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Boundary based stock classification: Expert otolith readers outperform automated outlining methods.

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Previous studies of stock discrimination based on otolith boundary contour have used various methods of boundary determination prior to morphological classification. Here we examine whether the method chosen for otolith boundary extraction affects the accuracies of stock discrimination when using elliptical Fourier based classification of otolith boundaries. We compare two methods of boundary extraction: Outlines derived by two expert readers, traced by hand, and outlines derived by intensity thresholding of otolith images using bottom-up and top-down approaches. Outlines from each method are transformed using elliptical Fourier methods to create a set of harmonics for each of the outlining methods, which are in turn used to construct and test classifiers, each fully cross validated, using the WEKA machine learning suite. We find that classifiers constructed from outlines obtained through either thresholding approach, and used to test further samples outlined by the alternative thresholding approach, show statistically significant decrease in classification accuracies. Conversely, classifiers constructed using either expert's outlines show insignificant decrease in classification accuracies when testing outlines extracted by the alternative expert. Additionally, classifiers constructed using otolith boundaries traced by hand outperform those that use boundaries extracted using thresholding methods. This suggests that classifiers built using hand traced boundaries not only return greater classification accuracies, but are also more robust to changes in both boundary extraction procedures and to differences between experts.

Keywords: Otolith, Classification, Stock, Expert reader, Automation.

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