Proposal Panel 1 : 2127466

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Agency Name: National Science Foundation

Agency Tracking Number: **2127466**

Panel Summary

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This proposal aims to understand the potential consequences of range-shifts caused by ocean warming in the evolution of marine populations. In particular, the accumulations of deleterious mutations in expanding populations' leading edge. As a model, they propose to use Black Sea Bass in the NE US fisheries. This species, originally distributed from Cape Hatteras to Cape Cod, has recently expanded into the Gulf of Maine.

The proposal includes 3 main objectives/steps. The first one focuses on assessing if, as hypothesized, there is an accumulation of deleterious mutations in the leading edge. This will be achieved by sequencing coding regions, measuring demographic parameters (population size, diversity and migration rates) and measuring deleterious mutations. The second objective would link a reduced fitness to the accumulation of mutations. This will be achieved by quantifying organismal traits as proxies for fitness: length-weight ratio, percent protein and C:N ratio (as fat content). These will be analyzed in a multiple regression model that accounts for temperature, age and diet quality. Although this seems a logical step, this makes objective 2 really a sub product of objective 1 – what if objective 1 hypothesis is not true? What would be assessed? Objective 3 will test if fishing pressure (overfishing) exacerbates the effect of these mutations. This will be achieved through simulations in a population model of range expansion and dynamic population size. The model parameters will be taken from objectives 1 and 2.

The panel is in general enthusiastic about the presented idea. The proposal is well thought out and developed. The integration of phenotypic and genomes, and integrating fisheries pressure into the model (although fisheries pressure is not very clear how it is going to be integrated), are considered a novelty and potentially transformative. Having existing samples in hand, an excellent host/mentor, with contacts already in the stakeholders community, are also strengths in the proposal. The panel was missing however a follow-up on the potential consequences of this work. If these hypotheses are true, then what? Would those mutations stabilize the expansion front? Slow down the expansion? Collapse of the species? The panel debated if this work would also be applicable to other systems such as invasive species' expansion.

Reviewers raised concerns that the body condition parameters in ectotherms are all correlated to temperature, which is what is actually driving the range shift in this species (latitude). They suggest finding other ways to measure fitness, not correlated to temperature, to disentangle this limitation. There were also some comments about the lack of detail of sampling locations and effort at each of them, and possible confounding effects due to year of sampling. Concerns were raised about the mechanistic underpinning of the fisheries modeling. Specifically, it wasn't clear whether the model-data comparison entailed sufficient information to meaningfully test the effects of increased fishing. The panel did not consider these comments as critical, but the PI should consider them carefully if funded.

Broader impacts are adequate. A strength of this proposal are the existing connections between the host and stakeholders. Maybe some more details on the educational activities would have been appreciated.

Data management plan does not comply with BIO-OCE standards (BCO-DMO).

This summary was read by the assigned panelists, and they concurred that the summary accurately reflects the panel discussion.

PANEL RECOMMENDATION: