

Building numbers and Quality Through Managed Breeding

As an aquarium hobbyist throughout my life, there has never been a time when every species did well all of the time. With many species, breeding them in enough numbers to keep a population going was often an issue, and with species that did not breed in large numbers to begin with, or that were difficult to keep, it was a reward just to be able to keep them around.

With the creation of Select Aquatics, it became necessary to breed a number of species in large quantities. Species that had taken a year to produce a tank of 20 or 30 individuals would now need to be bred by the hundreds. At the same time, many of the species are also being maintained in selective breeding programs, where fish are separated by sex at a young age, then need to be grown to adulthood to be evaluated as future breeders to improve upon the line.

However, not every species you may want to breed out will be possible for you, given your water qualities, tank setup or husbandry practices. For example, fish that require small multiple feedings, exemplary water quality and large tanks (such as sailfin mollies) are not the best option for the use of my setup. At the same time, from experience there are species that simply do not do well in my current water conditions. Species that have done well in the past at different locations may not be an option today. The fish may breed and survive, but slowly, and may not grow to their potential, while there are others that will do better here than they have in the past with other water suppliers. *Priapella intermedia* had done very well when my water was supplied by a local well system, but today does very poorly, and is not a species that breeds using the current city water treatment system I now must depend upon. When embarking upon a breeding program with a species, not all fish are created equal, and some species will be far better suited for you than others. Because of the consistent water changes required within any breeding program, constantly buffering or tweaking the water to meet certain conditions is very difficult to maintain and to keep consistent.

The practices you use then are not entirely responsible for your success- an important part of the process is to select a species that you know will do well in your water. This is not a "cop-out"- *C. lateralis* and *Z. tequila* both do well for me for me now, and neither bred well on that well water mentioned earlier, and neither is a species known for being prolific. Experience will tell you which species to focus on, and in general, if two species are of the same genus and one does well, the other should also. This is not always the case, however, as *Alfaro cultratus* does very well in this setup today, but *Alfaro huberi* does not. The only way to find out which species will work best is to try, and move on if after about 6 months a group of adults has not bred, or thrives only marginally.

The intention of this essay is not to persuade anyone to change the way their tanks currently operate. But if you want to focus on a particular species, breeding it to maintain a reserve of that species for yourself and for other hobbyists, there are practices that can be followed to get your numbers up in healthy, inexpensive, and effective ways.

The practices here were problems eventually solved, or the result of trying things that went against common wisdom, but worked. The aspects of problem solving and fashioning solutions keeps fishkeeping interesting- when breeding many batches of small fry, there is routinely the need to create dividers, breeders, tops and the occasional light fixture.

Often I am faced with a problem that cannot be fixed with something that can be purchased. For problems that can be addressed with a little creativity and time, to fashion a quick solution, I keep on hand a number of plastic shoebox containers, some nylon netting, electrical ties, plastic cross stitch backing, some nylon screws (as glue is not always a fix when exposed to water over the long term), and "honeycomb" plastic light fixture grating available at any home products store, that I cut to size for tops and tank dividers. Extra box filters, airline tubing, dechlor, green "scrubby" kitchen pads, and a few extra gang vales generally need to be on hand. A dremel tool, scissors, pliers, colored electrical tape and felt tip pen (that I use to make labels to mark each tank, as fish are constantly being moved) round out my toolbox.

I also keep on hand a variety of sizes of plastic containers that are used daily to move fish, sort them, etc. Though rarely used, I have temporary tank dividers made up for most of my tanks of the white plastic honeycomb sheets, cut to size, that are carefully covered with cross stitch backing attached with electrical ties, or nylon screening material so that young cannot pass through. On three sides these dividers are bordered by attached, cut strips of the green scrubby pads so that the divider can be slid into place easily and it will firmly stay in place until removed. Usually, I sew the strips on with nylon thread so that the seal with the glass is consistent and even.

