New discoveries in the study of carp otoliths

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All teleost fishes have three pairs of otoliths which may be taken as a good environmental proxy for water mass where the fish lives. A newly observation made by the authors found that the relationship between weights of carp lappillae(y) and carp body (x) shows difference in fresh waters of north China (Baiyangdian Lake and Miyun Reservoir) and Australia plain (Murray river) [1] with $y=2\times10^{-6}x+0.003$, $R^2=0.9365$ (N=20) and $y=2\times10^{-5}x+0.0048$, $R^2=0.589$ (N=40) respectively. This relationship deserves further research in depth to determine whether it can be used to trace fish origin or producing area. Another discovery is related with the authors' NAA of carp otoliths. Almost all the 33 metals in the otoliths from Baiyangdian Lake are one order of magnitude richer than those from Miyun Reservoir (10 samples respectively), being consistent with the analyses of the respective water chemistry. A tentative study demonstrated that some of the thermolumines-cence (TL) parameters of otoliths can be employed to discriminate among water masses with or without heavy metal pollution. Baiyangdian Lake, unhomogeneously polluted by heavy metals, shows much wider half-widthes of carp otolith TL peaks than those from Miyun Reservoir. It is obvious that the TL parameters are posi-tively related with the heavy metals contents in otoliths.

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A surprising correlation between magnesium isotope composition and pH in synthetic calcium carbonates precipitated from saline water

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Experiments of carbonate precipitation from natural saline water were carried out in a pH-controlled system with an initial purpose to further callibrate the correlation between B isotope composition of carbonate precipitates and pH. The experiments were performed at room temperature with pH values vary from 7.6 to 8.75 adjusted using NaOH. Precipitates was separated from supernates and washed by ultrapure water until chlorine was not detected.

The precipitates are composed of calcite and aragonite dominantly with trace amount of $Mg(OH)_2$ as shown by X-ray diffraction. The Mg/Ca (mmol/mol) of the bulk precipitates range from 70 to 490, positively correlated with pH.

Mg isotope compositions of the precipitates and the original saline water were measured using MC-ICPMS after chemical purification. The Mg isotope compositions of the precipitates are systematically ligher than that of the original solution, and the δ^{26}Mg of the precipitate relative to the original solution range from -2.03 to -0.33‰, positively correlated with pH.

The discovery of the correlation between Mg isotope composition of bulk precipitates and pH is somehow surprising. Possible explainations for this unexpected correlation may include the following scenarios:

1) Mixing model: the variation in Mg isotopes results from the mixing of carbonates and $Mg(OH)_2$ in different proportions, and the content of $Mg(OH)_2$ in precipitates increases with the increase of pH. In this scenario, a very heavy isotope composition of Mg is required for $Mg(OH)_2$

2) The $\alpha_{solid\text{-}liquid}$ changes with pH condition. If this were true Mg isotope composition in carbonates would be a powerful tool in tracing pH change.

Study in process will provide tests for these two scenarios.