HEAVY METAL CONCENTRATIONS IN SOME BIVALVE SPECIES FROM THE SOUTHERN COAST OF THE MARMARA SEA (TURKEY)

Serhat ÇOLAKOĞLU*, İbrahim Ender KÜNİLİ

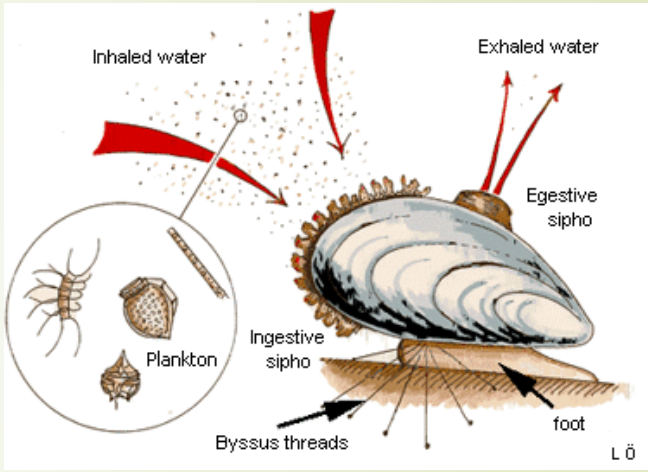
Corresponding Author: serhat_colakoglu@comu.edu.tr

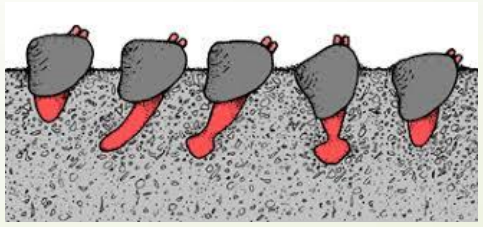
Bivalves

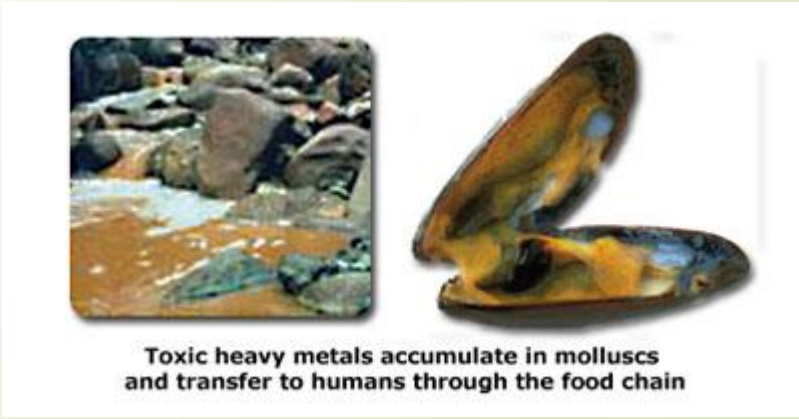
- The quality requisites of bivalve mollusks are primarily dependent on the water quality

- Since they are filter - feeding organisms, they can accumulate toxic substances, including heavy metals, from seawater together with nutrients.

- Heavy metals such as cadmium, lead, and mercury are particularly important dangerous matters since they are especially found at high concentrations in industrialized coastal waters







Bivalves

- Most bivales are economically important, some of them are found in Marmara Sea, Turkey.

- Most harvested species among Marmara Sea bivalves are;

- Manila Clam - *Ruditapes philippinarium*
- Oyster - *Ostrea edulis*
- Wedge Clam - *Donax trunculus*







Material

Oysters

- The oyster’s body is enclosed in a shell hinged by two parts.
- The shell is oval or pear shaped and has a distinct hooked beak where the two shells join.
- The two shells are shaped differently, with one being cup shaped and cemented to the substrate, and the other flat, forming a lid (hence why it is sometimes known as the flat oyster).
- Oysters are usually up to 11 cm long and live on average for 5-10 years, but they have been known to grow as long as 20 cm and live for 20 years









Wedge Clam

- Wedge Clam is an Atlantic Mediterranean warm-temperate species.
- The shell can be found in colors ranging from olive, through chestnut, to yellow-white and is over an inch broad.
- The sexual dimorphism of wedge clam is largely gonadal and both sexes are equally represented in populations.
- In the Atlantic, it has been recorded from Senegal to the French coast It inhabits the high-energy environment of exposed sandy beaches, where it forms extensive, dense beds.