In the hobby currently there are species that routinely disappear through lack of communication between hobbyists, stalled efforts to enact effective species management programs, and inconsistent husbandry by those keeping the fish. Often, under what may seem to be the best of care, fish born healthy do not survive to adulthood to help increase their numbers. Accidents happen, each species responds to its environment differently, and some fish are simply not healthy to begin with. One hobbyists friend believes that you should never part with a fish until you have at least 30 on hand, yet few fishrooms can boast that they maintain at least 30 healthy individuals of each species they keep.

Select Aquatics breeds primarily livebearers- swordtails, both wild and fancy lines, show guppies and goodeids. There are also Barbs (The *puntius padamya*), while beginning to work with rarer species of Danios and Ricefish. Using the methods described in this essay, most species are kept in fairly large numbers, in over 120 tanks that are between 10 and 100 gallons each, and the room contains about 25 species.

I have chosen four representative fish that are bred here- The Swords, the *Alfaros cultratus*, the Goodeids and the Odessa Barb, to hopefully cover many of the specifics that are essential for some species, and how those requirements have been dealt with.

Basic Tank setup for any species that does not require a substrate to spawn:

Any breeding tanks are going to be covered to prevent jumping and to provide security, bare bottom (no gravel or substrate), with adequate filtration (I use 4" simple plastic box filters, with polyester floss) and minimum 20-30% weekly water changes. Live plants are always provided, primarily Java Fern and Java Moss, moderate light, a heater when needed, and all of the fish covered here do best with substantial aeration. The size of the tanks will depend on the species being kept. The biggest obstacle to breeding fish in larger quantities is tank space. Don't let this deter you- you do not need to go out and buy a number of new aquariums. Having the tank space is ideal, but when the space is not available, particularly if access to 5 or 10 gallon aquariums is not possible, there are a number of other solutions that will be mentioned throughout this essay. One of the most ideal solutions comes from breeding large numbers of guppies to be culled down to just a few, I would expand my capacity and space for pairs and trios, etc. with Sterilite brand plastic containers. Often sold as the white plastic kitchen trash bins, they come in a variety of sizes from 5 to 10 gallons. They are lightweight and stack within one another when not being used. Avoid the rubberized or Rubbermaid brand containers as they can contain a chemical that leaches into the water and kills the fish. When set up next to one another with small box filters and overhead light, you can keep a number of temporary spaces going as breeding spaces, places to raise fry, etc. They can also be lifted easily and will never leak.

Once tank space is established, the amount of space you will need can be calculated. Each line or species you choose to work with will require a minimum of 4 tanks. A tank for the breeders to mate in, a tank for the female to have her fry, and two grow out tanks- one for males and one for the females. With fish that do not need to be separated by sex, such as the goodeids, you will need a minimum of 3 tanks. Obviously, as soon as you have two gravid females, the need for more tanks quickly comes into play. Using shoebox style plastic containers of various sizes, I was able to make large, comfortable breeders to have on hand. The sides are cut out with a dremel tool, and the openings are then covered with an attached, inexpensive nylon mesh. A small brace is tied on with nylon electrical ties that hold the breeder in place when hung from the side of the aquarium. These breeders can both serve as a space for the females to spawn in as well as the initial tanks to raise the new fry, until regular tanks are available.

An effective breeding effort requires a lot of handling of the fish, raising them by size, moving them gradually to larger tanks to grow out. Large batches of 30+ fry quickly outgrow a 10 gallon tank, and waiting too long to split a batch up will stunt their growth.

No breeding program will do well without hatching and feeding baby brine shrimp (BBS) on a regular basis once

fry are large enough to benefit from it. Most livebearer fry can take BBS immediately. Adults to be bred should be fed at least twice a day a mix of dry and occasional live foods, and young should be fed 3-4 times lightly per day at first to quickly get them past their most fragile stages. One practice is to immediately freeze ½ of every batch of brine shrimp that you hatch in ice cube trays. Depending on the amount of BBS hatched, you can then maintain a reserve of fresh frozen baby brine shrimp in constant, convenient supply. The best way to obtain Brine Shrimp “eggs” (they are actually cysts) is to purchase them in a 1 lb. can from a number of vendors on the internet.

