**22-02: Fairchild –** Improving Lumpfish Grow-out Production: Optimizing Feed Strategies

* This proposal is relevant to priority 2-22. It aims to improve understanding of optimal feeds for lumpfish hatcheries. It builds on prior NRAC-funded efforts that helped to support the initiation of lumpfish production in the US. There is now one hatchery nearly operational. A possible concern is that this is related to only one company at this time although it has the potential to support steelhead trout (although little information is provided about if that is feasible).
* The overarching goal of this project is to provide lumpfish hatcheries with basic, but lacking, cost-effective techniques on juvenile feeding strategies that will increase production and lower costs.
* The project is well designed to meet the goals and objectives and will provide beneficial information to the industry to enhance production of lumpfish for controlling problems in the important salmonid industry.
* The difficulties associated with delousing salmon is discussed in the preproposal, however the costs and potentially how lumpfish might improve the bottom line is not laid out in detail. Natural parasite controls (lumpfish) have obvious public perception, and ecological benefits, but the economic impact is less well articulated.
* Prior NRAC funding they have two cohorts of lumpfish and completed nutritional studies, formed a Consortium, and developing a hatchery manual. Funding has been leveraged to work with trout farmers in NH for steelhead in NH waters. Saltonstall-Kennedy funds manipulated broodstock out-of-season spawning. USDA National Coldwater Marine Aquaculture Center used NRAC funding to amass broodstock to supply larval lumpfish to commercial production facilities and researchers in US leading to the first US lumpfish hatchery.
	+ Questions to be answered – are there documented lumpfish hatcheries actually producing progeny available for the industry in NE.
	+ Are these hatcheries independently owned or subsidiaries of Cooke Aquaculture?
* This effort seeks to improve profitability by improving feeding techniques and strategies
* Feeding intake is correlated to aggressive behavior (if feed input is too infrequent) and ocular disease (if growth is too rapid).
* Building on previous NRAC funded efforts they will evaluate a regimented feeding regime to determine which feeding rate (5 rations) at different temperatures (3). Evaluations will be based on growth and aggression. Y2 will refine Y1’s findings.
* Feeding frequency will be evaluated by examining a “regular feeding” and a satiation feeding based on a weekly ration. The frequency will be at two levels – high ration for max growth and low ration for controlled growth.
* A clear projection that a lumpfish industry will actually develop is lacking. The PIs make the case for the need as a biological control, but is there really going to be an industry for lumpfish production since there are limited operations on a global basis. Also this project benefits only one industry since they are the only player in the NE salmonid production – where’s the industry expansion possibilities?
* Improving production and cost effectiveness of lumpfish is a fine goal and could have a beneficial impact on salmon and steelhead production. Details are lacking on what exactly the scope of this benefit will be, either in terms of the number of farms impacted, size of production increase number expected due to better survival, and potential number of lumpfish hatcheries developed that the industry can support, etc.
* The PIs state the case for researching more effective culture methods for the lumpfish very well and have obtained some positive results to date. This success could be further advanced through funding of this project and should yield more effective production techniques for lumpfish. Creating local lumpfish suppliers will aid US producers in obtaining this species locally. The timeline is expected to be one that the PIs can effectively meet.
* It is intuitive lumpfish have potential to provide economic benefit and the feeding strategies will help optimize the use of lumpfish. It is a bit unclear, however, how many farms would benefit from this or would even use the lumpfish. Since there is only one company producing salmon in NE it is somewhat difficult to continue to expend NRAC funds for something the company should be investing in themselves.
* Sea lice infestations are demonstrably costly to the salmon aquaculture industry worldwide, and the further development of lumpfish aquaculture would have clear benefits to that industry, especially in the more-developed industries within Canada and Europe. I do note that the Northeast US industry itself is still limited to just the state of Maine and a single company that is not vertically integrated, so the regional benefits are less broad and somewhat suspect.
* Will only benefit one company at this point (target Cooke Aquaculture – Maine salmon industry), even if it will create opportunities for other farmers to supply the salmon industry. Shouldn’t they be funding the project?
* These authors have worked in this area previously and are building on their results.
* The project team includes both an industry member (Cooke Aquaculture’s R&D person) and an Extension individual. The team will write SOPs and disseminate information on optimal feeding in husbandry guides and publications. Unfortunately, while standard practice, such items are outputs. What are the projected outcomes of the project (short, medium, and long-term)? These outcomes need to be clearly defined in the Logic Model.
* Their Extension plan centers on upgrading an existing hatchery manual with new information pertaining to feeding and temperature obtained from this research, but also includes creation of factsheets, conversations with Cooke Aquaculture (one of the co-PIs), and scientific publications and presentations at meetings; all of which are outputs – what are the projected outcomes, how will they be evaluated, documented, and demonstrated?
