

Establishing an environmental DNA method to detect and estimate the biomass of Sakhalin taimen, a critically endangered Asian salmonid

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Abstract

For field ecologists, detecting a target species in the wild is a severe bottleneck to understanding its distribution and population status. Recently, environmental DNA (eDNA) techniques have been developed as a noninvasive monitoring tool for aquatic organisms. While applications of eDNA techniques for biomass estimation have been proposed, little is known about an applicable size range of the organisms, which might affect relationships between biomass and eDNA concentration. Here, we investigated eDNA from Sakhalin taimen (*Parahucho perryi*), a giant salmonid species of northern Japan. This species is critically endangered and difficult to detect in the wild by conventional sampling methods. Using quantitative real-time PCR, we tested correlations between eDNA concentration and fish density using fish with a wide range of ages and body sizes in aquarium experiments. We found that our new primers and probe were truly species-specific, and that the eDNA concentration was significantly correlated with fish density and body size ($p < 0.001$). Furthermore, based on our calculation, the eDNA concentrations were rather constant among aquaria with fish in different age and size groups when their total weight was adjusted. These results suggest that eDNA concentrations can be an indicator of biomass of Sakhalin taimen, although further research is needed for its application in natural environments.

Keywords

Environmental DNA (eDNA) Fish Endangered species Aquarium experiment Biomass estimation

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Electronic supplementary material

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