

SHORT COMMUNICATION

**The current impact of mucilage on tourism and
underwater cultural heritage in the Marmara region**

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Abstract

An analysis of the impact of the recent massive mucilage event in the Marmara Sea is necessary in order to manage the crisis and introduce mitigation measures for the sustainability of tourism in the area. Legislation and preventive measures can help to prevent large-scale disasters and destruction, particularly in the marine industry. Yet, despite early signs and warnings, no measures of any impact have been taken to limit the outbreak of mucilage. Consequently, the Marmara region, well known for its unique inland sea, history and culture, is now in great jeopardy. Mucilage is a threat to the tourism sector, an important contributor to the regional and national economy, and its underwater cultural heritage. This study aims to show the short-term and long-term effect of mucilage on the tourism sector and on underwater cultural heritage. The data was collected through interviews with local business owners, an examination of beach's health throughout years in the Marmara Sea and the impact of tourism on the Turkish GDP. Lastly, previous cases of mucilage were taken as an example for a more accurate prediction.

Keywords: Mucilage, Marmara Sea, tourism, underwater cultural heritage

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Marine mucilage, also known as “sea snot”, is a phenomenon that occurs when the marine ecosystem of a specific region undergoes a serious change in its parameters. Different contributing factors, such as pollution and an increase in nutrients, can result in massive production of phytoplankton, which secretes the mucilage. This phenomenon forms a slimy layer that spreads over the surface of the sea, creating a mud-like feature, and then sinks under the surface, creating a “marine snow” that results in “dirty sea”, both on and below the surface. (Danovaro 2009; Öztürk 2010).

The marine environment is very rich in nutrients, making it susceptible to such occurrences. The first disturbing sighting of mucilage in the Marmara Sea was in 1997 and it reappeared between 2007 and 2008 (TUDAV 2021). However, these events were nothing like the amount that has affected the region in the summer of 2021 (Özalp 2021). Contributing factors, such as the rise in sea surface temperature and, in particular, unsustainable wastewater management in the area, turns this problem into a disaster (Balkis *et al.* 2010).

As shown in Figure 1, mucilage creates a “dirty sea”, which dramatically affects touristic activity in the region. Often, coastal regions rely heavily on leisure, sea and cultural tourism to sustain their economy.



Figure 1. Appearance of mucilage on the coast of the Marmara Sea
(Photo: B. Öztürk).

The history and geography of the Marmara region has made it a popular tourist area. Located between Europe and Asia, it is a bridge between East and West, between Oriental and Occidental culture, and home to numerous underwater cultural heritages (Demir 2004; Akal 2009). Hence, touristic demand is very high throughout the year.

The Marmara Sea is a draw for tourists who want to dive, sail or swim, making it a popular sea tourism destination (Demiroglu *et al.* 2017). However, the vast amount of mucilage, as seen above, has had an important impact on traditional, coastal, and sea tourism.

Since April 2021, mucilage in Turkey has intensified and expanded by the day. The problems it has created were multiple and had major negative effects. Before an analysis of the impact on tourism in the Sea of Marmara itself, it would be pertinent to analyse the formation of mucilage within the region and similarities with other cases (Mecozzia 2001).

Though not as severe as the one currently facing the Marmara region, the Adriatic Sea and the Mediterranean Sea have also seen their share of sea snout (Lancelot 1995). Therefore, to understand the problem and its consequences, it is important to look at the common denominators (Stachowitsch 1990).

The coasts of all these three areas share the same environmental challenges: unregulated exploitation, over-fishing commonly with trawlers, the high presence of macro and micro plastics, and an altered sea surface temperature (Abbasnia and Toros 2019). In the Adriatic Sea, for example, mucilage reaches its peak around August, thus demonstrating the impact of warming temperatures (Schiaparelli *et al.* 2007; Ricci *et al.* 2013).

How does it affect the sea? Firstly, the slime-like layer prevents oxygen passing through the sea surface, leading to destruction of the seabed. It then dramatically affects immobile organisms on the seabed, damaging the fishing industry (Giuliani *et al.* 2005; Yentur *et al.* 2013; Keleş *et al.* 2020).

