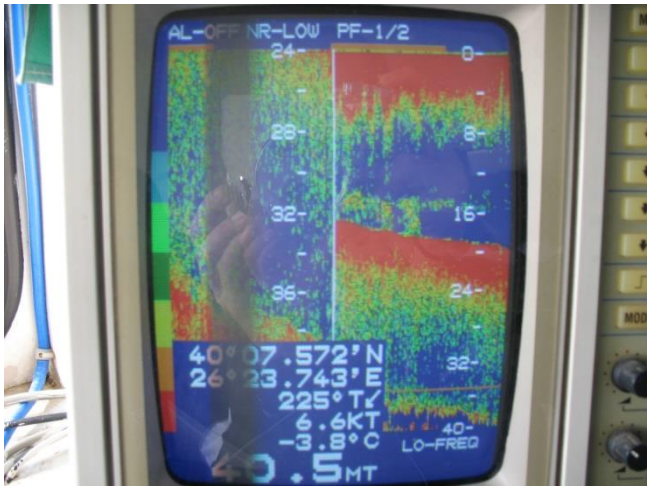


Figure 1. False layer of water column due to mucilage (courtesy of Adnan Ayaz)

Study Area

Guzelyali is located in the Asian shoreline of Dardanelles Strait. Its population increases in summer season because of summer houses. Guzelyali is an unprotected area against the wind and current system, anthropogenic and tidal impacts. Its substrate is usually muddy and sandy. The location of Abide is in the Europe shoreline of Dardanelles Strait. It is a semi-enclosed area. Its substrate is muddy with *Posidania oceanica* beds.

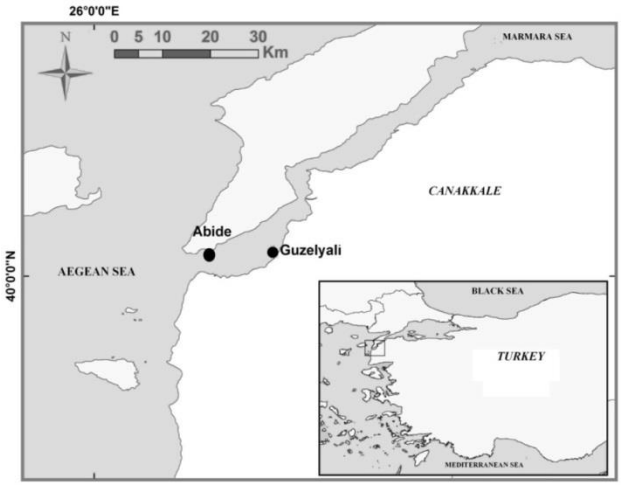


Figure 2.The location of Guzelyali and Abide in Dardanelles Strait

Results

In order to determine the causes of mucilage, atmospheric data were collected (Figure 3). According to the results, it can be suggested that sudden temperature variations, wind speed and rainfall may affect the mucilage occurrence. Except summer, mucilage has been observed all through the year. During the study period, despite of a large mucilage occurrence, small layers were determined through the water column.

The weekly average of temperature values during the period of mucilage occurrence showed sudden changes when compared with the previous weeks. The maximum and minimum temperature values during the mucilage occurrence were; 21.84°C-17.31°C in October 2007, 11.84°C-8.26°C in December 2007 and 26.81°C-16.01°C in June 2008, respectively. The maximum wind speed values were determined as; 12.44 m/sec in October 2007; 11.99 m/sec in December 2007 and 9.30 m/sec in June 2008, respectively.

