Title: Mechanisms of Bacterial Adhesion Inhibition in Skin Mucus of Barred Mudskipper (Periophthalmus argentikineatus)

Name: Shun Kono

School: Ehime Prefectural Nagahama High School

Place: Ohzu, Ehime, Japan

Although fish skin is widely recognized as an important physical and chemical barrier against infection, the specific defensive mechanisms mediated by skin mucus have been insufficiently categorized. Furthermore, Previous studies have mainly focused on farmed fish species, and little is known about this particular mechanism in the genus Periophthalmus. Therefore, in this study, I aimed to investigate the antibacterial and bacterial adhesion-inhibiting effects of the skin mucus of barred mudskippers (Periophthalmus argentilineatus). Disk diffusion tests, adhesion inhibition tests using glass slides, and phenol-sulfuric acid tests were performed. Results showed that skin mucus did not exhibit antibacterial activity against Bacillus subtilis or Escherichia coli. However, it exhibited a significant inhibitory effect on the adhesion of Bacillus subtilis. This adhesion-inhibiting component was re-secreted within 10 seconds after the initial mucus collection. Furthermore, treatment of the mucus with proteolytic enzymes did not significantly alter the adhesion-inhibiting effect, and the mucus contained a high concentration of sugars. These findings suggest that sugars may be the primary factor in the bacterial adhesion inhibitory effect of skin mucus. Collectively, these results indicate that barred mudskippers employ a pathogen-defense strategy based on saccharide-mediated adhesion inhibition and rapid mucus re-secretion, complementing the skin's role as a physical barrier. This characteristic likely represents an adaptation to the highly variable environment of mangrove forests. Fish mucus inhibits pathogen adhesion, offering insights for low-cost, antibiotic-free infection control in aquaculture and medicine.