

Aquarists and Fisheries Managers: Building Bridges To Fill Knowledge Gaps On Native Fishes

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Agency biologists need the help of aquarists to prevent native fish species from going extinct. A great deal has been learned by aquarists breeding fish in aquaria that could be directly applied to conservation actions. However, government restrictions and laws intended to protect rare species can sometimes get in the way of collaboration between the two groups. In many states aquarists are limited in what species they can collect and keep in captivity, especially any that are threatened or protected. This creates a barrier that prevents knowledge from being easily gained and disseminated. As more of our fish species continue to decline we start to become limited by the knowledge we have of those species that could be useful in their conservation (such as how to reproduce them). Within fisheries management there is a growing awareness of this limitation. Too often this problem gets highlighted during a crisis. Often management agencies do not have the knowledge of where to find people that can help in these situations. The North American Native Fishes Association (NANFA) is ideally placed to build a bridge between the fisheries agency community and the fish breeding community for the greater good of both, and most importantly the fishes themselves. Such a bridge will not be easy to build and maintain as there are difficulties that exist on both sides, however, it is clear that such a bridge could have important benefits to all. Here we outline some strategies and options that can provide a means for a closer relationship between fisheries managers and aquarists targeting the skills of both to increase our knowledge base.

It is important to be clear that this article is not about how the general public can obtain protected fishes to keep in their aquariums. It is about helping people who have fish breeding experience and skills and an interest and willingness to collaborate with government biologists to contribute to the conservation of rare native fishes by documenting their breeding biology. We provide a guide of what is needed for developing the skills and reputation necessary for successful col-

laboration. This is not something that can easily be achieved or done quickly but the rewards have the potential to be great for all involved, especially the fishes.

The inspiration for this article on the need for information on captive breeding came via informal discussions involving various people from the Desert Fishes Council (DFC) in the early 2000s. This led to an evening discussion at one of the DFC meetings regarding the potential role of aquarists and captive breeding of native fishes in general. While these discussions were generally quite positive, the idea never moved forward. The 2010 Nevada NANFA convention provided an excellent setting to revisit the discussion. Most of our speakers were long-term members of the DFC and have considerable interest in the topic. They also came from a diversity of backgrounds including agency biologists (J. Sjöberg and S. Parmenter), a biologist from a facility for breeding non-game native fishes (D. Ward), as well as someone with great skills at breeding native fishes (B. Muller). In addition, we had a diverse audience representing parts of academia, public aquariums and hobbyists to provide feedback and discussion of the ideas present. This article grew from the roundtable discussion and presents one potential road map for a closer relationship between agency biologists and native fish enthusiasts.

Many native fishes in the western USA are often limited to one or just a few individual habitats which makes them highly vulnerable to various catastrophes. Often fisheries managers work to establish refuge populations as back-ups, although sometimes this is not a readily available option. If a population is in steady decline, one management tool available is hatchery propagation. One problem that managers face is that for many species there is little or no documentation on breeding these species in captivity. Many occur in remote locations and/or are rarely kept historically by aquarists. Having information on a species' reproduction though is critical. In some cases fish can be removed from an existing population and translocated to a new one.

However, as species become rarer, removing individuals from the population becomes more problematic. One solution to this is to bring individuals into captivity and use their offspring for reintroduction efforts. There are many issues and problems associated with the captive raising of fish destined to be released into the wild; however, it remains a potentially valuable option in the conservationists' toolbox. One potentially limiting factor to this strategy is that aspects of the captive care, breeding and rearing of various species remains undocumented. Well-documented captive propagation not only can produce individual fish for augmenting wild populations and establishing new ones, but can provide critical information on life history and successful conditions for reproduction. Thus in an ideal world the goal is to obtain information on reproducing the species before population decline reaches a critical point.

