

# Fish mass mortalities are not always related to environment

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## ABSTRACT

Several thousands of round sardinella (*Sardinella aurita* Valenciennes, 1847) individuals were deposited at several locations of Kavala Gulf shoreline (northern Aegean Sea, Greece) in the morning following a strong storm. Fish biomass was estimated to exceed 2 t, with total lengths ranging from 16 to 22 cm. Instead of being the effect of environmental conditions (temperature, wind, waves) as was initially assumed, the mass mortality of the fish was caused by a small-scale fisheries vessel, whose net was damaged while unloading the fish onboard. Dead fish were simply washed ashore.

**Keywords:** fish mortality, fishing, environment, round sardinella.

## INTRODUCTION

Fish mass mortality incidents include direct effects resulting from 'abnormal' or severe meteorological conditions (e.g. temperature shock<sup>1</sup>), and indirect effects related to environmental conditions, such as toxic algal blooms<sup>2</sup> and susceptibility to pathogen infection<sup>3</sup>. Some fish, such as the middle-sized pelagic fish (Family: Clupeidae) of the subtropical zone, round sardinella (*Sardinella aurita* Valenciennes, 1847), are sensitive to environmental fluctuations and suffer drastic population changes when conditions are unfavourable<sup>4,5</sup>. The mass mortalities that have been reported for round sardinella in the northern Mediterranean Sea were all attributed to the inability of the species to withstand sudden temperature declines (Adriatic Sea<sup>6</sup>, Aegean Sea<sup>1</sup>, Adriatic and Ionian Seas<sup>7</sup>). The behavioural responses of round sardinella show that it is attracted to artificial light<sup>8</sup>, but avoids noise<sup>9</sup> and vessel light<sup>10</sup>. In order to avoid predation, round sardinella shoals may stay close to the sea bottom, on the edge of the continental shelf<sup>11</sup>, may disperse<sup>12</sup> or even strand themselves on the shore<sup>13</sup>.

The aim of the present work was to reveal the cause of the round sardinella mass mortality observed at the northern Aegean coastline in February 2005 following a strong storm and heavy southerly winds.

## RESULTS

In the morning of 15<sup>th</sup> February 2005, thousands of round sardinella individuals were deposited on several locations of the Kavala Gulf shoreline (northern Aegean Sea, Fig. 1), while others were observed floating into the water. The locations where fish were found were directly exposed to onshore winds and waves. The total biomass of the washed-up fish was estimated to exceed 2 t and their total length ranged between 16 and 22 cm. The length distribution suggested that the deposited fish were between two and four years old<sup>14</sup>. The spatial extent of the phenomenon and the high fish biomass indicated that practically all round sardinella shoals that were close to the coastline were deposited by the strong waves beyond the high splash mark. Surprisingly, round sardinella was the only fish species affected by the surge of the water.

According to the data of the meteorological station of Fisheries Research Institute (FRI) of Kavala located nearby, during the previous night, heavy SSE winds were blowing with forces reaching 50 km/h resulting

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**Figure 1.** View of the seashore with the stranded round sardinella (*Sardinella aurita*) individuals. Inside panel clearly shows the species.

to high storm waves. The meteorological parameters, routinely recorded at 30 min intervals, showed no sudden variation during the previous 24 hours. However, despite the harsh weather conditions, a few small coastal boats were operating. These small boats (less than 10 m in length) were using a small purse seine net (called “sardine-net” in northern Greece) and are usually fishing close to shore targeting small and medium size pelagic fish, mainly sardine (*Sardina pilchardus*) and round sardinella.

## DISCUSSION

As round sardinella was known for its massive incidents in Greek waters<sup>1,13</sup>, we thought this was a case for another one. The incident was very impressive. Hundreds of meters of shore were covered with stranded round sardinellas. We began to write this article as a case study of storm wave induced mortality in the northern Aegean Sea. In parallel, we downloaded all weather data from a nearby meteorological station to check for any correlation.

In vain, because soon after deciding the authors list and the conference to which this short note would have been submitted to, we heard the news. The previous day, a small-scale inshore fisheries vessel had caught, in a single haul, 10 t of round sardinella (rough estimate of the fisher and owner of the boat). The amount of fish was so large and the weather so bad that the net was torn apart before the fishers being able to unload the full catch on the boat. About 30% of the catch escaped through the damaged net. The remaining 70% completely covered

the boat and the bad weather conditions, mainly waves, caused the loss of large quantities of fish back to the sea. It was these fish that we discovered the next morning along the coast.

Had we not heard the sea story in the fish market, this could have been the third—well documented—incident of mass mortality observed in the northern Aegean Sea over the last 12 years, the other two being caused by the sudden decline of temperature<sup>1</sup> and by a predator attack, which forced round sardinella individuals to strand themselves on the shore<sup>13</sup>.

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