Manila Clam

- The internal surface of the shells near the siphon end is normally stained a deep purple color or yellow.
- Their siphons are short so they are buried to only about 4" fairly high in the intertidal zone.
- They inhabit a variety of substrates, from gravel to mud to sand, above the half-tide level, which is higher than the zone where butter and littleneck clams are found. The black siphon tips on Manilas are split.
- The The inside edge of their shell is smooth to the touch. In Puget Sound, they are especially abundant in small outlets and lagoons.
- Growth is quite rapid with the clams reaching marketable size in two years.

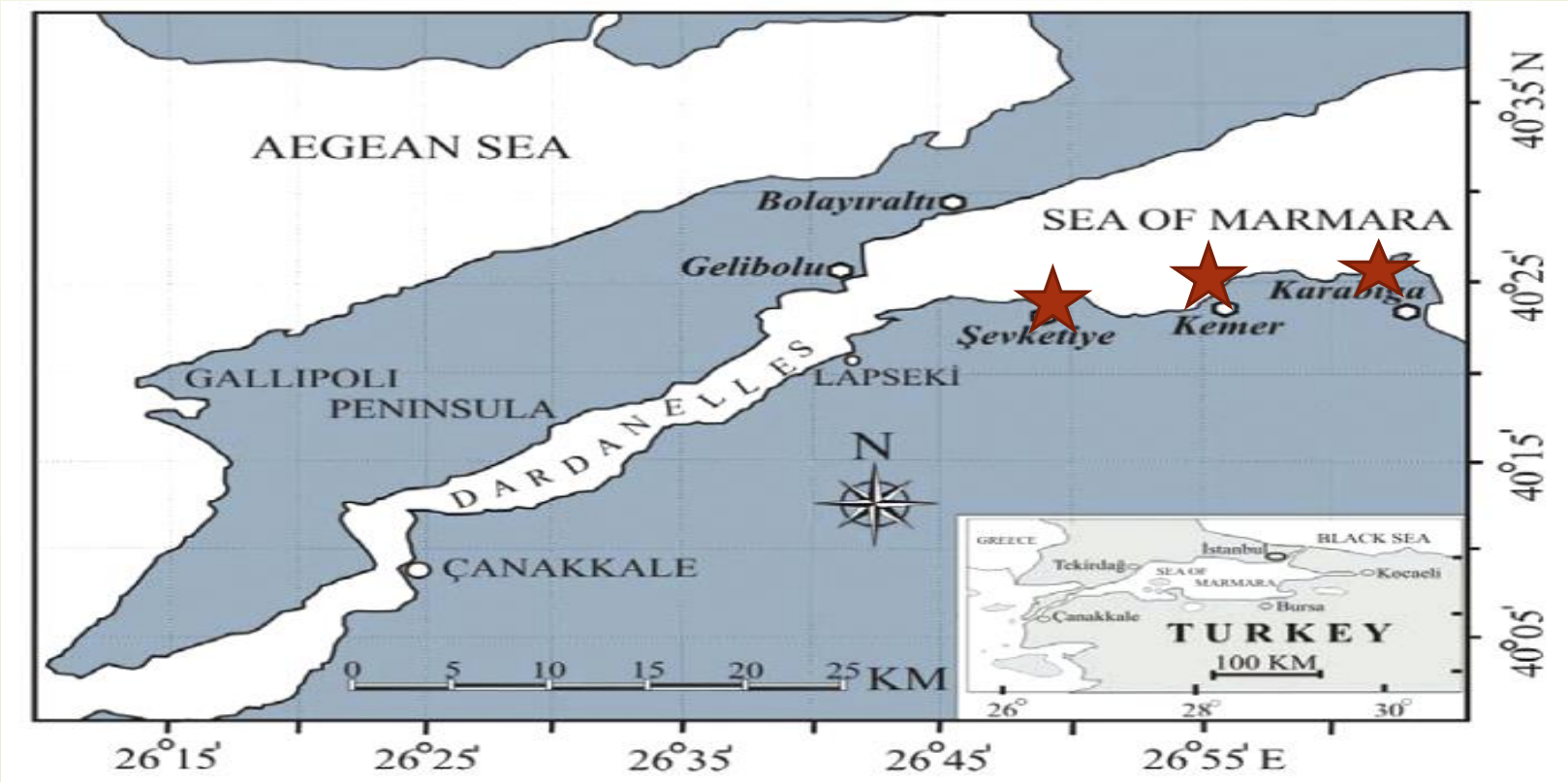






Sample Collection

- Research materials, oyster, wedge clam and manila clam collected from the southern coast of the Marmara Sea, Turkey.
- Samples were collected seasonally by diving into several natural beds of littoral zones between 2013 and 2014