* The Extension plan is adequate but could be significantly improved. While past activities have resulted in a document and the PIs state that the further research engendered by this project will be used to revise and extend it. We would like to see more hands-on training included should the project be invited to full proposal. Simply giving talks at scientific or industry meetings is barely adequate for an effective Extension program. The PIs mention that training has previously been carried out (where’s the documentation and results of the training?). We suggest they use previous efforts to develop and evaluate more effective activities in this project.
* The applicants are able to leverage existing husbandry guides, which will aid in communication of their findings to the industry in the Northeast US and beyond. The team includes the VP of R&D at Cooke Aquaculture, further solidifying direct communication of findings to the industry. The team also includes two Extension professionals that could help with dissemination of findings beyond just Cooke, although their contributions appear to be more on the scientific and technical side than on technology/knowledge transfer.
* This team has a strong track record of success with prior related lumpfish efforts.
* We believe the PIs will be able to accomplish their objectives within the stated timeframe and that it will lead to advances in the culture of lumpfish. The credentials of the team are impressive, with significant prior experience and publications. The facilities and equipment available to them to carry out the work in the project are impressive and tie together state and federal labs to interact and combine expertise.
* They seem well prepared to carry this out *if* the lumpfish supply is available
* Seems like good progress from previous research, and approach building onto it. Will need to see details in proposal.
* The overall probably of accomplishing the objectives is excellent. This group has been working in this area for a while now and have the personnel and facilities that are required for this research. The funding and timeline are good.
* The feeding experiments seem like they are designed in a robust way that will allow the feed amounts and feed timing to be analyzed. Something was missing to help me understand the design based on Table 2 (and Table 1 is redundant to the text).
* The approach is logical and based on prior efforts from the PIs is likely to result in the planned outcome. Very well laid out plan, with good detail for a pre-proposal.
* We believe the project is well designed, with strong science and technology that will lead to beneficial results that can be utilized by industry. The project is ambitious but should be able to reach all stated objectives within the design timeframe. We believe the results will be highly applicable to industry and should be adopted in short order. Our only suggestion is that the Extension portion be reconsidered to include better interaction to provide in-person training to the relevant personnel who will actually be involved in the production of lumpfish through the techniques researched by the project personnel.
* Without an existing commercial lumpfish hatchery in the US it is not fully clear how this would be transferred.
* I feel the overall scientific and technical approach for this project is excellent. These authors are not starting a new project but are building on a successful research area that is very valuable to the industry. Their design, developmental methods and plan to transfer results are excellent.
* **Overall comments and/or suggestions:**
* The team addresses an issue facing salmon producers in ME and steelhead producers in NH (is there really a steelhead production facility that exposes the fish to sea lice necessitating the need for lumpfish?). Thus scope of these sectors in the NE is not addressed, with respect to either number of farms potentially benefitting, or the magnitude of the impact on production, etc.
* The scientific plan is well designed, the team is experienced and has the necessary facilities and equipment to conduct the work. The team includes a leading industry member and two Extension specialists and can leverage existing husbandry guides for dissemination of results. The only real shortcoming I see of the proposed work is the limited salmon aquaculture industry in the Northeast with a single company reduces the overall regional relevance.

**Points to incorporate into full proposal:**

In addition to the comments above there are specific points that need to be addressed and they include

1. A well-developed proposal that build on projected outcomes in addition to outputs – what are the outcomes, how will they be evaluated, how will they be documented, and how will you demonstrate the outcomes. A thought to consider in your outcome projections is that “if you took the vacuum cleaner off the table” is there still relevance to the industry. In other words, is there a possibility of the fish being used for food fish themselves? Relevance is the point of consideration as it is not really clear if the fish will be used on a scale large enough to support an additional industry, even if it’s at the cottage industry level.
2. There is a growing concern among reviewers as to whether NRAC should be funding projects that support a single company in a single state without any evidence of vertical integration wherein the company provides the seed stock, the independent producer does the husbandry and the company purchases all the resultant crop. Please strongly justify how this research will benefit an industry beyond a single company and how you anticipate that a lumpfish industry will actually be a result of this project.
3. Clearly articulate the scope, scale, and potential of the steelhead industry in NH to mitigate some of the concerns of single state-single company. Are these steelhead producers independent farmers and are the fish being reared where sea lice are problematic?