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Exploring an Exome Target Capture Method for Cross-Species Population Genetic Studies

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Abstract : Next-generation sequencing has enhanced the ability to acquire massive amounts of sequence data to address classic population genetic questions for non-model organisms. Targeted approaches allow for cost effective or more precise analyses of relevant sequences; although, many such techniques require a known genome and it can be costly to purchase probes from a company. This is challenging for non-model organisms with no published genome and can be expensive for large population genetic studies. Expressed exome capture sequencing (EecSeq) synthesizes probes in the lab from expressed mRNA, which is used to capture and sequence the coding regions of genomic DNA from a pooled suite of samples. A normalization step produces probes to recover transcripts from a wide range of expression levels. This approach offers low cost recovery of a broad range of genes in the genome. This research project expands on EecSeq to investigate if mRNA from one taxon may be used to capture relevant sequences from a series of increasingly less closely related taxa. For this purpose, we propose to use the endangered Northern Tidewater goby, Eucyclogobius newberryi, a non-model organism that inhabits California coastal lagoons. mRNA will be extracted from E. newberryi to create probes and capture exomes from eight other taxa, including the more at-risk Southern Tidewater goby, E. kristinae, and more divergent species. Captured exomes will be sequenced, analyzed bioinformatically and phylogenetically, then compared to previously generated phylogenies across this group of gobies. This will provide an assessment of the utility of the technique in cross-species studies and for analyzing low genetic variation within species as is the case for E. kristinae. This method has potential applications to provide economical ways to expand population genetic and evolutionary biology studies for non-model organisms.

Keywords : coastal lagoons, endangered species, non-model organism, target capture method
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