FUNDING PROGRAM FOR NEXT GENERATION WORLD-LEADING RESEARCHERS

Project Title: Research Project on the Establishment of Surrogate Broodstock Technology in Marine Fishes	
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1. Background of research

Wild larvae of highly migratory fish species, such as bluefin tuna, Japanese eel and yellowtail, caught in the ocean are reared on fish farms for the aquaculture. Japanese farmed fish has a reputation for being of high quality and safe, making it popular overseas, and exports are increasing. In recent years, flourishing aquaculture in neighboring countries has resulted in overfishing of larvae and competition. Simultaneously, the Japanese domestic aquaculture industry is also being battered by factors such as crude oil price hikes, declining fish prices, and aging of fishermen.

2. Research objectives

Japan has developed some of the most advanced fish farming techniques in the world, but techniques for spawning in captivity, cultivating larvae, and rearing larvae of bluefin tuna or other large fish is still in the development stages. Our ultimate goal is to “use mackerels, which are smaller and which lay eggs in tanks, to act as surrogates for bluefin tuna”. To achieve this goal, we are following our original research program—“the development of surrogate broodstock technology in marine fishes (having one fish species lay eggs of another fish species)”.

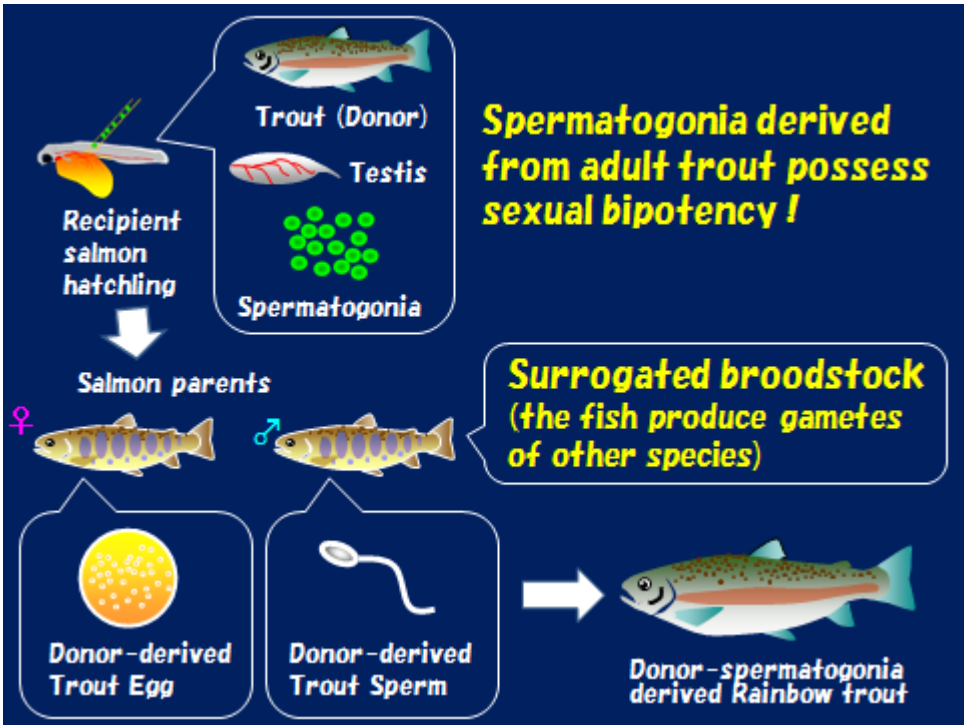
3. Research characteristics (incl. originality and creativity)

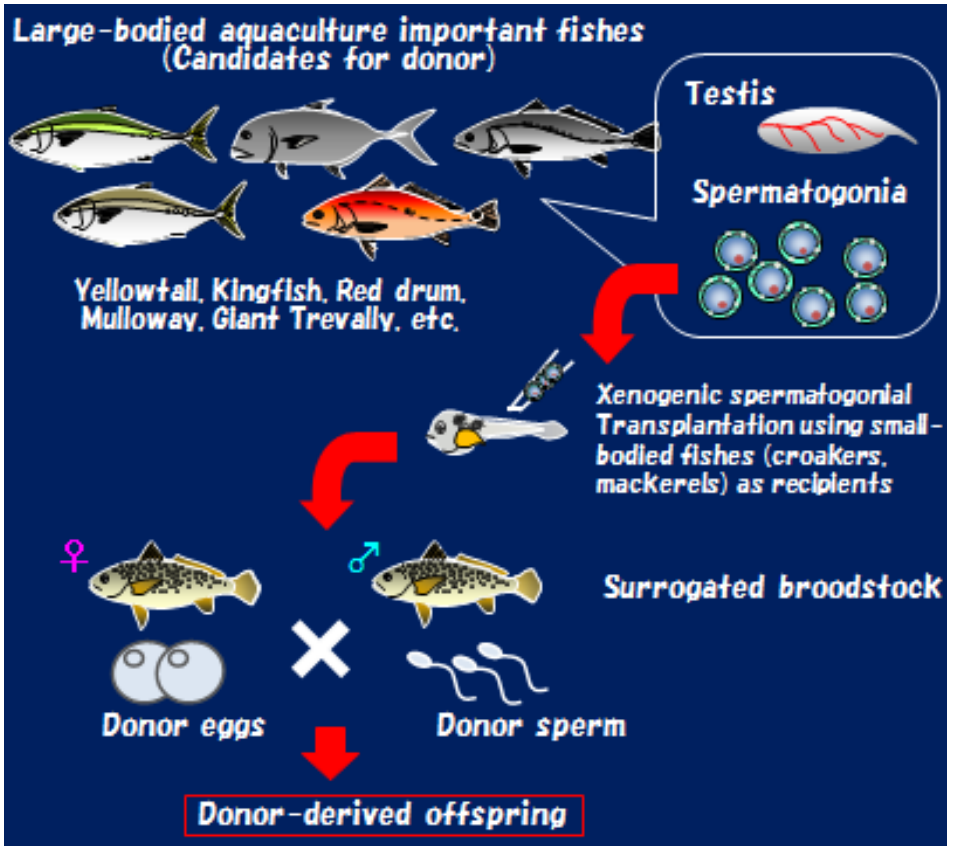
We have already succeeded in getting the freshwater salmonid, masu salmon to produce rainbow trout eggs on an experimental level, and this research is already being applied to revive other salmonid species that are scarce and at risk of extinction in the wild. However, attempts to apply this technique in species other than salmonids have not been successful. Our research aims to the extract germ cells that develop into eggs from a large aquaculture species that grow to be more than a meter in length and transplant those cells into small marine fish species that matures at about 20 cm in length, and then use the produced eggs for larval production.

4. Anticipated effects and future applications of research

Rearing adult bluefin tuna reportedly costs hundreds of millions of yen per year. Successful tuna egg production by mackerel will reduce rearing costs by more than 90% to less than a few million yen per year by eliminating the need for rearing tuna to maturity. Also, mackerel reach maturity in one year, which means less time would be required to produce tuna eggs. This research proposes techniques to produce larvae of large aquaculture species quickly, cheaply, and easily with small space requirements. We hope that this technology will contribute to the world food supply and reduce environmental problems, while contributing to the reinvigoration and further development of a fish-eating culture and the conservation of wild-fish resources.

Xenogenic spermatogonial transplantation in Salmonids (Okutsu et al., *Science* 2007)





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