Aquarists are ideally placed to be able to contribute valuable information towards the conservation of native fishes. One of the greatest contributions aquarists make is to document the captive reproductive biology of different fish species. By and large, many fishes have little, or nothing, written documenting their captive care and breeding. Even when information is available, it is still helpful for others to document their efforts as people can have completely different experiences with the same species. For some states, obtaining species to work with is fairly easy, although there are no real guidelines as to which species would be the most important to work with first. However, in many states, strict regulations prevent the capture and transportation of fishes. This requires that a collecting permit be issued, but many agencies have been unwilling to issue permits to the general public and restrict availability to academic researchers. Here we outline ways that these barriers can be overcome as well as the type of information that would be useful.

Any time that one deals with state and federal government agencies, the regulatory aspect is crucial in order to have a successful program. States have clear guidelines set up to deal with issues relating to protected and threatened species. Fisheries managers are bound by the state to enforce laws and to try and protect natural resources. Traditionally, scientific permits are only issued to people associated with universities who have legitimate research programs. However, this does not preclude permits being issued to individuals outside of universities, but it is far more difficult to justify and implement. It is crucial that anyone wishing to work outside of an academic setting has built a relationship with people working in that field. In other words, you have to establish credibility. This can be achieved in many different ways. It may be volunteering with your local fisheries biologist or university researcher to help them in the lab or the field. Affiliation with organizations such as NANFA can be important. What is your history of keeping fish? For instance: How long have you kept fish?

How many aquariums do you maintain? How many species have you bred? Have you written articles documenting fish reproduction? Ultimately, who you know and their impression of you is one of the most important factors as people with management authority within agencies will need to be able to vouch for your credibility. Without building some sort of legacy and a strong working relationship it is unlikely that a management agency will take the risk of issuing you a scientific permit. Another important step is to try and approach the relevant people who make decisions regarding permits since they're the people you need to convince. Our suggestion is to always try and talk to those folks before requesting a permit as they can at least be clear about what they are willing to consider, and what your responsibilities would be. Perhaps if you have been working with others in the agency or in academia, have them contact the relevant officials first to set up an introduction for you.

Assuming you have established some credibility, the next step is to apply for a scientific permit. This is something that should be developed in conjunction with people in the agency that you are applying to. Such an application would need to develop clear goals, objectives and a time line. It would also include: justification for the project, demonstration that you have the skills and resources to conduct the project, and a plan for what to do with the fish at the end of project. Other factors to consider are any issues relating to the importation of the fish into your state. In some cases states may require disease-free certification as well (which is not a trivial matter to deal with). You will need to outline how you plan to investigate the species breeding biology and what type of information you will be recording. The justification needs to demonstrate that the information you obtain will be beneficial and that it fills a gap in our knowledge. Just saying that you'd like to be able to keep the fish is inadequate! Obviously local fish biologists can help suggest which species have the greatest need as well as helping to justify why. Documentation of your skills and resources is needed, including: How long you have been keeping fish? How many species have been bred? How many aquariums you plan to dedicate to the project and any articles you have written in the past? Lastly, what happens to the fish at the end of the project is a crucial matter. Most state agencies are rather protective of their fishes. The unauthorized release of fish back into the wild is a massive concern. Just a single foreign individual can mess up a population irretrievably. Undocumented releases can alter local population genetic patterns (management decisions often get based on the alleles present and their frequencies). When new populations get recorded today it can be difficult to determine if they are truly native, or the result of an introduction. In many places, but especially the western USA, many species are directly threatened due to hybridization from introductions. As a result, most state agencies will not allow fish to be distributed to others without