Method

- For Cd, Hg and Pb determination, about 20–30 specimens from each species were homogenized by an Ultra-Turrax DI 25 dispersing device.
- All dissection equipment, plastic and glassware were cleaned by soaking in 10% v/v HNO_3 for 24 h and then rinsed with Milli Q water to avoid contamination.
- Cadmium and lead were determined by Graphite Furnace Atomic Absorption Spectrometry. Mercury was determined by the hydride technique.
- Two grams of homogenized bivalve sample material were digested with 8 ml HNO_3 (65%) and 2 ml of H_2O_2 (30%), in a closed Teflon vessel using a MARS 5 microwave oven at 200 psi with 25 min ramp time to 210 °C at a maximum power of 300 W and 10 min hold time.

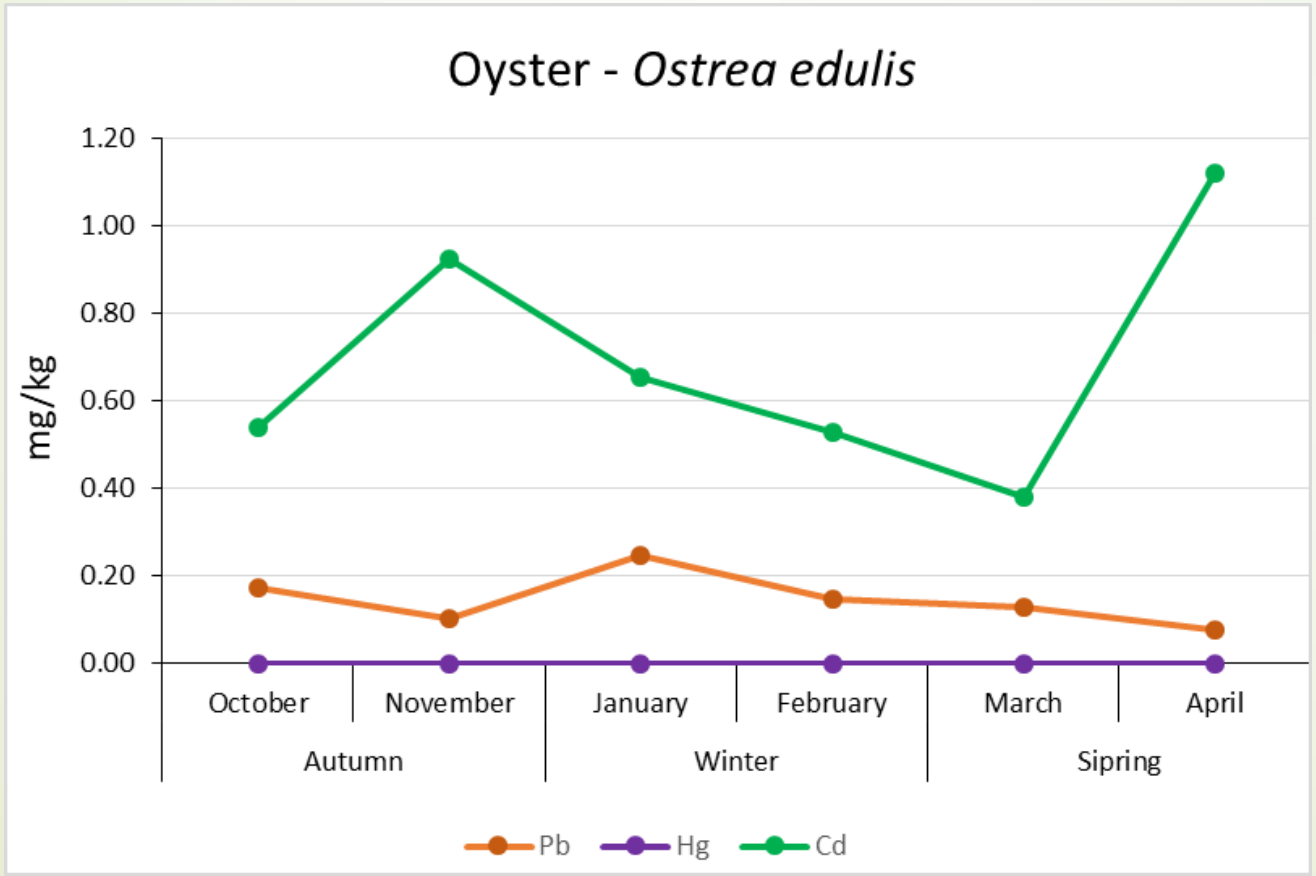
- After mineralization, digests were cooled and diluted to 25 ml with Milli Q water and stored in polyethylene bottles until analysis. Measurements were performed in triplicate.

