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Biological and Ecological Features, Enough to Predict Invasion – The Round Goby Case

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Biological invasions are one of the most important treats for stability of ecosystems. For many years, biological invasions have been investigated and general rules concerning this process are well described. In many cases, knowing the main invasion vectors, we can predict which species could be the next invader. Many non-indigenous species present in the Baltic Sea are of Ponto-Caspian origin. Both regions have similar geological history and partially similar environmental conditions. They are connected by rivers and canals systems. Round goby is common Ponto-Caspian species with wide environmental conditions tolerance. In 1990, first round gobies were fished in the Gulf of Gdańsk. It was unexpected as each invasion but not curious. Many aspects of the Gulf of Gdańsk environmental conditions were favorable or at least acceptable for round goby. Unexpected was the scale of invasion, we observed, in subsequent years. Round goby spawns in waters of temperature over 10°C, embryo development is most effective in temperatures from 15 to 20°C. Such temperatures are typical for shallow, inshore waters of the Gulf of Gdańsk, in summer. Round goby is classic euryhalinic species. Salinity of 7 PSU does not influence fish importantly on any stage of its ontogenesis. Round goby is typical bivalveworous fish. Zoobenthos of the Gulf of Gdańsk is dominated by bivalves, especially blue mussel, forming very good food base for round goby. So, environmental conditions seem to be favorable for round goby. Why do we describe the invasion of round goby, in the Gulf of Gdańsk, as at least to some extent, unexpected? Round goby builds nests under hard substrate, on bottom. Nest and territory around it are guarded effectively by male. The Gulf of Gdańsk is typical soft bottom area. Stones are present on very limited regions. Ports, concrete piers and other hydrotechnical constructions may be use for round goby nests placement, also. Taking into account the area of hard substrates on the bottom and the average distance from one nest to another (about 2 meters); reported from fish native regions, it was possible to predict the effectiveness of spawning. This calculation did not give round goby chance for serious invasion, in the Gulf of Gdańsk. Surprisingly, round goby nest distance in the Gulf of Gdańsk is much smaller than in fish native region. Nests are situated very close. Often, they attach one to another. As the result we observe much more effective reproduction that could be predicted. Invasion of round goby in the Baltic Sea could be expected but the place of its start and the invasion extent in southern, sandy bottom areas are definitely unexpected. In contrary, almost all north shores of Baltic Sea are rocky with hard bottom but round gobies are still not so frequent in those areas. In described case, fate and lack of predators in shallow water zone were the main factors promoting invasion despite deficiency of spawning areas. This case shows, that prediction of invasion place and size is very difficult and many invasions could be still unexpected.

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