Length-weight Relationships and Conversions for Fresh and Ethanol-preserved Age-0 Splittail

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I conducted a modest study to evaluate the effects of ethanol preservation on the length and weight of age-0 splittail so that fresh measurements could be estimated from preserved specimens for ongoing age and growth studies. In this highlight I provide a brief synopsis of the results of this study, equations for length and weight relationships, and conversions for both fresh and ethanol-preserved fish.

I collected 71 age-0 splittail from the Sacramento River during 2003 for this study (standard length range = 19 to 46 mm; mean = 28 mm; standard deviation = 5 mm). Shortly after collection, each individual fish was measured to the nearest millimeter for standard length, fork length, and total length, and weighed to the nearest hundredth of a gram while either alive or freshly dead. The fish were then preserved in 95% ethanol in individual vials and measured at increasing time intervals after preservation: one day, seven days, and one year.

Effects were apparent within the first day of preservation. On average, individual fish lost about one millimeter in each length measurement due to preservation, with no relation to initial length. The simple effect of human error associated with measuring small fish to the nearest millimeter produced enough variation around the mean that preserved lengths were not statistically different overall from initial lengths (one-way ANOVAs for each length measurement, $P > 0.05$). In contrast, individual fish lost up to 47% of total body weight after preservation due to dehydration, and weight loss was negatively correlated with initial standard length ($r = 0.89$, $P < 0.001$) and total body weight ($r = 0.91$, $P < 0.001$). Although the variable effect of preservation on length versus weight is not surprising, it is important to document for future studies. Table 1 provides length-weight relationships for fresh and preserved fish, length conversions for fresh and preserved fish, and equations to convert preserved length and weight measurements to fresh measurements.

Table 1 Length-weight relationships and various conversions for age-0 splittail. All relationships are statistically significant at $P < 0.05$ and residual plots were examined to ensure the appropriateness of each model.

Data	*Equation*	r^2
Fresh length-weight relationships		
	$WT = 0.000028SL^{2.95}$	0.97
	$WT = 0.000012FL^{2.97}$	0.98
	$WT = 0.000011TL^{2.98}$	0.98
Fresh length conversions		
	$SL = -1.120 + 0.891(FL)$	0.98
	$SL = -0.275 + 0.762(TL)$	0.99
Preserved length-weight relationships		
	$WT = 0.000017SL^{2.98}$	0.98
	$WT = 0.000004FL^{3.18}$	
	$WT = 0.000004TL^{3.06}$	
Preserved length conversions		
	$SL = -2.81 + 0.950(FL)$	0.99
	$SL = -1.64 + 0.799(TL)$	0.99
Preserved-to-fresh length conversions		
	$SL_f = 1.99 + 0.963(SL_p)$	0.99
	$FL_f = 0.44 + 1.03(FL_p)$	0.99
	$TL_f = 0.79 + 1.01(TL_p)$	0.99
	$SL_f = -0.724 + 0.914(FL_p)$	0.97
	$SL_f = 0.359 + 0.770(TL_p)$	0.97
Preserved-to-fresh weight conversion		
	$WT_f = 0.048 + 1.448(WT_p)$	0.99

SL = standard length, FL = fork length, TL = total length, WT = total body weight, $_f$ = fresh, $_p$ = preserved.