Livebearers- Swords-

If possible, start with groups of 1 male to 4-5 females in 10 gallon tanks to be bred. Put in enough plant cover to provide a sense of security for females being chased, etc., but not so much that mulm buildup will happen, or such that you cannot see each fish easily. You do not want females having stray batches of young in the plants that may then get eaten.

When a female becomes gravid, remove her to a small tank (or temporary container) of her own, filled with water from the home tank, or with aged water that is as similar as possible. Feed her well to help ensure fully developed, healthy fry, while also discouraging her from eating her fry. I have found that livebearers benefit from earthworms (chopped or flake) when gravid, for larger batches and healthy fry.

A female placed in her breeding tank 1-2 weeks before she drops is ideal. Moving a fish too close to when she is about to drop may cause her to drop early- often too early for the fry to survive. A female whose abdomen begins to “square off” is generally ready to drop within a day or two, but the ability to predict based on gravid spot color and body shape can be very imprecise. Their gestation is generally 25-40 days, based on temperature, and when first building up a line it is important to log the date a female drops, then isolating her when she will be due again so that you will not miss the next batch.

Fill the tank with Java moss so that she can swim around, but young can easily escape into the plants, out of her reach. The goal is to catch every fry released by every female you are breeding. Most livebearers will drop their fry between sunup and about 10AM. If you see one fry, unless she is in the middle of having them, all will have been born and she will need to be removed. If you are not convinced she has released all of her fry, put here into a separate bucket with some Java Moss for another hour or two while you are tending to the rest of the spawn. If you have the tank space, it is best to allow a female that has just dropped a couple days to recover before putting her back in with the other adults.

After she has dropped and been removed, carefully remove the majority of the plants- leaving some for the fry to hide in and feed from, shaking them gently but thoroughly to let any stray fry fall away. Put the plants into a separate container filled with water to let any fry you may have missed fall to the bottom and be removed later. Once the young are swimming about, feed a light dose of baby brine shrimp to get them going. After 2-3 days, carefully observe any “belly sliders”, mutations etc. that may appear, and remove them to be raised separately or disposed of.

I feed BBS (Baby Brine Shrimp) daily, changing 50% of the water each day for the first 10 – 14 days. At 2 weeks I will put the young in a net breeder in their eventual grow out tank, releasing them when they are big enough to be let go with the adults, when they can fend for themselves. When tank space is a problem, and another tank or breeder is not available, I will float the new fry in an intact, rectangular plastic shoebox container with some Java moss within another larger tank with the appropriate water temperature, removing and changing the water in the container daily until a better space opens up.

Once a group of females is having fry regularly, I will put a gravid female in a 20 gallon breeder to have her young, and let the young grow out for 1-2 weeks. At that point the fry have become too large for most females to be interested in eating, and are too small themselves to bother new fry. Another gravid female is then added to the same tank, and kept well fed. Now the older fry function as “dither fish” for any new young that the gravid females release- when she gives birth, her new young mix with the old, and predation ceases, as the older young discourage her from attempting to feed on the new young in the tank. Once 20 or 30 young are swimming around, I will then put as many as 2 other gravid females in the tank, removing them as soon as they have thinned down. Once that tank is fully stocked, I will let them grow out, and get another one started.

The young, whenever possible are raised by themselves in tanks small enough that finding food is never a problem. Generally, livebearer fry are raised in 10-20 gallon tanks with box filters, moderate aeration and some Java moss for infusoria growth and biological filtration. With the amount of brine shrimp fed, live plants in a fry tank are essential to keep the ammonia levels down. Keeping fry separate also allows for better spotting of mutations and identifying fish that you may wish to raise separately, or cull to maintain quality within the line.

