

SHORT COMMUNICATION

Unusual mass mortality of jellyfish *Rhizostoma pulmo* on the coast of the Sea of Marmara in December 2020

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Abstract

This study presents the unusual mass mortality of *Rhizostoma pulmo* occurred on the coast of İstanbul in the Sea of Marmara in the first week of December 2020. The density of dead *R. pulmo* was 45 ± 5 ind./m² in the area and the mean diameter was 24.3 cm. The role of physical parameters, marine pollution, nutrient influx, climate change, overfishing, invasive species on jellyfish blooms and its effect on human health are discussed briefly in this study.

Keywords: Barrel jellyfish, Sea of Marmara, gelatinous organisms, bloom, circulation system

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Rhizostoma pulmo (Macri, 1778), known as barrel jellyfish, is one of the common Mediterranean jellyfish species and frequently observed in all seas surrounding Turkey. Colour of its umbrella is typically pale grey and colourless, while its marginal lappets are narrowly edged with an ultramarine blue, violet, or brown line of dense colour (Öztürk *et al.* 2004; Çınar *et al.* 2014). Together with the moon jellyfish *Aurelia aurita*, it is one of the most important scyphozoan jellyfish species blooming along the coasts of the Sea of Marmara (İşinibilir 2012). It is also the second largest jellyfish species in the Sea of Marmara after *Drymonema* sp. (Öztürk 2020). Previous studies reported its population increase between August to December (Mariottini and Pane 2010; İşinibilir and Yılmaz 2016; Öztürk *et al.* 2018).

Within the first week of December (4 December 2020), an intense population increase of this species was observed along the Marmara coasts of İstanbul (Figure 1). This increase later ended with a mass mortality of this species, clearly observed on the beaches between Avcılar and Yeşilköy, approximately 10 km shoreline (Figure 2a). Each individual was at least 1 kg in weight. Most of them were collected and buried by ISTAC (İstanbul Environment Management Industry and Trade Company), İstanbul Metropolitan Municipality.

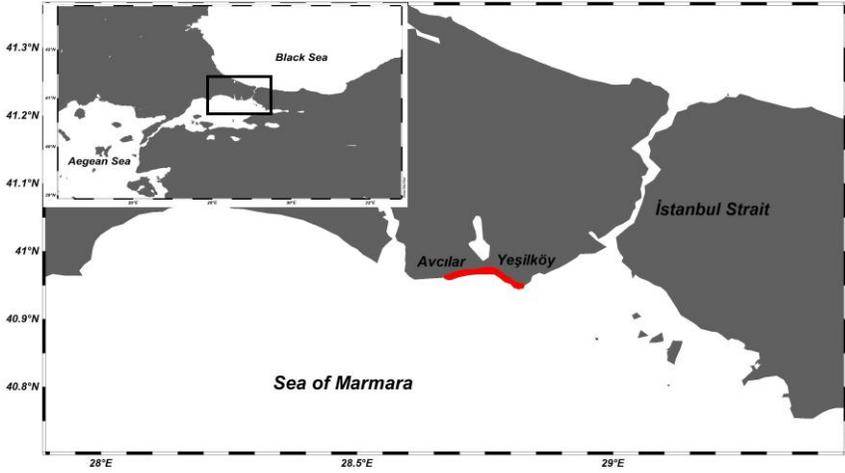


Figure 1. The location (between Avcılar and Yeşilköy) of mass mortality of *Rhizostoma pulmo* in the Sea of Marmara.

On 7 December 2020, the beach of Ambarlı (Avcılar) was visited and the stranded jellyfish specimens were examined. Individuals were photographed and the dead *R. pulmo* density was determined as 45 ± 5 ind/m² on sandy (Figure 2b, d) and rocky (Figure 2c) shores. The umbrella diameters of randomly chosen ten specimens were measured (Figure 2e) and found that the mean diameter was 24.3 cm and the maximum was 38 cm. The depth where dead specimens are clustered was less than 1 meter. The sea surface temperature was 17 °C.

Rhizostoma pulmo was categorized as moderately venomous by previous studies (Mariottini and Pane 2010; İşinibilir 2017). Erythematous and ulcerous lesions may cause after contact; burning on the skin and particularly the lips, sneezing and rhinorrhea, urticaria and systemic symptoms have been reported (Del Negro *et al.* 1991; Kokej and Plozzer 2002; Sumen 2019).