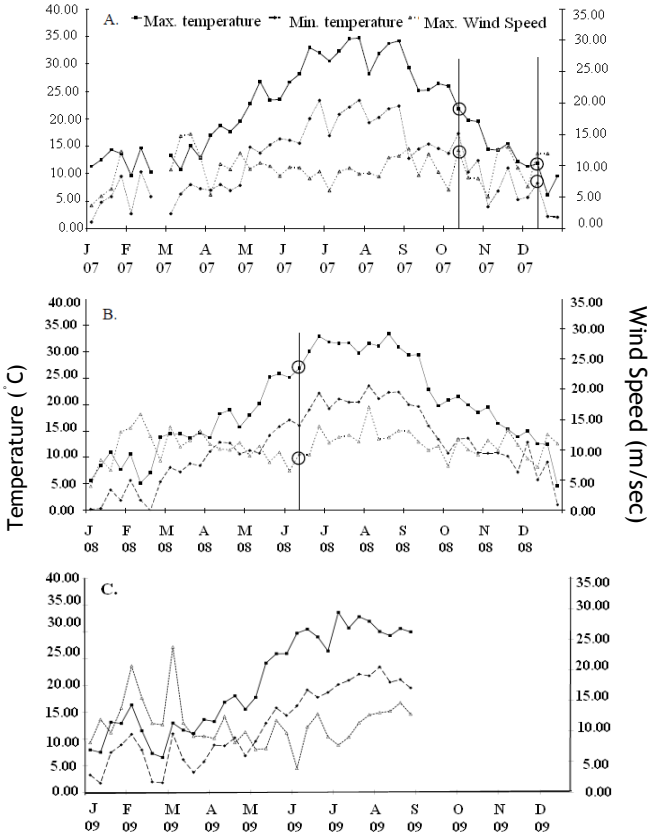


Figure 3. Maximum temperature, minimum temperature, maximum wind speed values and mucilage occurrence period in A. January 2007- December 2007, B. January 2008- December 2008, and C. January 2009- December 2009

Discussion

Although it is not possible to control the mucilage occurrence, the effects of this problem on marine environment, biodiversity, and economy can be mitigated by using some protection aspects such as the control of anthropogenic effects causing eutrophication, fishing period and etc. Despite the fact that there are not direct impacts of mucilage on human health, microbial contamination which can be a problem may occur depending on low circulation in the water column. Therefore, swimming in areas covered by mucilage can be a risk and not suggested. Since, there is not any knowledge about the time of mucilage occurrence, meteorological data can be shared to collaborate between universities and meteorology centers around the world to understand the reason better. Additionally, monitoring of mucilage occurrence is an important aspect to determine the effects on aquatic environment and to take necessary precautions in the affected systems.

Acknowledgement

This study was funded by TUBITAK #108T624 project. Thanks are extended to Ozgur Emek Inanmaz, Ayca Kılıc, and Alkan Oztekin who helped with field samplings as well as anonymous reviewers for their critiques on a previous iteration of this manuscript.

References

Artüz, M.L. 2008. Marmara Denizi Genelinde Gözlemlenen Karışık Alg Patlaması Konusunda Rapor. Sevinç-Erdal İnönü Vakfı, 31 Mart 2008 (Rapor).

Degobbis, D., Fonda-Umani, S., Franco, P., Malej, A., Precali, R., and N. Smodlaka. 1995. Changes in the Northern Adriatic Ecosystem and the Hypertrophic Appearance of Gelatinous Aggregates. Science of the Total Environment, **165:** 43-58.

Innamorati, M. 1995. Hyperproduction of Mucilages by Micro and Macro Algae in the Tyrrhenian Sea. Science of the Total Environment, **165:** 65-81.

Marchetti, R. 1990. Algal Blooms and Gel Production in the Adriatic Sea. In Eutrophication-Related Phenomena in the Adriatic Sea and in Other Mediterranean Coastal Zones, eds. H. Barth and L. Fega. Water Pollution Report 16, Commission of the Euro-pean Communities, 21-42.

Mecozzi, M., Acquistucci, R., Di Noto, V., Pietrantonio, E., Amici, M., and D. Cardarilli. 2001. Characterization of Mucilage Aggregates in Adriatic and Tyrrhenian Sea: Structure Similarities Between Mucilage Samples and the Insoluble Fractions of Marine Humic Substance. Chemosphere, **44:** 709-720.

Rinaldi A., Vollenweider R.A., Montanari G., Ferrari C.R. ve Ghetti A., 1995. Mucilages in Italian Seas: The Adriatic and Tyrrhenian Seas, 1988-1991, Science of the Total Environment, **165**: 165-183.

Stachowitsch, M., Fanuko, N., and M. Richter. 1990. Mucus Aggregates in the Adriatic Sea: An Overview of Stages and Occurrences. Marine Ecology, **11:** 327-335.

Vollenweider, R.A., and A. Rinaldi. 1995. Editorial. Science of the Total Environment, **165:** 5-7.