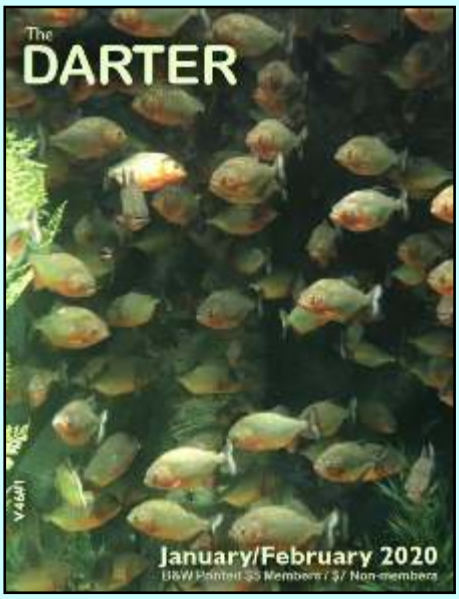

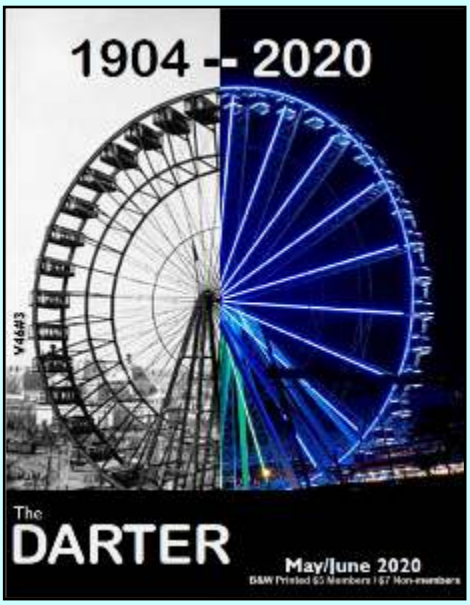

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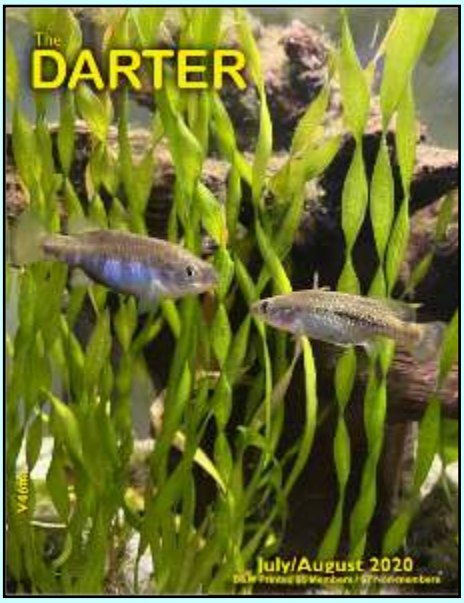

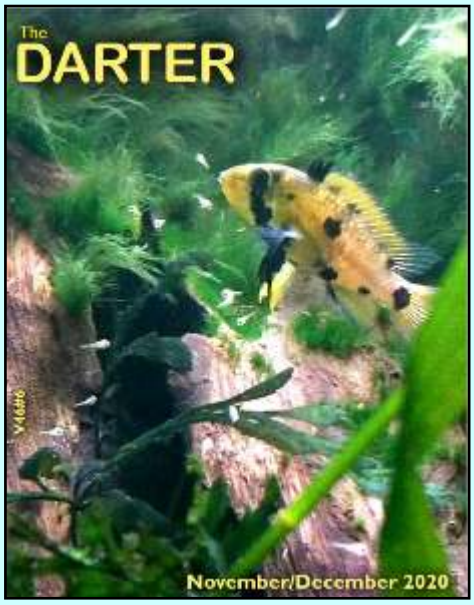

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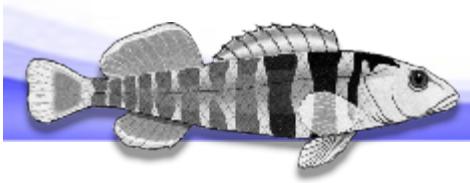

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Failure to receive three consecutive issues of a society's publication may be considered as a termination of our exchange, unless advised to the contrary. Send electronic versions to Editor@missouriaquariumsociety.com & Exchange@missouriaquariumsociety.com

MEMBERSHIP

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Join or renew membership at any meeting, most club events, by PayPal from the MASI Website's Membership Page or by contacting the membership chair.

