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Title: Potential for DNA-based ID of Great Lakes fauna: species inventories vs. barcode libraries

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Abstract: DNA-based identification of mixed-organism samples offers the potential to greatly reduce the need for resource-intensive morphological identification, which would be of value both to biotic condition assessment and non-native species early-detection monitoring. However the ability to assign species identities to the DNA sequences found within a mixed-organism sample is dependent on the availability of comprehensive DNA signature libraries. Here, we compile inventories for aquatic fauna presently found in or threatening to invade the Laurentian Great Lakes and examine the availability of mitochondrial COI DNA barcode libraries (as catalogued in the Barcode of Life Database) for them. We found DNA barcode libraries to be fairly complete for extant Great Lakes vertebrates (100% of reptiles, 98% of fish, and 92% of amphibians had barcodes) and for species appearing on “threatening to invade” lists (100% had barcodes). In contrast, DNA barcode libraries are poorly developed for precisely those organisms where morphological identification is most challenging and time consuming: 45% of extant invertebrates lacked barcodes, with rates especially high among rotifers, annelids, and mites. Lack of species-level resolution to many Great Lakes invertebrates also is a barrier to matching DNA signatures with physical specimens. Attaining the potential for DNA-based identification requires a concerted effort to build supporting signature libraries and voucher collections. Our research group has incorporated DNA library building into ongoing research on non-native species early detection strategies.