The impact of tourism on the Turkish economy is highly significant. The profit generated solely by tourism in 2019 was \$34.5 billion, representing 4.6% of total GDP (Association of Turkish Travel Agencies 2019). This figure dropped to \$12.1 billion, a decline of 65.1%, representing 3.8% of total GDP in 2020, caused by the COVID-19 outbreak, which shows the important role of tourism in Turkey (Republic of Turkey Ministry of Culture and Tourism 2020). It is particularly the touristic coastal areas of Turkey that are dependent on this income. Due to its coasts, most tourism in Turkey takes place during the summer.

As for coastal tourism, two major factors affect tourists' decisions: visual pollution and physical pollution. Tourism in the Marmara region, particularly cities such as Istanbul, Çanakkale, Balıkesir, Yalova, and Tekirdağ, rely on the sea and coasts of the region providing guests with activities (Yıldırım *et al.* 2008; Albayrak *et al.* 2019). Since most enterprises in the area are generally not all-inclusive resorts, hotel owners, timeshare owners, and summer-based property owners point out that tourism relies heavily on underwater photography, snorkelling and scuba diving, fishing, sailing, and boat excursions (Çoşan 2021). None of these activities can be carried out in a region covered in mucilage (Figure 2).

Beaches are one of the main attractions in the region. According to Republic of Turkey Ministry of Health data, there are 355 beaches in the region, 254 with a coastline on the Marmara Sea and open to swimmers; 91 of these beaches are in Istanbul (Republic of Turkey Ministry of Health 2021) (Table 1, Figure 3). These beaches are divided in three categories: “good” for those in a healthy condition and that provide a clean sea in which it is safe to swim; “medium” for those relatively polluted and where swimming is not recommended; and “bad” for those categorized as dangerous and where it is unsafe to swim.



Figure 2. Mucilage around boats used for touristic purposes at Bostancı, Istanbul. The presence of mucilage highly affected overall reservation and daily trips. The sea snot also irreversibly damaged these boats (photos: B. Öztürk).



Figure 3. Beaches in the Marmara region and Istanbul. Green for good to medium condition, yellow for medium to bad condition (Republic of Turkey Ministry of Health 2021).

To understand the impact of mucilage on beaches, we can compare the statistics of beach health in 2019 and 2021. In 2019, of the 81 beaches in Istanbul at that time, 10 were in good condition, 60 were in medium condition, and 11 were in bad condition (Republic of Turkey Ministry of Health 2019).

The addition of ten beaches increased the number of beaches in Istanbul to 91. Presence of mucilage has dramatically changed health conditions of beaches. By 2021, only seven beaches of are in good condition, whilst 49 are in medium condition and 35 are in bad condition (Table 1).

Table 1. Beaches in the Marmara region and their sanitary classification according to Republic of Turkey Ministry of Health (2021)

	Good	Medium	Bad	Total
Istanbul	7	49	35	91
Edirne	1	6	2	9
Kırklareli	3	1	0	4
Tekirdağ	7	17	9	33
Kocaeli	7	12	5	24
Sakarya	2	3	1	6
Bursa	0	19	14	33
Yalova	1	8	9	18
Balıkesir	31	44	24	99
Çanakkale	4	18	16	38
Total	63	177	115	355

For this research, ten business owners, including hotel operators, beach owners, and real estate agents, two of each from Istanbul, Heybeliada Island, Büyükkada Island, Çanakkale, and Avşa Island were interviewed (Table 2).

Table 2. Interviews conducted and their dates

Locality	Position	Date
Avşa Island	Hotel manager	June 9, 2021
Avşa Island	Diving school staff	June 9, 2021
Büyükkada Island	Real estate agent	June 7, 2021
Büyükkada Island	Beach manager	June 7, 2021
Çanakkale	Hostel owner	June 15, 2021
Çanakkale	Diving school owner	June 15, 2021
Heybeliada Island	Beach owner	June 15, 2021
Heybeliada Island	Real estate agent	June 15, 2021
Istanbul	Captain for boats used for touristic purposes	June 12, 2021
Istanbul	Five star hotel commercial representative	June 12, 2021

The interviewees were chosen according to their facilities' location, their role in that business, and their online presence. The interviews were conducted on the phone due to COVID-19 restrictions. To prevent a negative impact on their business, the interviewees preferred to remain anonymous. Three questions were asked to determine the impact of mucilage on their business.

