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### **From Population Dynamics to Evolution: Oscillation in Lateral Asymmetry of Fish Induces the Evolution of Homozygote Incompatibility**

Lateral asymmetry, originally found in scale eating cichlid fish in Lake Tanganyika, was first considered to follow the simple Mendelian genetics. Later, more controlled mating experiments on scale eaters and other fish reveal that they lack lefty (dominant) homozygote. Lethality of lefty homozygote explains F1 ratio, but not the high hatchability of lefty pairs. We construct models of incompatibilities of lefty homozygote and investigate the condition for the invasion and fixation of the incompatibility gene. Laterality morph frequencies in many fish oscillate due to cross-predation among prey and predators: predators feed on prey of the same laterality with them more than those of different laterality. Incompatibility gene, that prevents eggs of lefty gene from fertilizing sperm of lefty gene, spreads in case of group spawning, as long as laterality morph frequencies oscillates. Under pair spawning condition, however, incompatibility gene does not spread, as incompatibility gene prevents part of eggs to fertilize in some genotype combinations. We consider partial incompatibility where eggs of the incompatibility gene and the lefty gene fertilize with sperm of lefty gene in smaller ratio than sperm of righty gene. The incompatibility gene spreads even under pair spawning condition if its incompatibility is partial. We also study the evolution of the level of incompatibility by simulating the dynamics of frequencies of two incompatibility genes of different incompatibility levels both in prey and predator. Stronger cross predation, large predation coefficient, as well as larger survival rate lead to larger level of the lefty homozygote incompatibility.