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A Very Special Edition of The DARTER
celebrating Missouri Aquarium Society Members' contributions in 2020

2020 was a very difficult year for society in general and organized clubs specifically.

2020 began normally enough, but when COVID-19 became established in March everything changed. Spread primarily by close contact, COVID prevention measures quickly led to social distancing and official limits being placed on the size of gatherings. These were devastating to groups who relied on Face-to-Face socialization, such as MASI, who regularly holds organized F2F monthly meetings and public auctions and swaps with hundreds of participants.

Initially clubs complied with the conditions required for safety and suspended F2F activities. Membership faltered in many socially based clubs, including the Missouri Aquarium Society and, although hopes were that the pandemic would pass quickly, it began to intensify and it became plain COVID would be around for an extended period. To remain viable, MASI and other similar F2F groups were forced to use alternative means of supporting the hobby.

Existing Social Media was leveraged to promote the hobby:

- MASI began to utilize a YouTube channel.
- The monthly Bowl Show was moved Virtually to Face Book.
- Arrangements were made to move some requirements for the Horticulture awards to on-line submissions.
- F2F activities became Members Only with little contact through limited attendance, masked, Bag for Bag Swaps, instead of large public auctions.
- Some programs, such as the annual MASI Challenge were suspended.
- Monthly educational speakers went on-line using YouTube and Streamyard to maintain the educational outreach to members and attract the public.
- Annual Awards, Christmas Party and other F2F events were postponed.

Throughout the year the Darter and the written information became important to keep current members and an increasing influx of new members involved in the Hobby and the Society.

Many Thanks to those Authors here who contributed to the well being of the hobby by writing for the Darter.

By the end of 2020, the Missouri Aquarium Society has regained nearly 200 members and is poised to enter 2021 on a positive note.

THIS EDITION OF The DARTER has been compiled as a Thank You for participation in the programs and events of the Missouri Aquarium Society during the 2020 Membership Year.

MASI members appreciate the work and dedication by the authors that went into these articles. Those Editors and Exchange Editors who see newsletters from other Aquarium clubs and Societies also appreciate the efforts that go into these contents. As a result of both first time and established authors, MASI's "The DARTER" annually contains some of the best collections of information about the Aquatic Hobby available.

This Very Special Edition is also meant to serve as inspiration and possible guide for others who would like to contribute information about the hobby. As you find yourself with time or enthusiasm, consider writing about your hobby experiences for the Editors to use spreading information and promoting the hobby. It is an editor's responsibility to guide and help insure your efforts promote yourself and the hobby in general.

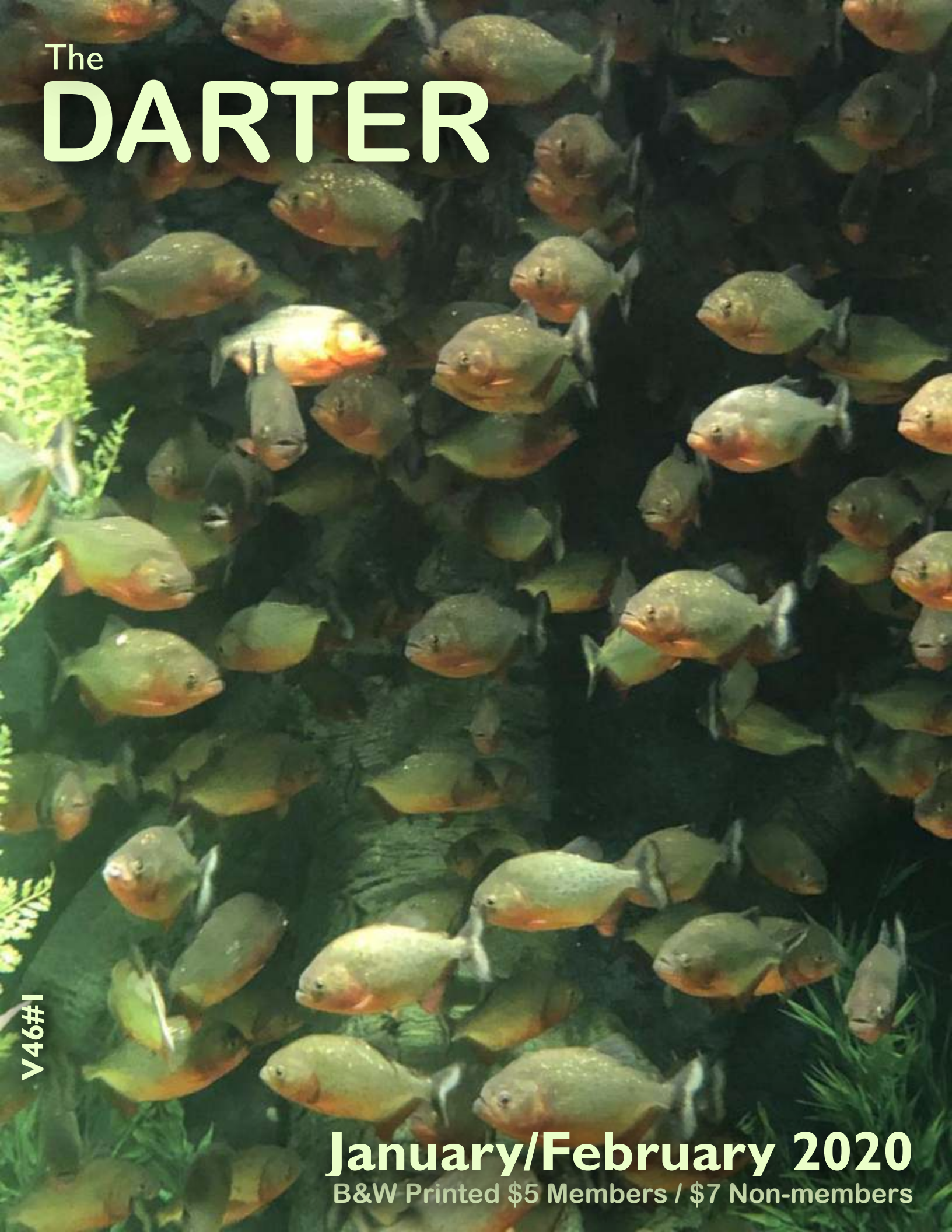
I am often asked, "What should I write about?" My answer is always, "Write about your own interests." No matter what those may be there will be someone who shares those interests or finds them interesting.

