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## Changes in the Gulf of Gdansk Biocenosis by Round Goby (*Neogobius melanostomus*) – An Invasive Ponto-Caspian Fish

Mariusz R. Sapota

University of Gdańsk, Institute of Oceanography, Department of Marine Biology and Ecology

Al. M. Pilsudskiego 46, 81-378 Gdynia, Poland

T: 48 58 6601601F: 48 58 6202165 E: ocmrs@univ.gda.pl

Functioning of each ecosystem tends to stay in its specific dynamic equilibrium. Structure of the trophic net, its complicity and richness are governing factors in ecosystem stability. Changes in species content can influence the structure of the trophic net, flow of energy and circulation of matter. Invasion by the round goby (*Neogobius melanostomus*), the Ponto-Caspian fish, has been observed in the Gulf of Gdansk in 1990. Gobies were of small importance during the first few years of the invasion, but soon they became the dominant of the shallow water fish community in the west part of the Gulf of Gdansk. The invasion process in this area involves a number of different species and a stable and complex ecosystem. This unusual situation provokes some important questions: How was such successful invasion possible? What changes in the ecosystem of shallow water of the Gulf of Gdansk were caused by the invader? We are trying to answer the second question by concentrating on the portion of the ecosystem where the biggest changes are likely to happen and document the scale of the change.

Round goby is a typical shallow water fish. Adult gobies feed primarily on bivalves. Filter feeders, primarily bivalves, are treated as dead end in the trophic net of shallow water zones of seas. This also applies to the Gulf of Gdansk. There are some fish species, mainly eelpout and flounder, feeding sporadically on bivalves but for none of the species do bivalves represent such an important source of food. Additionally general changes in the biocenosis during last thirty years resulted in increased bivalve quantity and areas covered by them. New invasive fish species removed part of this bottom deposit. A fraction of organic matter caught in bivalves is moved back to the trophic net. The average round goby has an energetic value of about 142 kJ. Colonies of bivalves do not only represent deposits of organic matter but also act as a sink for many toxic substances. Round goby feeding on bivalves returns toxic substances into the food web. From the heavy metals, the round goby accumulates mainly zinc and copper. In quantities higher than other Baltic fish – zinc up to 236 mg kg<sup>-1</sup> ww in gonads, copper up to 325 µg kg<sup>-1</sup> ww in liver. Other heavy metals are accumulated in much smaller quantities. Accumulation of chlorinated hydrocarbons is lower in round goby than in other Baltic fish and even in the blue mussel. It is uncertain what impact the returned toxins might be on the ecosystem.

Up to now the round goby has been documented only in the west part of the Gulf of Gdansk. It inhabits the shallow water zone of an area of about 400 km<sup>2</sup>. The quantity of round goby varies from less than one to 600 individuals on 100 m<sup>2</sup>. Each year on average an adult round goby consumes about 0,4 kg of bivalves. Given the density of round gobies, thousands of tons of bivalves are consumed by this species each year. This is likely to be an important change to the Gulf of Gdansk food web. Tons of blue mussel (dominant bivalve in the Gulf of Gdansk) consumed represent a large quantity of copper being returned to the trophic net.

Due to degradation of ichthyofauna structure in the Gulf of Gdansk (lack of predators in shallow water zone) the round goby is not an important food source for other fish. Instead, the round goby is the main food supply for birds – black cormorants feeding in that area. The round goby constitutes from 60 to 90% of food of this birds. The round goby is also potentially a market fish.

Concluding, the invasion of round goby greatly changed the shallow water biocenosis of the Gulf of Gdansk.