- At what capacity is your facility currently working?
- Compared to last year and 2019, how has mucilage affected your reservation numbers?
- What do you think this means for your business?

Early reservations in hotels and rental houses of real estate agents are a good indicator of the number of tourists that will eventually arrive. Tourism agents interviewed for this study said the situation was dire. (Interview with Çanakkale hostel owner, 15 June 2021).

Normally, from mid-June to early July there is an influx of reservations and guests to coastal areas. However, in cities such as Balıkesir, Istanbul, Çanakkale, the situation this year is very bad as these attractive coasts have completely lost their touristic appeal. (Interview with Istanbul captain for boats used for touristic purposes, 12 June 2021).

Real estate agents, who rent houses seasonally, are also dramatically influenced by the situation. Local summerhouses are most commonly available for rent after school exams and are rented by the week or for the night. However, examination of reservations and interviews with real estate agents, show that, at the time, no reservations had been made in the area. What is interesting is that mucilage has impacted real estate tourism more than the COVID-19 pandemic, which in itself was destructive to the local tourism economy (Altuntaş and Gök 2021; Interview with Heybeliada Island real estate agent 15 June 2021; Interview with Büyükada Island real estate agent, 7 June 2021).

Islands such as Avşa that have not been affected by mucilage on the sea surface, have been affected by underwater “sea snow”, making the area unappealing (Interview with Avşa Island diving school staff, 9 June 2021).

For hotel tourism, the situation looks a little bit more optimistic. Although coastal hotel reservations have been heavily affected, hotel owners remain hopeful for the upcoming period. (Interview with Avşa Island hotel manager, 9 June 2021; Interview with Istanbul five star hotel commercial representative, 12 June 2021).

The situation was worse for day trips and overnight tourism. Islands within the Marmara Sea are usually big attractions on weekends for day and overnight trips. Interviews with local beach managers from islands such as Büyükada Island and Heybeliada Island revealed that the situation was even worse than they had expected (Interview with Heybeliada Island beach owner, 15 June 2021). A Büyükada Island beach manager stated “It’s worse than imaginable. On regular times at weekends, we would be working at full capacity, but because of the mucilage, I have not seen a single tourist, local or international, in the region” (Interview with Büyükada Island beach manager, 7 June 2021).

Additionally, the mayor of Marmara Islands Municipality, Süleyman Aksoy, referred to the sea snot as a natural disaster, similar to an earthquake that the city was not prepared for. In his interview, he also stated that the municipalities' efforts to restore the situation was going positively and that tourism in the area would be back to normal as a result (Sputnik News 2021).

A further critical destruction mucilage causes is to the underwater tourism in areas that are deeply rooted in cultural history. Underwater cultural heritage, which includes artefacts, archaeological sites, sunken ruins, and shipwrecks beneath the sea, is protected under the UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage and its Context and is a big attraction for tourists, both local and international. Since their first recognition in Turkey by G.F. Bass in 1960 (Özdaş 2020), these artefacts have been preserved and protected, not only by Turkey but also by the international community (Figure 4).



Figure 4. Underwater Cultural Heritage Sites in Turkey
(The Shipwreck Inventory Project of Turkey (TUBEP 2010))

Thus, the western coast of Turkey and the Marmara region is host to many precious shipwrecks such as the H.M.S Majestic at Çanakkale, which makes the region attractive for underwater tourism (Interview with Çanakkale diving school owner, 15 June 2021). Mucilage can attach itself to the sunken ships and have a detrimental effect on the sea physically (Figure 5).

The destruction mucilage causes to underwater cultural heritage, a “hot-spot” for tourists and divers from all over the world, influenced touristic visits. Additionally, these sunken ruins form artificial reefs providing ideal habitats for marine organisms, which have also been affected by mucilage. Firstly, the lack of oxygen destroys the artificial reef and, secondly, the mucilage increases hydrogen sulphide, which destroys the ship remains (Karakaş 2021).

