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Development and Evaluation of a Standard Weight (W_s) Equation for Blue Catfish

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Abstract.—Using a data set composed of 33 populations from six states, we employed the regression-line-percentile technique to develop a standard weight equation for blue catfish *Ictalurus furcatus* and validated it with an independent data set composed of 43 populations from 10 states. The equation is $\log_{10}W_s = -6.067 + 3.400 \log_{10}TL$, where W_s is standard weight in grams and TL is total length in millimeters. The English-unit equivalent (pounds and inches) is $\log_{10}W_s = -3.950 + 3.400 \log_{10}TL$. The equation is valid for blue catfish 160 mm (approximately 6 in) TL and longer. Relative weight (W_r) values computed with this equation did not exhibit any systematic length bias.

The blue catfish *Ictalurus furcatus* is a large-river fish with a native range extending from the Mississippi, Missouri, and Ohio River drainage basins of the central and southeastern United States, southwest into Mexico and northern Guatemala (Glodek 1980). It supports sport and commercial fisheries in inland waters throughout its range. However, there is no published information on standard weights for blue catfish. The objective of our study was to develop a standard weight equation for blue catfish based on the regression-line-percentile (RLP) approach and evaluate possible length related bias within and among several populations.

Methods

Blue catfish individual length and weight data were solicited from biologists across the North American range of the species' distribution. Population data with fewer than 50 fish or with low coefficients of determination ($r^2 < 0.80$) between $\log_{10}$ weight and $\log_{10}$ total length were eliminated.

Determination of the minimum applicable length of fish is common in standard weight equation development to eliminate variance resulting from differing body shapes, as well as weighing inaccuracies, associated with small fish (Willis et al. 1991). Minimum total length (TL) for inclusion in our analyses was derived from the inflection point of the variance-to-mean ratio of $\log_{10}$ weight by centimeter length-group. Data from those fish smaller than the inflection point, where the ratio became unstable, were removed from analysis (Murphy et al. 1990).

Some population data made available to us represented multiyear collections. To minimize variability within those populations, data for a single year were chosen on the basis of highest r^2 from $\log_{10}$ weight $-$ $\log_{10}$ total length regression, largest sample size, and broadest length range. When populations encompassed more than one state (e.g., Toledo Bend Reservoir borders on both Louisiana and Texas), data from each state were considered separate populations. The proposed RLP standard weight equation was developed following Murphy et al. (1990).

Variation in relative weight across length categories is expected to occur within populations but not with a consistent decreasing or increasing trend over a large number of randomly selected samples (Neumann and Murphy 1991). Our equation was evaluated using an independent (i.e., different populations from those used to derive equation) data set. We tested for a length-related bias by regressing individual W_r against TL for each population (Murphy et al. 1990). The total number of samples in our independent data set with significant positive and negative slopes was compared using chi-square goodness-of-fit tests. Statistical significance was assessed at the 95% level ($\alpha = 0.05$).

Results and Discussion

The RLP standard weight equation was based on 6,250 computerized records (33 populations in six states) and tested with an independent data set

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from 5,419 records (43 populations in 10 states). Our proposed equation for blue catfish is $\log_{10}W_s = -6.067 + 3.400 \log_{10}\text{TL}$, where W_s is standard weight in grams and TL is total length in millimeters. The English-unit equivalent (pounds and inches) is $\log_{10}W_s = -3.950 + 3.400 \log_{10}\text{TL}$. The minimum applicable length for the equation is 160 mm TL (approximately 6 in).

Significant W_r–TL relationships were evident in 24 of the 43 test populations, 13 of which had positive slopes and 11 had negative slopes. Chi-square analysis indicated no significant difference in the frequency of occurrence of both positive and negative slopes. Given the wide range of ecological regions from which the data originated, it is likely that any local length bias reflects ecological conditions, rather than an artifact of the W_s equation (Neumann and Flammang 1997). We recommend the use of our W_s equation for blue catfish throughout the species range.

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