Alfaro cultratus-

Known as the “knife livebearer” for its elongated shape and lower body scale structure, this peaceful, 3 inch butter yellow schooling fish has some interesting characteristics that can make breeding challenging. This is a species that will casually eat its fry, so that a batch of young will slowly disappear over 1-2 days if they are not removed. Females do not possess a “gravid spot” as in many other livebearers, and a female being gravid is not always entirely clear. Moving a single female to her own 10 gallon and waiting is sometimes a fruitless and weeks long undertaking. Lastly, this fish can produce spawns that are heavy toward one sex or the other for the first generation or two in a new environment. Oddly, in my room the sex ratio seems to have evened out as the species accustomed itself to this environment.

After a number of approaches, the best method has been to raise the adults in a 30 gallon or larger aquarium, where the fish can be easily seen. Females are removed when they are obviously gravid- they are wider, fuller and heavier in the abdomen. Up to 4 gravid females are then put into a 10 gallon tank heavily planted with Java moss. It should be thick enough so the fish can navigate around the tank, but just barely. The females will then tend to hide down in the plants, staying hidden and out of sight. Females of most species are aware they are gravid and feel compromised in their ability to avoid predators or disruption. When looking to catch a gravid fish it is routine for the gravid fish to be the first to dart to the farthest reaches of the tank. A group of gravid cultratus will stay buried within the furthest reaches of their aquarium.

However, cultratus fry always head to the surface when they are born. A batch of new fry born shortly after sunrise will school in a group above the Java moss where they can be easily netted and moved into a grow out tank. The plants are then gently lifted, any other new fry are removed, and the females that dropped are removed and put back with the adults. Other gravid females can then be added to the tank.

Goodeids:

Most goodeids have few fry, and first time females will often only produce 5-10 fry at a time. The young are large, but they are still eaten in some species. Lastly, some female goodeids do not tolerate being moved when gravid, and will drop their lifeless batch soon after. Here is how goodeid species that are well known for being difficult to breed in any quantity are being bred here:

Zoogoneticus tequila- Adults are raised together and they are not selectively bred, so with the exception of the rare deformed individual that will be culled, they are “colony bred”. Adults are in 30 gallon tanks, and females are removed to have their young as fry generally do not do well in adult tanks with this species.

A 10 gallon is set aside as a breeding tank, and about half filled with Java moss. The female is released, then recaptured after she drops, and put back in with the adults she was with before breeding. Young are fed BBS and raised normally for about 1-2 weeks. I will then put another gravid female in with the previous fry, and fill up the 10 gallon fry tank just as I mentioned previously with the swordtails. There are times when as many as 4 gravid females are in the breeding tank at a time. Over 200 tequilas were produced in the last year this way.

Characodon lateralis- These are kept in the same manner as the tequilas, except that they are a species that is selectively bred. This species, however, is even slower to breed than the tequilas. The adult chosen breeders are in a 30 gallon tank, and the fry are raised in 10 gallon tanks just until they begin to sex out, and moved to larger tanks to grow out. The 10 gallon tanks fill up with fry just like the tequilas, but this species seems to prefer the smaller tanks. This is a fish where every breeding age female is known, and every female is watched closely. Having full control over each aspect of the process is a big part of making it work. The fry are then raised separately.

Ilyodon furcidens- This species gets large, and the sexes are not easily identified at a young age like many other goodeids. This species is carefully selectively bred, and far more closely so than the *Characodon lateralis*. Because Goodeids do not store sperm, a fertilization does not affect future fertilizations, so the sexes can be kept together until breeders are chosen. Their color and markings are spectacular, but they do not fully develop their appearance until they are 3-4 months old. The females, however, tend to be less intensely marked and colored than the males. The problem, because they are difficult to sex, is that culling them at 3 months will get

you the best looking individuals, but they will grow out to be mostly males. So you must also keep the culls and grow them out also, going back to them for the best looking females when it is time to select breeders for the next generation.

