Morphometric variation among spawning cisco aggregations in the Laurentian Great Lakes: are historic forms still present?

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with 6 figures and 5 tables

Abstract: Cisco (Coregonus artedi Leseur, formerly lake herring Leucichthys artedi Leseur) populations in each of the Laurentian Great Lakes collapsed between the late 1920s and early 1960s following a multitude of stressors, and never recovered in Lakes Michigan, Erie and Ontario. Prior to their collapse, Koelz (1929) studied Leucichthys spp. in the Great Lakes basin and provided a description of their diversity. Three cisco morphotypes were described; a ‘slim terete’ morphotype (L. artedi artedi), a ‘deep compressed’ morphotype (L. artedi albus), and a deep-bodied form resembling tullibee in western Canadian lakes (L. artedi manitoulinus). Based on body measurements of 159 individuals (Koelz 1929), we used discriminant function analysis (DFA) to discriminate historic morphotypes. Shapes of historic morphotypes were found to vary significantly (Pillai’s trace = 1.16, P < 0.0001). The final DFA model used nine body measurements and correctly classified 90% of the historic cisco. Important discriminating measurements included body depth, eye diameter, and dorsal fin base and height. Between October-November of 2007-2011, we sampled cisco from 16 Great Lakes sites collecting digital photographs of over 1,700 individuals. We applied the DFA model to their body measurements and classified each individual to a morphotype. Contemporary cisco from Lakes Superior, Ontario and Michigan were predominantly classified as artedi, while the most common classifications from northern Lake Huron were albus and manitoulinus. Finding historic morphotypes is encouraging because it suggests that the morphological variation present prior to their collapse still exists. We conclude that contemporary cisco having shapes matching the missing historic morphotypes in the lower lakes warrant special consideration as potential donor populations in reestablishment efforts.

Keywords: cisco, morphotypes, contemporary, historic, photographs, rehabilitation.

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