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United States Department of Agriculture

National Institute of Food and Agriculture

Special Research Grants Program

Aquaculture Research

Proposal 2022-06020 submitted by Roberts

Improved climate resilience in oysters through optimization of hatchery-based environmental conditioning practices

The review panel grouped proposals into one of the relative categories below. The percentage indicates the final distribution of proposals in each category.

Outstanding % 6

High Priority % 23

Medium Priority % 29

Low Priority % 42

Do Not Fund % 0

This proposal was placed in : Outstanding and ranked as : 3

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Aquaculture Research - PANEL SUMMARY

The panel decision regarding your proposal is based on the input provided by the reviews and the collected expertise and judgment of the individual panel members. This panel summary reflects the consensus opinion of the panel regarding your proposal.

Proposal Number: 2022-06020 Project Director: Roberts

Proposal Title: Improved climate resilience in oysters through optimization of hatchery-based environmental conditioning practices

Positive Aspects of the Proposal

The panel agreed that the rationale and relevancy of the proposal are very well detailed in the proposal. The potential impacts on oyster culture, if positive outcomes are achieved, would be significant on a nation-wide level and could be applied in the short term.

The panel recognized that the PD is highly qualified, with a good record in the proposed research area.

Support from tribal and industry groups shows confidence and the importance of addressing this topic for oyster production. The ties the team has with these groups increases outreach efficacy.

Negative Aspects of the Proposal

The experimental approach seems reasonable, though the methodology would be greatly strengthened with more details overall. Often it was clear where activities would occur, but not who would be doing them or what exactly would occur (e.g., environmental conditions and exposure timings/intensities). Further, articulating each person's responsibilities within the project would have been beneficial to understanding the level of involvement of each party.

The proposal is realistic with potential pitfalls. However, there are potentially too many confounding variables being addressed simultaneously. Another potential pitfall that wasn?t addressed is the short (6mo) field deployment. Further justification for this chosen period or extending it would strengthen the methodology. It would seem in a 2-year proposal that some measurement in the second year (or some use of second-year oysters) could be accomplished and would strengthen findings for oysters near harvest where potential losses may be greater.

More emphasis on `summer mortality? would be welcomed, as it would strengthen the justification for the project overall.

Synthesis Comments

Overall, the panel thought this proposal was innovative regarding shellfish to provide adaptability in non-invasive ways while being realistic to potential pitfalls. More details in methodology and specifically about which team members are doing what work in the text would clarify the flow of the work.

Adding some larger oysters while clarifying specifics of methodology could also strengthen impacts.

Finally, the panel agreed that a bit more detail on outreach/impact could further strengthen the project.

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The following reviews were submitted for your proposal, the names of the reviewers have been removed to maintain confidentiality.

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Rationale and significance and likely impact are well thought. The main concern for the proposal is lack of detail in how stressors will be applied. The proposal states “both statically and intermittently”, but does not detail targeted ranges (only maximums), durations, or combinations of stressors for treatments. Listing such would improve the proposal and make more clear how the challenges may impact oysters.

The PD has significant experience doing this type of work and is capable of performing such work rigorously.

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This project by Roberts from U. Washington is focused on improving climate resilience in oysters via certain hatchery practices. Specifically, they recognize as do many others, that dieoffs in coastal waters (including hatcheries) are significant biological, ecological and economic events.

They note that oyster larvae exposed to stressors early in the life cycle may be more resilient later in the life cycle, and hypothesize that purposefully stressing (presumably at an appropriate 'dosage rate'; in the proposal they call this 'nonlethal levels') young animals may confer improved survival later and could become a standard in the industry.

A second and parallel experiment will focus on stressing oyster broodstock with the hope that this stress may confer improved performance in the offspring.

Two commercial and one tribal collaborator are identified as locations to test these theories at the commercial/wild scale.

The science is well documented; and even the transgenerational plasticity, while somewhat less sure, has been documented by at least three previous studies.

The exact details are somewhat murky (a 'suite of conditions' which appear to include elevated temperature, lowered pH and possibly exposure to pathogens); and get more variable as it appears they will allow natural stresses at field sites during the summer ('intermittent exposure to dessication, hypoxia, salinity, light, sound and mechanical disturbance').

They talk about using first year data to address or prepare animals in the second year. This is of course somewhat less defined as they will need to adapt as their findings come in.

This seems like a well qualified team (three companies and a tribe wrote letters; and a federal agency is noted as another collaborator); with a project that is likely to succeed at least to some extent; and with commercial implications that could help these and other growers.

The findings may not be the 'silver bullet' to solve all problems, but may produce one more tool to consider for hatcheries, managers, growers and even regulators. It appears the likelihood of at least modest success is high, and there is some chance for significant enhancements for the industry, with implications for dealing with climate change (e.g. higher water temperatures and lowered pH). In short, this is a low risk, moderate to high reward proposal that is well written and documented.

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Scientific Merit of the Application for Research

The project proposed is relevant as it addresses a significant concern within oyster aquaculture. The proposed techniques may not appear novel at first because thermal priming is already an established technique used to increase other organisms' thermal tolerance. However, the approach proposed is novel and timely as far as oyster work goes.

Given the complexity of the problem that the proposal intends to address, there is a big chance that no oyster enhancement is achieved. However, the positive outcomes will be a game changer for the oyster aquaculture industry.

This project's positive outcomes will directly impact the nationwide aquaculture industry.

The experimental approach seems appropriate. The entire methodology could have been strengthened by articulating who is doing what. I noticed that the "where" is included, but it is unclear how many people will be in charge and if the entire responsibility of success falls on the PI alone.

Qualifications of Project Personnel, Adequacy of Facilities, and Project Management

Core personnel includes the PI only, who will collaborate with industry partners to bring this project to success. The PI has a track record of funding and experience working with shellfish, including oysters. Facilities, including the PI's lab and collaborating hatcheries, align with what would be expected to conduct this project. As mentioned above, articulating each person's responsibilities within the project would have been beneficial to understanding the level of involvement of each party.

Project Relevance

This highly relevant project aligns with USDA's Program Area Priority of "Development of climate resilient technologies, production systems, and/or management strategies for commercial aquaculture species. It addressed Strategic Goal 1: Combat Climate

Change to Support America's Working Lands, Natural Resources, and Communities, and

Strategic Goal 2: Ensure America's Agricultural System is Equitable, Resilient, and Prosperous.

The relevance of this project is highlighted by the letters of support attached to the proposal.

Data Management Plan

The data management plan is adequate.