In this collection there is a very wide diversity of articles. Such information is readily used in Club publications to help promote the our Hobby.

If you need an added writing incentive, some clubs, including MASI, offer cash incentives or rewards for writing.

BEGIN WRITING, IT HELPS EVERYONE, including YOU!

The DARTER



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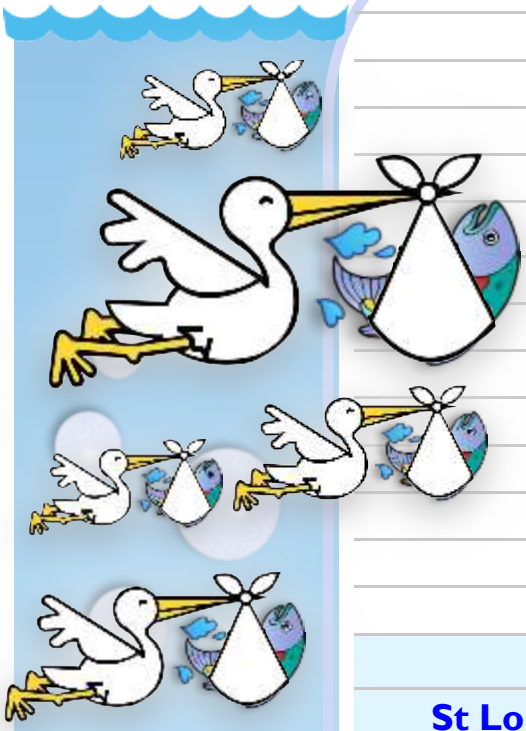

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Click/Tap this to bounce back here. Then tap/click the article you want to read next!

Meet MASI Fishy Folk: Charles Harrison

BORN AND RAISED in Wichita Falls, Texas, I spent my first 35 years in the North Texas, Ft. Worth - Dallas area.

My first wife is no longer with us but our two daughters are both living in Texas along with two Grandkids and two great Grandsons. Sue Ellen, my wife of 43 years and I have been living in St. Louis since 1978 but have no kids between us.

I started keeping fish after High School in 1961. I had a little 10 gal. tank with black gravel and a lot of Elodea to have something like we had in Biology class. I don't know where I got them, but I remember Gold Australies in the tank and watching the eggs they laid turn into fish over a couple of weeks. Guppies never were my real thing. The egg scatterers were, and still are, more pleasing.

One of the largest problems to overcome was a need for some live foods. I collected some Daphnia and cultured them and Protozoa to meet that challenge. While doing so I learned a lot about the microscopic side of aquatic life and how things interact.