In this fishroom, about 20 breeder adults are kept in a 50 gallon tank and females are pulled when they become gravid, 3-4 to a 10 gallon tank heavily stocked with Java moss, and moved back as soon as they drop. Young are raised in the 10 gallon tank for 2-3 weeks, then combined with other fry in 30 gallon tanks. At about 1.5 inches they are then culled down to the best looking individuals, the culls being kept separately to retrieve future females, obvious inferior males are given away or disposed of. The choice group is then put into the large breeder tank, and older past breeding age fish, or fish who no longer represent the advances of the line are culled. This species has always bred seasonally for me, tapering off around October, beginning again the following May. But I have recently found that intensive feeding during the winter months has kept them breeding.

Ameca splendens- This is one of the species mentioned above where the females do not tolerate being moved when gravid. Fortunately, they are not big fry eaters, so fry released into the tank, particularly with adequate plant cover are generally safe. To breed the female so that the young can be raised separately, I use "shoebox" style storage boxes as in-tank breeders. The bottom and sides were cut out, covered with a fine nylon mesh, and a clip was fashioned so they can hang into the tank and stay put, creating a breeder that only moderately confined the female. Gravid females would then be put into these with a little Java moss for security, and young were netted out and put into a grow out tank as they appeared. Being in the same water, in the same tank, and in a large enough breeder has not triggered females to release their fry early.

Egg Layers- Barbs, Danios, etc.-

The *Puntius padamya* (Odessa Barbs) bred here are typical of many egg scatterers in that each female releases a lot of eggs- 150-300 at a time. But you cannot make the assumption that a single spawning from a single pair is going to produce 300 fry. At the same time, I hear from others breeding these (or other species of similar types of fish) that with each spawn they may get 8-10 fry. With effort and the right approach, your results should lie somewhere in the middle.

There are many specifics to breeding these fish, but the effort must result in continued, consistent clean water, the fry must be "surrounded with food", and the food must be appropriate for their size. It takes about 5 weeks of daily 50% water changes and feedings 2-4 times per day, of foods appropriate for their size, to get maximum growth and save the greatest number of fry.

The 30 gallon breeding tank is prepared, and a number of males and heavily egg laden females are put together for 2 days with lots of Java Fern. I use a screen divider for eggs to fall beneath, though it is not as effective as it would be for non-adhesive eggs. From then on, raising the fry is a constant balance of water quality vs. introduced food. Vinegar eels, microworms and paramecium all work well. The goal is to get each hatched egg through its first week- this is when the majority succumb. Having fresh, correctly sized food available for the young when they hatch is the key, then feeding those first foods mentioned earlier while consistently maintaining adequate water quality will determine the number of fry that survive- and the payoff is worth the effort. Of a pair that lays 300 eggs, I would expect to raise out 50- 75. It is routine for many to be unfertilized or to not survive for one reason or another. Finding a way to change water without removing the tiny fry is one important step. Also, only add clean aquarium water from another tank to do water changes.

Development of lines, keeping a fish specifically to build it up, or to selectively breed requires a lot of fish, and with numbers comes culling of fish- something none of us like to do. When breeding strictly to build the size of your population, a fish too old to breed is generally removed to save your resources (food, etc.) for those that will still breed and produce. I keep all of my non-breedable or too old fish in tanks used for show, but most breeders find ways to pass them on to others.

