

Conservation Genetics of the Tidewater Goby -- *Eucyclogobius newberryi*

(Funded 2000-2001)

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Executive Summary:

Overview: We are proposing an analysis of the genetic structure and population genetic differentiation of the tidewater goby, an endangered fish that is restricted in its distribution to a number of small coastal estuaries. Although federally listed, this taxon is currently under consideration for "delisting". However, the population genetic differentiation of this taxon has been little studied. In our initial work (see attached figures) we have documented geographic differentiation of populations using mitochondrial DNA. These initial results have already had some impact on the "delisting" debate in that southern populations (Camp Pendleton) are shown to be substantially sequence divergent from fish distributed in estuaries along the more northern California Coast. In part as a consequence of our observation of their distinct genetic status, these southern populations have been excluded from the delisting proposal. I am pleased that the data from my lab appear to be having some impact on this delisting discussion. However, the data as they now support other distinct genetic subdivisions in the northern part of the state. These may also merit management and protection as distinct regional genetic entities.

Although the data in hand are suggestive of complex pattern of genetic differentiation, the number of localities studied, and the sample sizes examined to date are insufficient to resolve the patterns of genetic differentiation to the extent that would be required to make appropriate management decisions. This statement is so regardless of the outcome of listing or delisting actions that may be taken at the federal level. IN fact in the process of soliciting funds for this work, I have found broad interest in, and a willingness to support the work, from a large number of management units. Federal units such as Fish and Wildlife and the Marine Corps have expressed considerable interest. In the event that a grant is forthcoming several parties have committed themselves to providing match in the 1 to 5 K range. These include both the Pt. Reyes and Golden Gate National Seashores, through their private foundations, as well as the California State Parks. This there are clearly a variety of parties interested in this research that have a stake in the actual management of this taxon.

It should be noted that we have no large grant support for this project despite the pressing need for these data. The data we have recovered to date was supported by very modest funding from the Academic senate at UCLA, by Sea Grant, and by the PADI Foundation. These funds have been expended. We have also solicited funds from the National Fish and Wildlife Foundation for considered match. In that instance the research could be expanded and progress could be made fairly rapidly on two fronts -- continuing our work on the mitochondrial sequences and doing a more extensive microsatellite studies. To develop a comprehensive picture of the genetic structure across the range and the degree and geographic scale of gene flow in tidewater gobies both these classes of study will ultimately be necessary.

We are in a fortunate position in that we have a large prelisting collection of gobies, from across the state. We are supplementing this collection extensively through collaboration

with Cam Swift who is authorized to collect this endangered taxon for research purposes in localities and times of year when it is abundant (there is often substantial intra-annual variation in population size). In addition, a senior graduate student in the lab, Mike Dawson, has done much of the research on this topic to date. He is in the lab for one more year, a new student in the lab, Michelle Barlow, is also intent on pursuing tidewater goby population genetics for her research. Additional graduate students would work on these projects if funds for student support and the necessary supplies are available. Furthermore we have all the necessary equipment and have demonstrated our ability to do the research in the lab. This is the case for both the mitochondrial and microsatellite work. This we are in an excellent position to pursue the research and to expand it to address additional issues as funding becomes available.

It should also be noted that, in addition to the applied interest in this work, study of the tidewater goby has great potential from a more basic scientific viewpoint. This taxon is unusually genetically subdivided for an ostensibly marine organism. In addition, the tidewater goby 1) has been subject to a history of extinction and recolonization in local estuaries; 2) the extinction recolonization appears to vary in extent and in type from region to region; and 3) detailed study of collection records over the last century provides documentation of this extinction recolonization dynamic. These factors together make the tidewater goby a unique system for the study of the population genetic consequences of metapopulation dynamics -- a topic of considerable import in evolutionary biology and conservation genetics.

This project relates to a range of work in the lab pertaining to the factors controlling population differentiation and speciation, in the marine realm an understudied issue. We have ongoing work in this area. Most of our work has focused on how estuarine restriction, habitat preference, fecundity and life history affect population differentiation, and ultimately speciation. In this regard, although this is a relatively new lab, we have initial data on several species of invertebrates and fish. In a practical sense all this work relates to how genetic resources are partitioned between patches of habitat -- in this case estuaries. This work has broad implication for the appropriate preservation of marine habitat, specifically for the preservation of genetic diversity in heavily impacted estuarine habitat. As the results we have in hand are published, and as we develop new work, we will be increasingly able to generate funds from Federal and private sources for this general body of work. In this sense our study of tidewater gobies is very important in established a presence in this area.