

2 ABSTRACT

This work deals with the problem of accumulation of mercury in the tissues and organs of four species of birds of the family *Laridae* – the common gull (*Larus canus*), the herring gull (*Larus argentatus*), the black-headed gull (*Chroicocephalus ridibundus*) and the black-backed gull (*Larus marinus*) residing in the Polish coast of the Baltic Sea in the years 2010–2013. The study included also three species of the eggs of aquatic birds – the sandwich tern (*Sterna sandvicensis*), the common tern (*Sterna hirundo*) and the herring gull (*Larus argentatus*). In parallel, research was conducted with the participation of the African penguin (*Spheniscus demersus*) which lives in the controlled environment of a zoo.

The study attempts to identify some factors that shape the level of metal accumulation in the bird's body, regarding birds staying in the Polish coastal zone, by examining the relationship between mercury concentrations in selected tissues from individuals of all ages and sex. The conducted research and analysis of the obtained results together with the review of the literature of the subject allowed to formulate the following conclusions:

1. Total mercury concentration in the tissues and eggs of seagulls and terns over the Gulf of Gdansk was lower or comparable to the concentration of mercury in birds of the same species in different regions of the northern hemisphere. Such results may allow to define the thesis that the southern Baltic coast is a moderately polluted area and food exposure does not endanger the lives of birds. In none of the species of seagulls present above the southern Baltic, median mercury concentrations in feathers did not exceed the critical value, but in some individuals discrete values were higher than $5000 \text{ ng}\cdot\text{g}^{-1} \text{ d.w.}$ In innermost primary, of immature herring gull the mercury concentration exceeded almost twice the critical value. In adults, the concentration of mercury higher than critical was determined in rectrices of the common gull, in contour feathers of the black-headed gull and in innermost primary and down of black-backed gull. However, the conclusion about adverse effects should not be unambiguous.
2. Feathers, blood, and eggs of water birds can be obtained in a non-invasive way and can provide information on mercury contamination but can not be considered as equivalent indicators. Blood and feathers in the growth phase allow effective tracking of local contamination and directly reflect the mercury loading of the bird organism. However, the usefulness of long-term assessment of the contamination of the region from where the food comes from, more useful are fully developed feathers. Adult herring gull bred on the Polish coast are mostly settled, drawing on the same nutrient resources as other species of gulls, however, this particular species can be more useful as the sentinels of the environment.
3. Food is the main source of mercury determining the level of its accumulation in the body of birds staying in the coastal zone of the Gulf of Gdansk. With a highly variable diet, only subtle differences between individuals of different ages and gender can be revealed.
4. Herring gull's brains have been shown to be highly sensitive to the increase in mercury concentration provided with food. Birds probably exhibited a protective mechanism of the central nervous system consisting in an increased accumulation of mercury in muscle tissue with a slow accumulation of this element in the brain. The concentration of total mercury in the brain relative to other tissues of herring gull was the lowest. The effectiveness of the demethylation process depends on the level of total mercury and the condition of the organism, and the mercury content of the process can be measured by the amount of mercury that is incorporated into the newly formed feathers. Studies with birds have revealed logarithmic mercury concentration in newly formed feathers and concentrations of organic mercury and inorganic mercury in the liver. The resulting dependence indicated more effective demethylation in the liver, which revealed a greater increase in inorganic mercury concentration relative to organic mercury embedded in the feathers at the same time.