Figure 2. *Rhizostoma pulmo* bloom occurred along the coasts of İstanbul
a- High density along the beach, photo taken by drone (İhsan Dörtkardeş/DHA)
b-Individuals on sandy shore, c-Individuals on rocky shore, d-Stranded individuals,
e-Umbrella diameter of an individual

One of the key drastic consequences of climate change is the increase in cases of envenomation by marine animals due to human contact. Nowadays, jellyfish populations are increasing dramatically and spreading to new areas as a result of the change in the current regimes due to climate change. Injury with these animals in coastal countries appears to become a serious health problem that should be appropriately managed in the long run (Haddad *et al.* 2018). There have been more news related to injuries with jellyfish from the coastal areas of Turkey

(Gürlek *et al.* 2013). The clinical manifestations which may appear after the sting by contact of jellyfish are collected in two groups; local findings on the skin and systemic findings. Characteristic skin findings are rash, itches, burn-like wounds, redness, swelling, pain, and numbness. The systemic finding appears as a moderate or severe allergic reaction that looks like an anaphylactic reaction. These findings can be nausea, vomiting, abdominal pain, low blood pressure, shortness of breath, shock and even death (Öztürk *et al.* 2018; Hornbeak and Auerbach 2017).

Nobody can deny that, it is important to implement appropriate scientific approaches in order to reduce the number of victims and the harmful effects of the envenomation. It is commonly accepted that prevention is the priority in such envenomation cases. Therefore, if there is such blooming period of jellyfish at times like this, it must be avoided to swim in the sea and to touch the jellyfish even it is dead on the beach. Furthermore, if the victim is stung by the jellyfish, the interventions which should be applied at first on the scene are suggested as follows; avoid touching with bare-hand, do not use tap water to wash, rinse with 5% acetic acid (vinegar), remove the tentacles by means of tweezers, shave the skin with shaving foam, and apply local wound care. In case of any life-threatening condition, the victim should be admitted to the nearest hospital (Öztürk *et al.* 2018). Although jellyfish are consumed as food, used in cosmetic medicine in a vast majority of countries, we must remember that some species may threaten human health. Therefore, it is essential to take necessary precautions, inform the public by media and apply appropriate treatment so as to prevent the deleterious effects of the envenomation to human health.

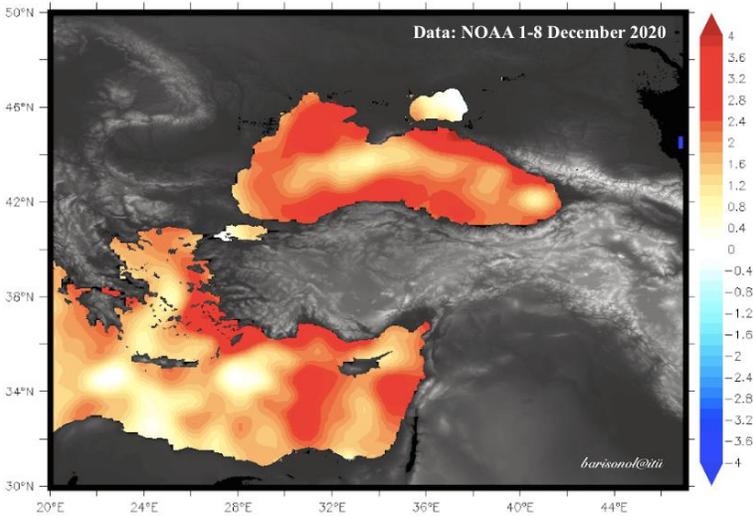


Figure 3. Anomaly in sea surface temperature of the Turkish Seas in the first week of December 2020 (source: NOAA, figure provided by Dr. Bariş Öñol)

Proliferation or bloom of *R. pulmo* in winter were reported in the previous studies (Malej and Vukovic 1984; Scalera-Liaci 1991; Kideys *et al.* 2000). Nutrient influx, climate change, marine pollution, overfishing and invasive species are generally responsible for jellyfish blooms (Mariottini and Pane 2010; İşinibilir and Yılmaz 2016). In terms of changes in climatic conditions, sea surface temperature is one of the important parameters. Long-term variations in the sea surface temperature can be monitored by satellite data. Figure 3 presents the anomaly in the mean sea surface temperature of the Turkish Seas for the first week of December 2020 compared to other normal years (*pers. comm.* Dr. Barış Önel). As much as 4-5°C anomalies were seen, which can be related to the bloom and mass mortality of *R. pulmo* occurred on the coasts of İstanbul.

