The Effect of Freezing on the Length and Weight Measurements of Ruffe

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Purpose

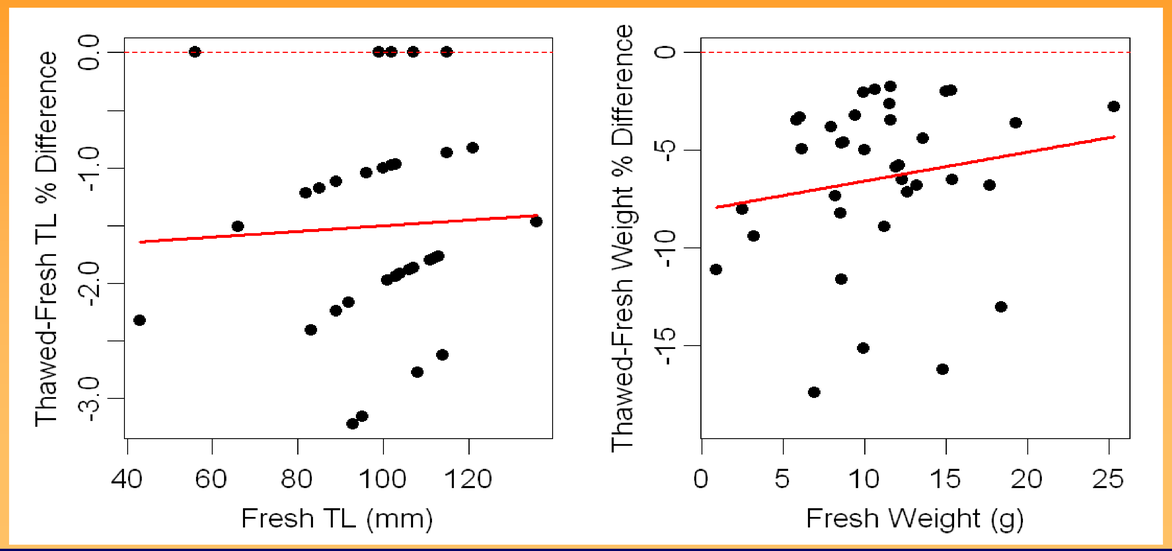
- Length and weight measurements are important data used to understand the dynamics of fish populations.
- Due to it's nuisance or "trash" status, ruffe are often frozen en masse, thawed at a later date, and then measured and weighed.
- Our purpose was to determine the effect of freezing on standard length (SL), fork length (FL), total length (TL), and weight (W) measurements and the weight-length relationship of ruffe.

Methods

- 36 ruffe were collected with bottom trawls from the St. Louis River Harbor on 20Sep07.
- Each ruffe was measured fresh for SL, TL, FL and weighed. Fish were then individually labeled and frozen en masse.
- 75 days later frozen ruffe were thawed and re-measured for lengths and re-weighed.
- Absolute and percentage change in length and weight due to freezing and thawing was calculated for each fish.
- Significant percentage change in length or weight from fresh to frozen and thawed ruffe was tested with matched-pairs t-tests.
- The effect of freezing on the length-weight relationship was tested with an ANCOVA.

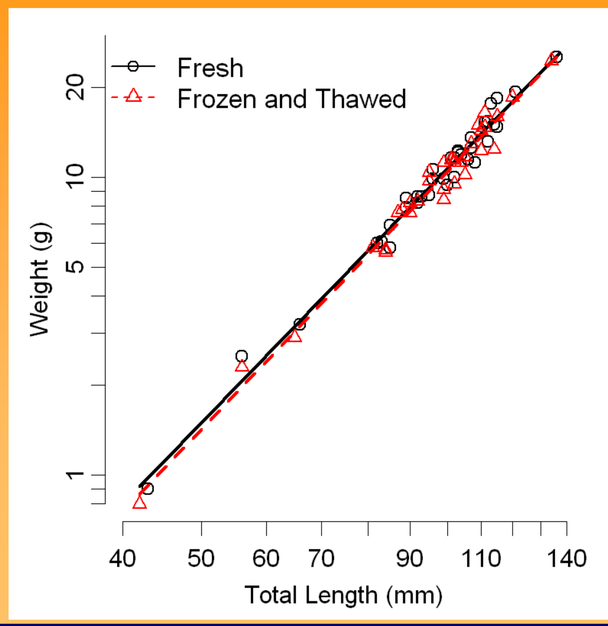
Results - Shrinkage

- Thawed ruffe were between approximately 1.5% and 2% shorter in length than fresh ruffe (e.g., TL; Left).
- Thawed ruffe were between approximately 5% and 7.5% lighter in weight than fresh ruffe (Right).
- Percentage changes in lengths and weight were not related to the fresh lengths or weight of the fish.



Results –Weight-Length Relationship

- The $\log_e$(weight)-$\log_e$(length) relationship did not differ between fresh and thawed fish for any length measure ($p>0.5080$).



Conclusions

- Fish of all lengths or weights lost a constant percentage of their length or weight, regardless of the fresh length or weight, after freezing en masse and thawing.
- Weight-length relationship was not affected by freezing and thawing of fish. This result may be due to the relatively small amount of observed shrinkage or to a shrinkage ratio similar to the slope of the $\log_e$(weight)-$\log_e$(length) relationship.

Consequences

- Fresh weight estimated from the lengths of thawed fish will be underestimated due to shrinkage from freezing and thawing.
- Estimates of fresh biomass, and other parameters, will be underestimated using the weight-length relationship to estimate the weight of ruffe from thawed lengths.
- Bias in fresh weight estimates can be avoided by using fresh lengths, fresh lengths estimated from lengths of thawed fish, or converting weight predicted from lengths of thawed fish to fresh weights.