approval (which is usually stipulated in the permit). In some cases it may be possible that fish produced could get used by others conducting different research to avoid taking more fish from the wild. There may be a professional aquarium that would like to work with the species. It is unlikely, though, that approval would be given to spread the species around within the aquarium hobby, which is an unfortunate reality when dealing with regulatory agencies. While most people within groups such as NANFA are very responsible about not releasing fish, it is a risk most agencies are unwilling to accept at this time. That being said, every situation is different, thus it is difficult to forecast what requirements agencies will place on what happens to the fish at the end of a project. The time that a permit application takes can vary massively, but in many cases it is likely to take a few months. It should be mentioned that for species that are federally listed under the Endangered Species Act, the process can be much more complex, time-consuming and difficult. Such species also will require a permit issued by the U.S. Fish and Wildlife Service, in addition to any state permits, and federal biologists may have much less latitude to accommodate private aquarists compared to situations involving species that are only under state-level jurisdiction. The ability to permit listed species would depend greatly on the local situation in terms of which species and who is involved with it.

For the most part, documenting aspects of breeding species is relatively straightforward, but it requires diligent observation and note-taking. The key information to record relates to what someone else would need to know in order to reproduce the fish. For example, what was the trigger you used to induce spawning? What was the photoperiod? Was it natural or manipulated? What was the temperature regime? Having reliable equipment to track things such as water temperature is crucial (next time you are in a pet store look at the

thermometers and see how many of them actually read the same temperature!). If the fish are artificially lit then use automatic light timers if possible. Some species will spawn whenever temperatures are over a certain level; others require a cooling period, while some require a specific day/night photoperiod (and temperature) that mimics late spring/early summer. Having accurate information on how you changed these factors could be important. How large/old are the fish being spawned? What is the sex ratio? How many eggs were deposited? What sort of substrate were the eggs deposited on? What size are the eggs? How often did they spawn? How long did they take to hatch? What first foods were accepted? What were their growth rates? Did the fry have any sex ratio deviations? At what age did they mature? These are all issues that most of us pay attention to, but never quantify or record notes on. Actually measuring and quantifying these types of parameters, and recording other relevant observations, are an important part of documenting a species' breeding biology. Most important of all, you must publish your findings. If nothing gets published in a permanent place where others can find it, then all of your efforts are worthless in the long-term.

Such a program as outlined could have great benefits for all parties involved. Importantly, it helps break down barriers between fisheries managers and aquarists and builds communication, understanding and relationships between them. Having such a relationship helps bring the plight of native fish enthusiasts closer to the attention of regulators, who are increasingly restricting access to native fishes for hobbyists. Most important of all, though, are the potential benefits for the fish species involved. Such information could be critical in assisting conservation programs and avoiding extinction of our unique and underappreciated native fish resources. 

Board Nominees Wanted for 2012-2013 Term

Any member may nominate his or her self to serve on NANFA's Board of Directors, or may nominate a fellow member as long as that member accepts the nomination. A nominee must meet two qualifications:

1) A nominee should ideally have demonstrated his or her ability and interest in the management of NANFA and/or the promotion or advancement of its objectives. Ability and interest can be measured by participation in one or more NANFA duties and/or programs, including but not limited to: serving as a Regional Representative or Contact, writing articles for *American Currents*, or helping with its editing, design, printing and/or mailing; contributing to NANFA's website or helping manage it; helping maintain or manage NANFA's email list, forum, treasury or database; helping with annual election mailings and vote counting; hosting or helping the host(s) of an annual convention, regional meeting, or collecting trip; promoting NANFA and/or its

objectives by writing articles for outside media, or by giving presentations at or leading trips for aquarium clubs, nature centers, schools, or other venues; by setting up or maintaining educational native fish aquaria; and by providing counsel to the Board.

2) At the time of assumption of office, a director shall have maintained a continuous membership in NANFA for not less than one year.

Nominees are required to submit a candidacy statement describing their qualifications and what they hope to accomplish as a board member to Board Chair Dustin Smith (see inside front cover for contact info) no later than November 1, 2011. This statement will be distributed to the membership as part of an election ballot if an election is necessary and will be posted on NANFA's web site.

Board seats held by Sajjad Lateed, Martin Moore, Fritz Rohde and Uland Thomas are open for the 2012-2013 term.