- The wavelengths monitored were 228.80 nm for Cd, 53.65 nm for Hg and 283.30 nm for Pb.

- Limits of detection (LODs) were 1.15 mg/kg for Cd, 50.28 mg/kg for Hg and 11.42 mg/kg for Pb. Limits of quantification (LOQs) were 3.80 mg/kg for Cd, 166.02 mg/kg for Hg and 37.68 mg/kg for Pb.

- The following relations were used: LOD= 3 Sb/m and LOQ= 10 Sb/m, where Sb is the standard deviation of the blank response (n=5) and m is the slope of the calibration curve for each element.

Results

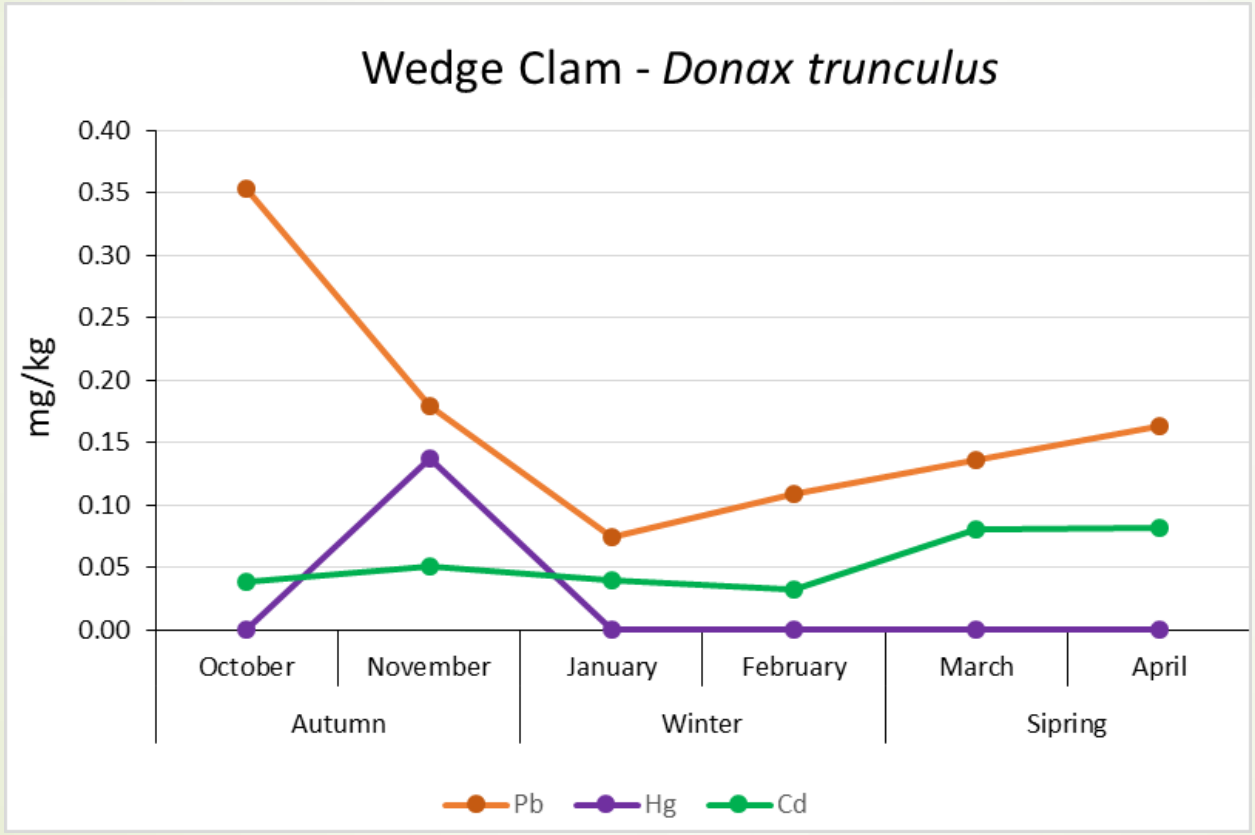


Cd (cadmium) was ranged 0.40 to 1.17 mg/kg

Pb (lead) was lower than 0.20 mg/kg in all months

Hg (mercury) was not determined in any samples

Results

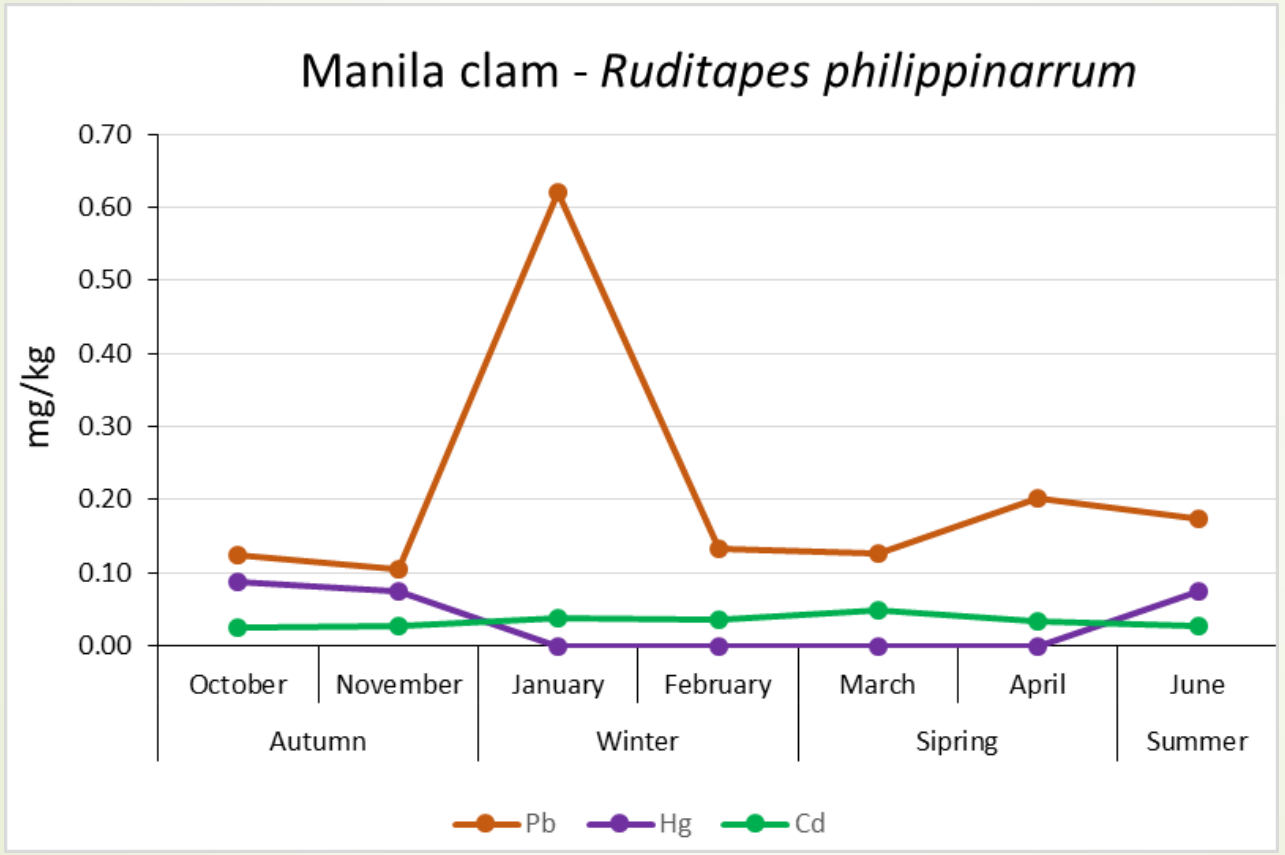


Pb was highest in Autumn Samples ranged 0.17-0.36 mg/kg

Hg was just determined in November samples 0.14 mg/kg

Cd was ranged 0.4 to 0.7 mg/kg in all months

Results



January was the highest Pb level with 0,62 mg/kg

Hg and Cd were under 0.10 mg/kg at all months

Hg was not determined January to April

Conclusion

- The heavy metal levels of bivalves were found in the following ranges: Cd 0.03–1.12, Hg<LOD–0.14 and Pb 0.07–0.62 mg/kg.
- Among the reported metal levels, only Cd (1.12 mg/kg) in oysters exceeded the maximum critical concentrations enforced by Turkish legislation and European Commission.
- In conclusion, future monitoring programs should follow these changes in these metals

Thank You
For Attention