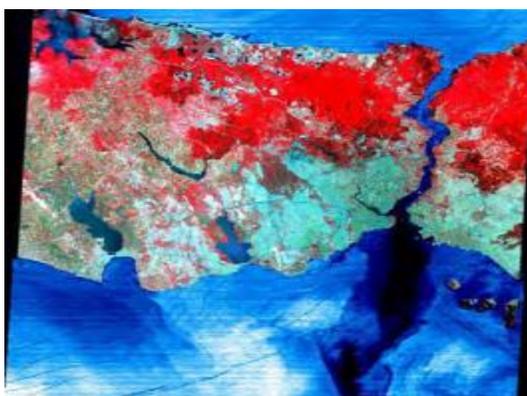


Figure 4. ASTER image for June 2000 showing the Bosphorus Jet (dark blue) (green: urban area, red: forested area) (Özsoy 2016b)

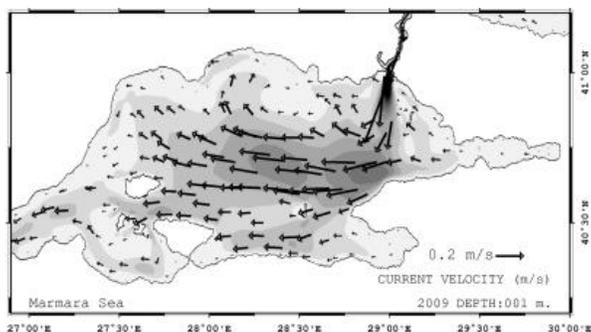


Figure 5. Annual surface mean of current velocity in the Sea of Marmara (Aydogdu *et al.* 2018)

Although Perez-Ruzafa *et al.* (2002) reported the relation between the increased nutrient input (especially due to agriculture) and increase in the number of *R.*

pulmo, the role of physical parameters such as winds and tides is clearly substantial (Keesing *et al.* 2016). According to their study, 90% of the jellyfish stranding occurred two days after winds started blowing onshore. In the present case, for 30 November and 1-2 December 2020, two days before the mass mortality, the average wind speed was 12.4 kt which is approximately 23 km/h, although the average wind speed for 2-3 December 2020 was 9.76 kt (<https://www.wunderground.com/history/monthly/tr/bak%C4%B1rk%C3%B6y/LTBA/date/2020-12>). The dominant direction of wind during that period was north. It is known that the northern winds normally accumulate the bulk of jellyfish to the southern coasts, but in this case all death individuals were stranded to the northern beaches. This event could be related with the Bosphorus jet effect (Figure 4), which is reinforced with the northern winds (Özsoy 2016a). Therefore, the small branch of the Bosphorus jet could have translocated the bulk of jellyfish to the shore of Avcılar (Figure 5).

Pitt *et al.* (2014) stated that strandings are more likely a consequence of mortality, rather than a cause and that the effect of senescence after spawning, infestations of parasites, food limitation, disease, low salinity, extreme water temperatures, predation and intertidal stranding can cause collapse of jellyfish blooms. Even though ecological importance of jellyfish blooms has a growing scientific interest (Richardson *et al.* 2009; Fuentes *et al.* 2011), it is also crucial to understand the spatial and temporal distributions of these blooms and the effect of these kind of blooms and jellification in the Sea of Marmara by implementing effective and long-term monitoring studies by scientific cruises and the citizen science-based jellyfish monitoring programs such as “Ya Yakarsa” (www.yayakarsa.org).

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Marmara Denizi’nde denizciğeri denizanası (*Rhizostoma pulmo*) olağandışı kitle ölümü, Aralık 2020

Öz

Bu çalışma 2020 yılı Aralık ayında, İstanbul kıyılarında meydana gelen denizciğeri denizanası (*Rhizostoma pulmo*) olağandışı kitle ölümü üzerinedir. Yapılan saha çalışmasında *R. pulmo* ölü bireylerinin yoğunluğu 45 ± 5 birey/m² ve ortalama çapları ise 24,3 cm’dir. Denizanası aşırı çoğalmalarında fiziksel parametrelerin, deniz kirliliğinin, besin tuzu girdisinin, iklim değişikliğinin, aşırı balıkçılığın, istilacı türlerin etkisi ve bu aşırı çoğalmaların insan sağlığı üzerine etkileri kısaca tartışılmıştır.

Anahtar kelimeler: Denizciğeri denizanası, Marmara Denizi, jelimsi organizmalar, aşırı çoğalma, akıntı sistemi

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