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Sex Ratio as One of the Major Factors Promoting the Invasion of the Round Goby (*Neogobius melanostomus*) In the Gulf of Gdańsk

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Invasion by the round goby (*Neogobius melanostomus*), the Ponto-Caspian fish, has been observed in the Gulf of Gdańsk from 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. The invasion in this area involves a number of different species and a stable and complex ecosystem.

Ecologically important invader is studied carefully. Most of population features are the same as in the native regions of occurrence. One of the most prominent differences is the sex ratio. In the Gulf of Gdańsk number of males is much higher than the number of females. Currently observed, sex ratio is two or three males to one female.

The round goby spawns in waters of depth down to twenty meters, mostly in the shallowest areas. Males guard eggs attached to hard elements of bottom. In the area of native occurrence, the Ponto-Caspian region, effectiveness of reproduction is correlated with sex ratio in the spawning population. When number of females is greater than number of males the effectiveness falls down. Nests are big, many females lay eggs into one nest (round gobies are multiple spawners). Guarding and ventilation of nests is difficult, a lot of developing eggs die. In native areas, the numbers of males and females are mostly equal and spawning success is excessive. Reproduction takes place during all warm periods of the year. In the Gulf of Gdańsk, spawn usually prolongs from the mid of April to the end of September. Due to the domination of males in number, the nests are small. Their guarding effectiveness is high. It results in the highest, ever observed, reproduction success. It promotes the successful invasion.

The sex ratio in fish population might be influenced by internal (genetic) or external (i.e., temperature, salinity, pH) factors. Performed investigations showed that temperature has the biggest influence on sex ratio in investigated population. Despite this in all temperatures from 10 to 20°C males were dominating among successfully hatched fish. It is worth to point out that in 10°C embryogenesis takes over two months while in 20°C only two weeks. In environment, the probability of successful finish of embryos development, in temperatures around 10°C, is very low. Male during all period of embryos development guards nest and does not eat. Its death before the end of embryogenesis is highly possible.

Investigations on genetic factors determining sex in round goby are in progress.

Taking into account frequent invasions of the round goby in various European and North American regions, presented data may be employed for prediction of invasion potential in early stage of settlement. Domination of males in numbers results in high reproduction effectiveness and successful invasion. Too low water temperature prevents effective reproduction.

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