Study of Phenotypic variation in four population of Urmia Kingfish (*Alburnus atropatenae*) in Urmia Lake basin using Elliptic Fourier Analysis

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Abstract
This study was conducted to survey the phenotypic variation in four populations of Urmia kingfish (*Alburnus atropatenae*) using Elliptic Fourier Analysis. Hence, a total number of 163 specimens was sampled from the four rivers of the Urmia basin including the Baneh, Saghezchai, Siminehrood and Zarinehrood rivers. The left sides of specimens were photographed. Then, the outline curve was drawn using TpsDig2 software and resampled to equal distances with 150 points. TPS data was converted to a readable file format for EPA analysis in EFAWIN software and EFA analysis was carried out with opting 17 shape harmonics (with 2 constants and four coefficients per harmonic). Data analyzed by PCA and CVA/Manova analysis. A significant difference between studied populations in terms of body shape was seen. Based on cluster analysis, the studied populations according to their body shape divided into (1) Zarinehrood and (2) Saghezchai, Siminehrood and Baneh branches. Based on results, the Bane, Siminehrood and Saghezchai population distinguished due to having small head size and caudal peduncle and the Zarinehrood population due to bearing larger head and caudal peduncle was. In addition, the Baneh and Saghezchai population compared to the Zarinehrood and Siminehrood populations possess greater caudal peduncle and body depth. The observed morphological variation can display phenotypic plasticity among studied populations as result of environmental conditions of their habitats and geographical isolation.

Keywords: Kingfish, Phenotypic plasticity, Urmia Lake Basin, Morphometrics.