

The inclusion of sub-detection limit LA-ICPMS data, in the analysis of otolith microchemistry, by use of a palindrome sequence analysis (PaSA)

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Web Appendix 1

Demonstration of the PaSA utility —To demonstrate the utility of PaSA, we analyze LA-ICPMS data for post-larval *Chromis viridis* that recruited along the northern tip of the Gulf of Aqaba (Red Sea). The data under consideration form part of a larger study of larval transport in the northern gulf (Ben-Tzvi et al. in prep.). We restrict our analyses to 10 fish that were collected from each of two sites (IUI & NB) during October 2005. In the analysis, we consider two sets of variables to chemically characterize the otoliths extracted from these fish, both pertaining to four trace elements: Cr, Cu, Mn, and Pb. First, the total number of elemental signals (see main text for the signal's definition) of each element measured during a vertical transect of 14 ablations on either side of the core (a distance which corresponds to the pelagic

phase of the otolith; Ben-Tzvi et al. in prep.). Second, the distance from the core (identified by high readings of Mg and Mn) to the first signal of each element. We use discriminant function analysis to see whether (some combination of) these 8 variables can distinguish between the recruits to the two sites. We ran the analysis twice: once using only the above-DL signals and once with data that conforms to the PaSA protocol. The results of both analyses are summarized in Table A1. Evidence that the two sites are receiving recruits with different larval trajectories only arises when we consider PaSA data. In contrast, the data based on the DL approach show no significant discrimination between the recruits. Therefore, using standard approaches we would have missed critical insight into the movement of larval fish in this system that is readily apparent using analyses of palindrome sequences.

Table A1.

Data	<i>P</i>	Correct back discrimination	Significant discriminators	Nonsignificant discriminators
Readings above DL only	0.42	55%	none	all
All readings	0.0008	85%	Nr of signals of Cr, PB, and Mn; distance of the first pair of Cr, Cu, Mn from the core	Nr of signals of Mn and distance of the first pair of Pb from the core

Comparison of the discriminant function analysis results obtained from the full palindrome data and the reading of signals above DL only. *p* value is for the significant difference between the two examined groups. It shows that only the full data allows discrimination between the groups. The obtained back discrimination based on the full data show high proportion of correct results while the results based on above DL only are close to random results (50% for 2 groups). 6 of the 8 factors were found to be significant discriminators ($p < 0.05$) using the full data while none were found to be significant using only the data above the DL.