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## Trophic level vs. eutrophication: A case study of gobiid fish (Isaza) in Lake Biwa, Japan, with nitrogen isotopic compos

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We report analytical results of nitrogen isotopic compositions of 12 amino acids of formalin-fixed gobiid fish "Isaza" (*Gymnogobius isaza*, Tanaka) specimens that had been collected from Lake Biwa through the 20<sup>th</sup> century. The pattern of the delta-<sup>15</sup>N values for these amino acids remains relatively constant, even though each amino acid exhibits a gradual increase by 3 per mil. from 1916 to 1992. With a formula proposed by Chikaraishi et al. (2009) and the nitrogen isotopic compositions of glutamic acid and phenylalanine, we estimated the temporal variations in the trophic level of Isaza in Lake Biwa. The trophic level of Isaza remained quite constant (3.2-3.3) across a major eutrophication period in 1960-1980. The estimated trophic level of Isaza fish is consistent with the stomach content analysis in the previous reports. The constant trophic level suggests that the eutrophication did not apparently affect the trophic level of Isaza fish, although Isaza's dietary preference changed from zooplankton to gammarids around 1970.

Keywords: amino acids, nitrogen isotopic compositions, Lake Biwa, Isaza, trophic level, eutrophication