Over time I found I could raise fish for sale and turned a sunroom into a Betta room with big glass Coke bottles shelved in the windows to sell Bettas and Cherry Barbs to a local pet store for a little extra cash.

My attention was also turning to photography and I put together a dark room and enlarger for prints. I even graduated from a NY Photography school with college credits in photography by mail! There was no idea of the internet in the '60's as the first ARPANET message was sent in 1969. After graduation in 1967, I took up residence in Ft Worth and began Graduate school at TCU.

I set up a fish room and kept many of the South American annual Killifish. The warm weather in Ft. Worth made it easier to maintain many warmer fish and Discus spawned in my distilled water from the university's lab water supply. I joined the area tropical fish club and shortly became editor of "Betta Tails", their monthly publication. 6 years later, I had managed a local fish store and spawned most of the S American Annual killifish available at the time. Dr. Dave Schleser and I became close friends.

Soon I was looking for employment and, as it was a tough time finding jobs in the scientific community, I left the fish behind and moved back to Wichita Falls to teach High School.

There was no new fish room in my life until 1978 after Sue and I moved to St Louis. I had never experienced a Basement before. The floor space was the size of the house! WOW! - so much more room!

My little fish room was built into our house a couple of years after we settled in South County.

I set up the fish room, insulated it and began stocking it with Killifish. We joined MASI a couple of years later and soon I was their VP and doing programs and inviting speakers. I was VP for 3 or so years and brought a lot of Killifish information into St. Louis. Now I am happy to be a Council member and keep the Web site and Fish Heads Forum going.

There was a lot of Killifish talk back then along with a lot of water chemistry. Since '78 I have spawned my way to Ultimate Grand Master Breeder (2012) and about 3,000 points and have grown into a Grand Master Horticulturist as well.

My favorite fish is the *Callopanchax occidentalis* (the "Gold Pheasant"). It requires a 6 months dry period for the eggs to mature. The absolute beauty of the golden fish equals its difficulty in keeping the fish alive without males killing off the females and each other. Collecting the eggs from a peat bottom is easy but keeping the eggs with just enough moisture for 6 months is a major challenge.

I do keep a pet fish just to keep something I can hand feed. She's an old Haplo Catfish that gets Black Worms in the morning She and a mate built a nice bubble nest about 5 years ago but there were never enough fry to turn in for BAP.

I have 20 ± tanks set up in my fish room now but have been cutting back in recent months to focus on obedience training and trialing our Cardigan Welsh Corgis.

I don't have a Dream Tank or even a picture of one in my mind. I love the Native tanks in the Chattanooga Aquarium but that is way over the top for an individual but I hope the St. Louis Aquarium does something like that.

I am looking forward to the 2020 AKA Convention here in St Louis. I served as their Chairman of the Board of Trustees for 2 terms and on their board for many years. The Killifish are a widely diverse group of many beautiful fishes from all over the world and I take great pride to present the AKA our 2019 Challenge Check during their convention this year.

The St Louis Aquarium opened Christmas Day, 2019

Maybe these early reviews will influence a decision to visit. These are text reviews, not heavily illustrated so not spoilers of impending visits. A photo article may be in a future Darter after more have had a chance to visit.

First impressions at a Pre-Opening of the Saint Louis Aquarium

By Bob O'Brien

The opportunity presented this week to get a December 10th preview of the new St. Louis Aquarium through my work. I have been to several aquariums around the country, such as Shedd Aquarium in Chicago, Wonders of Wildlife in Springfield (Bass Pro Shops), Adventure Aquarium near Philadelphia, Tennessee Aquarium in Chattanooga, but am by no means an expert on the subject. I really enjoy the Tennessee Aquarium.

My first impression when entering the St. Louis Aquarium was the similarity in design to the Wonders of Wildlife in Springfield. The Wonders of Wildlife Aquarium in Springfield is quite impressive and I thought the St. Louis Aquarium had some promise. Not all of the attraction were running, and there may be more displays that we were not able to see.

The first thing you see is the clock aquarium, populated with discus at the time. After that is a train car hallway simulating entering the train station remindful of being on the train years ago a cool touch in connection to the location.

Leaving the train car you see the first large display of the Mississippi River basin tank. This is a large tank, probably 5-10,000 gallons of endemic species and they were still adding stock to some of the displays before the opening on December 25th of this year. The fish are still young, but in really good condition.

