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Sustainable Aquaculture for a Secure Future

Title: **Using model-based inference to select a predictive growth curve for farmed tilapia**

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Aquaculture presents a unique challenge to the modeling of fish growth, because the main objective is to accelerate growth for profit. Growth patterns of captive fish in well-fed conditions will diverge from that found in wild fish. For a fish-farming enterprise, overestimating growth will lead to expectations for revenue and profit that will not be realized. Underestimating growth will lead to planning for later harvest than is optimal and the unnecessary additional cost of feeding. We evaluated the performance of four candidate models—Gompertz, logistic, quadratic, and von Bertalanffy—in predicting the growth of Nile Tilapia *Oreochromis niloticus*. Each model was fitted to 20 weight-at-age data sets collected from five demonstration farms in Ghana over a 5-month period. We used the Akaike information criterion adjusted for small sample size and model weights to assess model fit. We also assessed predictive performance by comparing predicted to actual growth observed over the last month of the experiment. The logistic growth model performed best for both model fitting and prediction. For a 1-month period approximately between day 121 and day 152 all but the logistic model overpredicted growth with corresponding SEs as follows: Gompertz (14.9 ± 3.8 g, mean ± SE), von Bertalanffy (21.0 ± 3.9 g), and quadratic (34.0 ± 3.6 g). The logistic model (–0.5 ± 3.8) did not significantly over- or underpredict growth, and is recommended for predicting future growth of Nile Tilapia under pond culture conditions in applications such as the construction of enterprise budgets to assess profitability of tilapia farms. The default fitting of the von Bertalanffy growth model to farmed tilapia data is not supported by this study.

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