To conclude, on a short term basis, the current situation is particularly affecting smaller touristic places. After the COVID-19 pandemic, most look to this current summer to recover from the deficit. Having looked at the economic impact on tourism in the region and throughout Turkey by interviewing those affected, the decrease in demand on the beaches, real estate, and boutique hotels suggests that a recession is pending for these sectors/businesses.

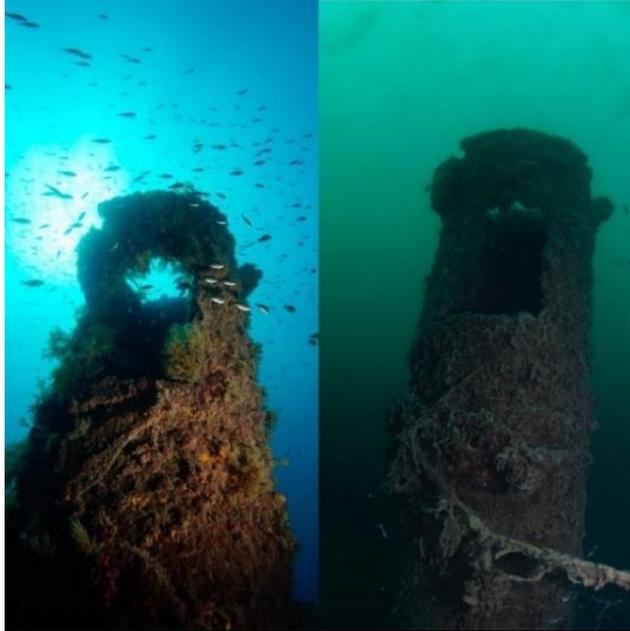


Figure 5. Photos of H.M.S Majestik, sunken ship at Çanakkale, before (left) and after (right) sea snot (Photos: F. Çoşkun)

Larger establishments, such as five star hotels with swimming pools, are less susceptible to the immediate impact of mucilage due to their facilities that can provide alternative leisure activities for tourists. These hotels' beaches have been heavily affected by mucilage and have been shut down, although municipalities' efforts in cleaning up the coast have helped these establishments.

The long term effects, however, have largely been ignored. Even though larger facilities can survive in the short term, with the area becoming less attractive by the day, according to the interviewees, it is likely that the tourists will choose other coastal areas of Turkey along the Black Sea and the Aegean Sea (Interview with Istanbul five star hotel commercial representative, 12 June 2021).

To foresee the negative effects the mucilage will cause, previous disasters' impact, such as COVID-19, can be taken as an example. Taking into account the

interviews and the number of reservation in the end of June 2021, it is safe to predict that the decline will continue, particularly in the Marmara region.

While it might be too late for preventive measures, it is not too late to combat the problem. By declaring specific areas within the Marmara region marine protected areas and introducing effective cleaning measures, the situation can perhaps be reversed. Nevertheless, this will be a long process and it is unclear whether smaller establishments in the region will be able to survive after such a blow. A mucilage alert system may be useful, but the establishment of scientific monitoring is crucial for combating this problem. Such monitoring will enable cooperation between the private sector, public bodies, and experts. This cooperation is crucial for combating the mucilage crisis while minimizing its effects.

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Öz

Özellikle denizcilik sektöründe, önleyici tedbirler, büyük ölçekli felaketlerin oluşmasını engelleyebilir. Marmara Denizi bölgesinde oluşan deniz salyasına karşı maalesef bu önleyici tedbirlerden yararlanılmamıştır. 1990'lardan beri birçok bilim insanının uyarlarına rağmen, musilajın artışını sınırlamak için gerekli tedbirler alınmamıştır. Sonuç olarak, eşsiz denizi, tarihi ve kültürü ile bilinen Marmara bölgesinde deniz salyası, balıkçılık yanında turizmi de etkileyecek bir hal alabilir. Bölge ve ülke ekonomisine önemli katkı sağlayan Marmara'daki turizm sektörünün deniz salyasından etkilenmemesi için sektörler arası işbirliği ve erken uyarı sisteminin geliştirilmesinin sorunu çözmede başarılı olabileceği değerlendirilmektedir.

Anahtar kelimeler: Müsilaj, Marmara Denizi, turizm, sualtı kültürel mirası

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