The next tank was a piranha tank, couple thousand gallon with maybe a hundred red belly piranha. Pretty cool. They did have some odd companions, I was told they added the tiger barbs just before we arrived, but they lost a few of them. Not sure why they would combine those two species from different parts of the world. Maybe it is a temporary dither fish or something.

Then there is a large Amazon Basin aquarium. This tank was way under populated, and I am pretty sure they were still stocking, but there were not yet many species that I saw in the tank. A few pacu, silver arowana, peacock bass, and one lonely severum.

The final and most impressive tank was the shark and salt water display. Similar to the aquarium in Springfield, it covers at least 2 floors with dozens of viewing ports and some large curved windows. This tank was pretty full at the time, with dozens of species of fish. The design of the viewing panes give some great views and interaction with the fish making this an obvious main attraction. Most of the people were impressed and excited to see the display. There was a large school of bait fish that moved around, a large grouper, and dozens of other species.

One of the displays that was not open at the time I was there was the octopus and invertebrates section. Looks like there will be a half dozen good sized displays for these. There were also a lot of interactive educational displays on the upper level, such as a ray petting zoo, river creation water flow, and area for kids to explore.

All in all, I would say the St. Louis Aquarium on the pre-opening tour was a bit disappointing, but I will reserve final judgement when I get a chance to view it after it officially opens for business, since there may be more to see than what was displayed at the preview. It was a similar but smaller version of the Wonders of Wildlife Aquarium in Springfield.

I would have liked to see more biotopes of different regions of the world, for instance, an African rift lake tank, or maybe their own eastern Asia tank for the tiger barbs. There was not a lot of freshwater species diversity.

One really nice thing about the aquarium is its location. There are lots of things to do and see at the Union Station that would make this an enjoyable day and evening. I hope everyone gets a chance to go visit the attraction.

FINALLY! - an Aquarium in St. Louis!

By Mike Hellweg

For as long as I can remember, folks have been talking about the desire and even the need for a public aquarium here in St. Louis. Big names were often associated with various plans - Marlon Perkins, Jacques Cousteau, Walt Disney, Gussie Busch, and many others. Plans came and went. The Post-Dispatch has featured probably more than a dozen different designs over the years.

As a kid I was sure it was going to happen. But it never did. At the last minute, before the paperwork was finalized, something always happened. Political intrigue, money problems, and various other behind the scenes machinations all led to repeated disappointment. But now, finally, we actually have a public aquarium in St. Louis.

Since most of you have probably not been there yet, I'll avoid any spoilers and just give a die-hard public aquarium fan's point of view. Chuck Bremer, Chris Mohrle and I went on January 6. I'm sure Chuck and Chris will have their own points of view, and I know Chuck took enough pictures to fill a photo album. *(Editor's note 300+)*

In the lead-up to our visit, I read all of the reviews in various places. Most were and are negative, so I truly wasn't expecting much. But I was pleasantly surprised. I actually learned something and saw something I've never even seen photos of before!

To be sure, the aquarium is definitely not the Shedd, Steinhart, or Chattanooga Aquarium (which seems to be the biggest complaint). But it isn't trying to be. Once you leave that preconceived notion behind, you can begin to enjoy it for what it is - something new, different and long-awaited for the St. Louis Metro Area. It's bright, crisp and clean and has that "new aquarium" smell to it. To be sure, like any new venture it has some kinks to be worked out, but overall it was a pleasant way to spend about two hours fish watching and people watching.

There are a few misplaced fish - tiger barbs swimming in the red belly piranha tank, Managuense and Midas Cichlids (from Central America) are in the big South American tank, and a couple of man-made varieties of fish in displays where, I think, the fish should be limited to fish found in nature only, but those are minor complaints - and I'm sure most folks didn't even notice. I'm a bit disappointed in the acrylic work - seams are visible and the acrylic has not been too well polished so it is wavy in places where it should not be...but that's an aesthetic thing.

The biggest negative that I have to mention is that the graphics at each tank are terrible. Everyone was asking "what's that" and there was nothing for them to look at and see what the fish were except for a single touch screen display a few feet away to one side of the tank. That's a neat idea, but highly impractical. When you've got 30 or so people milling about in front of a huge tank, and only one person at a time can get up to and manipulate the screen, most just walk away without getting their question answered. Pictures of the fish, with a small plaque giving their names and a short blurb about some interesting facts on that species or their habitat would be a simple fix.

The fish are all young and have some growing to do, but really for me that is just a reason to go back in a few months and see them again. All of the fish that I could see were healthy and behaving as they should, except for the gars. For some reason all of the gars were laying on the bottom of their tank. I've never seen gar do that before.