A few things to keep in mind-

- A species that does not produce large broods simply requires more females breeding at a time. The entire line of Red Hybrid swords here is currently being produced by 3 females. Each female will drop 40-60 young each time. But with the goodeid *Ilyodon furcoides*, each female produces 5-15 young at a time, and I keep about 10 females with a few males in a 50 gallon tank. Pulled when gravid, I always have at least two females of that species off in their own 10 gallon tank dropping fry.
- A fish that takes longer to mature simply takes longer to get started. Provided that food and maintenance costs are not prohibitive for you, you will get to a point where fish regularly reaching maturity occurs as regularly as with any other fish, but the longer maturing fish require more food, and more fish will need to be kept on hand, taking up more tank space, before they become ready to sell or breed.
- All fish will eat their fry. With regular feedings 3-5x per day of a variety of dry and live foods, I rarely feel that fry are being eaten, and do not see it take place. But if I were to miss a feeding or two, or a small enough new fry swam out in front of a big enough female, I fully expect that the fry would be eaten. I have watched many females eagerly eat their young- swordtails will sometimes swoop around and devour each young as they are giving birth, until they are full. To further discourage fry eating, I do not feed live fish to any of the fish in the room. Though I breed purple delta guppies, and cull routinely, I do not feed the culls to the *I. furcoides* (Though they would love it!), for I assume it would encourage them to eat their own fry when they appear. You can minimize or nearly end fry eating with frequent quality feedings, and watching closely for when fry are born, and removing the female shortly afterwards. As mentioned earlier, most livebearers drop their fry at sunup.
- There is nothing worse than watching an entire batch of fry get eaten because you released them too early in with the adults. It's amazing how big a meal some species will try to choke down. With some fish the fry may need to become full adults before being released in with their parents, or the adults will pick at them and kill them off. The time to release fry in with the adults is generally when they are at least a month old, depending on species. Always feed the tank where the fry are going well before releasing the fry into the tank. It is also good to feed the fry well before releasing them- they look larger to other fish, and go into the new tank with a full belly until they figure things out and are able to compete for food. Oddly, a well fed gravid female put into a new, smaller tank than what she had come from will rarely bother older fry already in that tank (which is why the trick mentioned above works).
- The future fish you have is entirely dependent on how well you raise your fry now. That seems obvious, but fry, for example, do not grow at their maximum when raised with adults. Besides possibly getting eaten, they don't compete well against larger fish for food, and generally benefit from slightly warmer temperatures. Raising fry in a simple, well oxygenated bare aquarium with a few floating plants and moderate light, where access to food is ideal is far better than competing with larger fish in the aquarium. You want them to grow as quickly as possible the first 4-5 months to get the best size and color from them over the remainder of their lives.
- To get female egg layers in their best health to be bred, I increase the number of daily feedings, and usually give the females all the time they need to re-plump out and fill with eggs between spawnings (though they can spawn again in about 10 days). In most cases, with good water quality and consistent, quality foods, if a female is thin she has either just spawned or is too young to breed. When well fed, females will fill out with eggs when they are ready- it is definitely not a situation where a well fed female will then also need a special feeding regimen to fill with eggs. With the Odessa barbs, the females are not ready to spawn until they are about 8-12 months old. The best circumstance is to raise up a group of females as breeders, then choosing the "ripest" when looking to spawn the next batch of fry.
- Always save any water siphoned from fry tanks for any reason. Many fry, particularly egg layer fry or eggs, are innocently siphoned away in attempts to clean up mulm from the tank. If possible, put in an airstone and wait 2-3 days, then net out any fry that appear.

Ultimately, the secret to raising large numbers of young is to keep the variables to a minimum- multiple bare bottom tanks with live plants, controlled matings, removal of gravid females to recover all fry, which are then raised separately so that they can be carefully observed and supported.

Simple aeration-based filtration with consistent, substantial water changes keeps the grow out tanks and new fry tanks stable and disease free. You must use quality foods that can be fed often without fouling the water- or do substantial water changes after each feeding. The routine tasks when breeding are to keep the filter medium clean,

with 50% daily water changes on all new fry tanks, which are generally kept slightly warmer than the adult tanks.

New fry must be fed BBS daily from birth or as soon as they are ready. New water change water must always be clean aquarium water taken from other, cleaner, disease-free tanks. Multiple groups of 1 male to 4-5 females for livebearers ensures the production of maximum amount of fry, when females are isolated when gravid to have their fry which are then raised separately.

Maintaining water quality is everything, particularly for fragile egg layer fry, which can be maintained only through consistent water hanges, before any particular feeding has the opportunity to foul the water.

In fact, the focus needs to be on keeping things as simple as possible, keeping the process as manageable and as under control as it can be kept. The time for heavily planted, gravel bottom tanks and mixing with other species, etc., can take place once the fish are healthy, big enough and old enough.

With many species currently being kept, an effort needs to be made to build up numbers and keep them in the hobby, or they will certainly disappear.

Greg Sage
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selectaquatics@gmail.com
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