

Length of Atlantic salmon smolt and their subsequent marine survival

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Migrating Atlantic salmon smolt encounter a range of risks, such as novel predators, strong currents and salinity, en route to their feeding grounds. Their primary defence against such encounters is avoidance: individuals swim away from threats, whether traveling in a shoal or alone. By avoiding such threats, they should have a higher chance of surviving to return to their natal rivers to spawn. We hypothesize that larger smolts are better able to avoid such threats by merit of their size and probable better swimming ability. We therefore predict that larger smolts will have a higher probability of returning to their natal river as an adult. We test this prediction with data from the river Frome, Dorset, UK, where individual salmon have been tracked emigrating as smolts and returning as adults since 2006 using Passive Integrated Transponder (PIT) technology. We build Bayesian State Space models to explain the probability that individual smolts survive to return as adults. We do this by describing post-smolt survival (i.e., survival in their first year at sea) from environmental variables, such as sea surface temperature, and individual smolt length. We select the most parsimonious model using Bayesian variable selection and present the weight of evidence for each explanatory variable. River Frome salmon smolt are shrinking, as they are on other rivers across Europe. If shorter smolt are less likely to return as adults to spawn, then managers will need to maximise both the number and the size (condition) of emigrating smolts to reverse salmon population declines. [250 words]

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