I thought maybe something was wrong with them, but later in the day we stopped at a couple of local shops that also had gar in their tanks and guess what? They were laying on the bottom, too! Strange, and definitely something to look into and learn more about. Something that this old fish guy didn't know about fish behavior. So I learned something!

My favorite display was, of course, the one with the leafy (*Phyllopteryx taeniolatus*) and weedy (*Phycodurus eques*) sea dragons. What a cool sight to see! And now I don't have to go all the way to Chicago to see them. What was even cooler? The leafy sea dragons were doing so well that they were mating! I've seen seahorses and some species of pipefish spawn, but

I've never even seen a photo of leafy or weedy sea dragons spawning! What a cool thing to see! I got to see something I've never seen before!

There is still a lot of open wall space that will hopefully one day have more tanks - and let's face it, every aquarium and every aquarist always wants to see more tanks and more fish!

I'm not sure why public aquariums seem to need to have something "cute" - otters, penguins, dolphins, small whales, sea lions, etc. Why not just focus their time, funds, and energy on the fish? That is more than enough of a draw to keep folks coming back. But we have the obligatory "cuteness" in a group of three young otters. As I watched them, I kept thinking what cool fish could they have kept in that huge display? Maybe one day...but again, most of the folks there, especially the kids, really seemed to enjoy them.

There are also the obligatory touch tanks with small turtles, rays, starfish, pencil urchins and similar critters. The difference here was that the ray touch pool has windows in the side so you can actually watch the rays. To me it was much more interesting than touching them. You can do that anywhere. Again, not a big fan of that wasted opportunity. But once again the kids seem to love it!

I hope the aquarium continues to grow and fill in the many blank spaces that still seem to call out for tanks and fish. I talked to several of the employees. They were all friendly and excited to be working there. Most did not quite have a complete grasp on the subject, but most of them haven't yet been working for more than a few weeks. I'm sure they'll become more proficient as time goes by.

Until then, maybe some laminated fact sheets for them would help. Instead, they have to look up answers to questions they don't know on their phones! Anyone can do that.

Additionally, I would love to see a large reef tank with sustainably captive grown corals to show both how beautiful the reefs are, and how we humans can help. Folks constantly hear "save the reef", but if they don't see one, can't relate to it, and don't know it, they won't ever really care. Hopefully something like this is in the works.

One comment I have to make on the folks enjoying the aquarium - maybe stop for just a minute and just watch the fish instead of trying to take dozens of photos of each fish and selfies in front of every tank. When you go, take a few minutes and just enjoy the fish. Everyone knows what you look like!

I will be going back, and look forward to it becoming a regular visit, just like going to the St. Louis Zoo. If you've read all of the negative stuff about how small it is, how small the fish are, etc. well, just put that out of your mind and enjoy it for what it is - finally, our own aquarium!

ST. LOUIS AQUARIUM
AT UNION STATION

The St Louis Aquarium is Different

By Chuck Bremer

Yes, St Louis now has an aquarium! As I'm sure some of the other reviews will concentrate on it as an aquarium, I'm going to approach it more as an attraction for St Louis. Everyone sees things differently and with a different eye.

I don't have the widest of comparisons to work from. I've never been to the Tennessee Aquarium, which I've been told is one of the best, and I plan to go. I have been to the Shedd, New Orleans, Bass Pro, Genova, Vienna, Mall of the Americas (Did you know that under Lego Land there is a public aquarium?), Cabellas, Fin Inn and a few other attractions that I've forgotten.

There are approximately 20 aquariums visible at the STL Aquarium. Not many tanks for a fish keeper, but fish keepers don't have tanks nearly as impressive as at STL. I won't get into detail on other attractions, but in addition to these were also 6-10 other dry or non-fishy attractions scattered around, mostly for educational purposes with spaces for plenty more or for more tanks as time and money present themselves.

The STL Aquarium was impressive! It was well thought out, well designed and, for the general non-hobbyist public will be a major attraction and introduction to the hobby we love. The aquarium is meant to be an attraction to St Louis that will bring in tourism as well as local visitors to complement the Gateway Park National Park.

The STL Aquarium did lots of things right! They used their knowledge of other aquariums to design an attraction that would be an incentive to the majority of the public. Knowledge of crowd psychology designed a facility that complements Union Station, and I think this one will stick, not disappear like past efforts.

