COMPARING CTENOPHORE SPECIES IN THE BLACK SEA AND THE EASTERN MEDITERRANEAN

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Abstract
The possibility of two Black Sea invaders *Mnemiopsis leidyi* and *Beroe ovata* blooms in the eastern Mediterranean is analyzed. A Comparison between these two species and the indigenous close species *Bolinopsis vitrea* and *Beroe cf. cucumis* is presented.

Key words: Mnemiopsis leidyi, Bolinopsis vitrea, Beroe ovata, Beroe cucumis

While M. leidyi and the indigenous Mediterranean species *Bolinopsis vitrea* Agassiz, 1880, another representative of the ctenophore Order Lobata, occur typically in neritic waters, they rarely overlap (1). *Bolinopsis vitrea* is indigenous to the Mediterranean, but not particularly abundant, although other species of *Bolinopsis* can sometimes reach high densities in other areas (2)

B. vitrea and *M. leidyi* have a similar size range and general body shape, but *B. vitrea* lobes are relatively shorter and they originate about halfway between the mouth and the infundibulum. The estimated relationship in the present study between total length with lobes and wet weight for both species showed that *Bolinopsis* is heavier than *M. leidyi* of equivalent length. Similarly, dry weight is higher for *Bolinopsis* than for *M. leidyi* in the Aegean Sea. Our experiments indicate that *Bolinopsis vitrea* has a lower metabolic and ingestion rate than *M. leidyi* of comparable length, suggesting that *Bolinopsis* is better adapted to the oligotrophic Mediterranean waters. The reproduction rate of *Bolinopsis vitrea* individuals is very weak (12-96 eggs. d^{-1}), probably due to the low ambient prey availability, while *M.leidyi* specimens produced 448 and 440 eggs per day, respectively.

The invasion of *M. leidyi* to the northern Aegean did not elicit any notable effect on behalf of the zooplankton communities, or on mesozooplankton abundance, biomass and community composition. If we compare zooplankton abundance before the *M. leidyi* invasion, this was much higher in most areas of the Black Sea than in the Aegean Sea, which was precisely what favoured the huge *M. leidyi* outbreak in the Black Sea. Thus, low abundance of zooplankton in most areas of the Aegean Sea could act as a limiting factor for *M. leidyi* development. According to our estimations, a population as small as that present cannot graze more than 0.08% of copepod abundance daily, which is negligible.

Among the other preys of both ctenophore species are fish eggs and larvae.

With a big abundance of anchovy eggs and larvae in the Aegean Sea, there seems to no measurable impact of *M. leidyi* and *B. vitrea* on the abundance of anchovy ichthyoplankton in the northern Aegean Sea.

Our experimental data show that conditions of the Aegean Sea can be well tolerated by *M. leidyi*. It can live, feed at a high intensity, and reproduce here. Its eggs develop well, and the percent survival and development of eggs are high (99.7%), but it has a smaller size than in the Black Sea, close to the size of individuals recorded in the Sea of Azov and in the Caspian Sea. Probably this is connected with a suboptimal salinity in the latter places, while in the case of the Aegean Sea, conversely, local salinity may be too high.

Experimental and field observations bring us to the conclusion that the distribution of both *B. vitrea* and *M. leidyi* is regulated to a major degree by prey availability and that the abundance of both species is correlated with the biological productivity of their habitat. In the mostly oligotrophic waters of the Aegean Sea, particularly open waters with low zooplankton density, the development of these carnivorous species is severely limited, and hence, their impact on the biota is virtually nil.

In 1997 another invader ctenophore, *Beroe ovata,* spontaneously appeared in the Black Sea and the Black Sea ecosystem began rapidly to recover (3,4). The question of origin of this species became relevant. First of all scientists presumed that *Beroe ovata* had arrived from Mediterranean Sea. A closer analysis of its morphology led to a revision of its identity, which turned out to be *Beroe ovata* Mayer 1912. It is believed to have been introduced with ship ballast water. Its origin is presumed to be the Atlantic coast of North America, exactly as the previous invader *Mnemiopsis leidyi*. Moreover comparing the new invader genus Beroe with Mediterranean *Beroe ovata* led us to conclude that it is not *Beroe ovata* Chun 1880, but Beroe cf. cucumis Mayer which inhabits the Mediterranean Sea (5).

Representatives of *Beroe* live in the shallows and estuaries of the Mediterranean Sea, and of the tropical and temperate Pacific and Atlantic Oceans. Few species inhabit Arctic Seas (2, 6, 7). All species of beroids are considered to be exclusively feeding on other planktivorous ctenophores. There is often a trophic linkage between *Beroe* species and planktivorous ctenophores. *Beroe* is an important link in pelagic food chains, but before its arrival in the Black Sea, comparatively little was known about its biology. *Beroe* significantly affects the population structure of planktivorous ctenophores and thus indirectly modifies the population dynamics of the zooplankters at lower trophic levels,as clearly demonstrated by *B. ovata* in the Black Sea.

B. ovata spread from the Black Sea to the Sea of Marmara, where it occurs every year during seasonal development of this species (August-November), even it was found near the Dardanelles (per. com. Melek Isinibilir, Istanbul University), most probably *B. ovata* might spread further west to the eastern Mediterranean and overlap with indigenous *B. cf. cucumis*.

Like *M. leidyi* and *B. cf. cucumis* (8, 9), *B. ovata* would not be able reach high density in the eastern Mediterranean due to very low prey (*M.leidyi* and *B. vitrea*) availability. (13) Thus at the moment a bloom of ctenophores – both invaders and indigenous – is not to be expected in the eastern Mediterranean.

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