The Aquarium definitely plays, pun intended, to the children who visit. There were lots of get 'em wet, hands on, experiences, and I saw more adults partaking than kids. There was even a "waterless tank" to play in so adults didn't get their hands wet. Now you'll have to go to the aquarium to figure that one out.

People handling capacity is high. Traffic patterns were well thought out without being noticed. Groups of visitors enter about every 15 minutes. While waiting visitors are entertained by a large, well populated, discus tank and an amazing "light show" on the ceiling of the lobby. The river otters were holding much of the crowd along the way with an educational nook. A reason to visit is to talk to an otter.

The biggest attraction was definitely the Ocean/Shark tank. It was well designed with a multitude of viewing spaces each giving a different view of things happening in the tank. Viewing took place on a top-to-bottom and clockwise path allowing more to view at once and significantly expanded the viewing spaces improving everyone's visit. The viewing ports were well integrated into the aqua scaping so that none were visible from other viewing ports and each seemed like you had your own private view.

This heavy use of computer enhanced display and design at the STL Aquarium I've not seen at others. If all the humongous video screens are added together it may be more square foot of viewing area than the actual vertical viewing area on the aquariums themselves, including the shark tank!

There were at least 6 major Computer enhanced displays that add greatly to the experience plus all the smaller ones used as information retrieval systems. The computer graphics enhancement added to the overall ambiance and experience and were one of the reasons the lights were dimmed.

Some of the Computer aided displays are reasons to visit the aquarium themselves, beyond the fish! The "light show" in the entry lobby is amazing, worth seeing and state of the art on a curved surface. The computer aided train ride sets the stage well for the rest of the visit and is narrated by a well-known St Louis native, John, a trainy guy. They make the otters talk and the sea shore palpable.

An additional attractions for kids, and adults, is a huge video screen view of an aquarium in the waiting area beside the ticket line at least partially sponsored by Tetra. Kids waiting to obtain tickets can color their own fish and release it to swim around the tank. Volunteers help and oversee the process. As a result of our visit, MASI now has a fish swimming around within this "tank".

No, the STL Aquarium isn't perfect. It can still be improved and likely will be for the future, but even now it is visit worthy and has something for everyone. It fits the intended purpose well and will enhance St Louis' attraction to natives and visitors alike and it will do much to entice more folks to keep an aquarium and advance the aquarium hobby.

I'll take Connie and the grandkids next time. We'll learn from the visit.

Spawning the Hillstream Loach

-

"Sewellia" species

-

By Charles Harrison

A **Goal of mine** for several years has been Spawning the Hillstream Loach!

There was a group of *Sewellia speciosa* in a recently changed out a 5 gal leaking tank that couldn't be fixed. I had made the old tank back in the '90's and it had some personal attachment. These fish had lived there for about 5 years without losing one but now the tank had developed a second leak I couldn't fix.

About the same time I had found a second offering of loaches at an auction and paid top dollar for them. I believed the new Loaches were *Sewellia elongata* but they are different enough to be a different species if not also a different genera. This second addition to the tank could also be *Beaufortia daon* but I shall keep the ID as is for now.

So, I now had two groups of Hillstream Loaches about 5 of each in a 5 gallon tank and put them into a new home. This time they were set up with several pieces of thin slate and a layered hill built in the back of the tank. The top of the slate pile was covered with a couple of 100 strand spawning mops and the old sponge filter was placed in the center of the tank with scattered 1" PVC pipe fittings in the front. In went new water and the captured Loaches.

The old location of the leaking tank had to dry so I set the new tank just below the old spot in the center rack, filled the tank and plugged in the air line for the sponge filter. Air flow was left up to move some water around.

The *Sewellias* have been kept using Baby Brine Shrimp (BBS) that I feed to all my Killies, indeed, almost all of the fish in my fish room. When the loaches were fed Algae wafers they never seemed to take after them and I never saw them eating what seemed to be Algae. They liked the live foods including Grindal worms and even got Black worms once in a while.

Fry in spawning mop

But only last night, about two months after set up, I saw a little black comma scooting across the floor of the tank!

BINGO! They have spawned!

Now to let them grow up so I can tell which species they are and turn them in for BAP points! This morning when I fed the tanks I took extra looks at the tank and found at least five in one counting and I am sure there are more in the mops. As time goes by will we will see, but this is an achievement of something I have been working on for several years.

Spawning some species just takes patience.

Photos by the Author

BEFORE I BUY...

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Or: It's No Fun to Think before I Tank, but it IS Important

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by Kathy Pilarcik Deutsch

MY FIRST REAL fish tank was probably the bane of my mother's day. Previously, I kept my carnival-won goldfish in buckets and bowls. But now I was 5 and I wanted angelfish.

It was, I suspect, a birthday gift from Lansing Pet Store. I feel zero guilt, all these years later, for deciding on tropical fish in the non-tropical climate of Northwest Indiana. My mom would go into Lansing Pet and gaze adoringly at the capuchin monkeys they sold. While she ogled primates, I was staring at (what I now know) were baby Angelfish.

The metal frame tank was a huge 5 gallons, and came with a shiny silver lid (with a LIGHT!), a box filter and pump, gravel and a heater! I was getting such exotic fish they needed heat! We put that tank on a plastic placemat on a coffee table, and promptly filled it with water and fish (probably all at once).

The tank was packed to the gills with angels and black mollies (which Mom liked). I am sure none of us knew that all those fish were babies who would grow. The filter was packed with dusty black charcoal and violently itchy "angelhair" (fiberglass floss). I was not allowed to touch either, so it was up to Mom to clean the tank.

Which she did, weekly, grumbling the whole time. All the fish were netted into a bucket, all the gravel, the

Metaframe & light similar to author's 5 gallon

water, the filter stuff came out. The heater did not last long, sadly. It, and the light in the hood, did not take kindly to Mom's brand of care.

After a scrub and rinse, the gravel went back in, well water was added, the heater and filter with fresh innards, and finally, the fish. After slamming on the silver hood, Mom called it good and went off to the next chore.

The mollies survived...

It was a lesson in how to not care for fish, and it taught me a lot. It enforced the truth that fish will die if I did not understand how to care for them. And that it was up to me, not Mom, to be the Mom of the fish. It's not fun, and sometimes I lapse, but usually I follow a thought-path when I get the yearning to get fish and/or a tank.

First, what is my end game? Do I want to look at a planted tank? Breed a species? Fill an empty spot (Oh, how I love finding a spot for a tank!) in my living room? Scratch an itch for a pair of angels gliding through the vallisneria?

Then I get practical, which I am not good at. WHO is going to clean the tank all the way to the bottom? WHO is going to add water, clean the filter, check the heaters, look for disease? I had a hexagonal tank on a stand that I got at Beldt's. Far too late, I realized I could not reach to the tank bottom to scrub algae. When I mentioned this to Ginny Macrum, the co-owner of Beldt's, she looked at me and said one word: "bikini".

Big nope, there...

Yes, these little guys will grow!

But the practical aspect is the most overlooked. Place the tank on a good floor, and be prepared with towels folded into the stand underneath. Actually, each tank should have some old towels underneath, just in case. Electrical outlets with ground fault interrupters are a must when siting a tank. Can the floor load HOLD that 200 gallon tank? Water alone is 8 lb per gallon.

And the window issue is a constant. Sunlight streaming into the tank is a glorious sight, with the fish darting about in glee. And then the algae starts. I love my tanks in the sun. And I really love algae eating fish, so that is what I do. But if you want big cichlids in the sun, best to plan for a armor coated pleco to help with the green stuff.

goes inside the perfectly filtered saltwater tank. With a sealed lid and a special filter with a cover so the guy does not slither into the impeller. ...I warned you.

But what is worth more than cash? Time. How much time is honestly available for ongoing fish care and study? I have my tanks in my dining room, kitchen, and bedroom. And also in the hallway. But we have pared down quite a bit from the time the kids were also doing fish on a large scale. I look at those fish in my dining room so much I no longer "see" them, if you know what I mean. Since I have taken on the responsibility of these lives, I make myself focus on each tank when I feed. I look to see who is getting old, who is getting sick. Sometimes, I just study their lives and how they go about the day.

Green stuff, the money kind, is another consideration. What is all this going to cost to buy and maintain? Especially if the fish are rare, it seems the food and accessories cost more as well. And speaking of "cost more", salt water tanks will collect salt all over and can potentially damage things. Just saying. If it is salt that you want, get a nano tank and place it in your kitchen, where cleaning is no big deal. And if an octopus is the coveted species, you need a critter keeper "jail" for it, that

No point in having fish if we don't make time to enjoy them. Too many tanks and the interest is gone, caught up in cleaning, water changes, and worry.

Time, money, practicality, and desire, the concepts I think about when I want to get new fish or a new tank. Wish I had some inkling about them when I was 5– would have saved a lot of trouble.

THE OLD FISH HEAD by KATHY DEUTSCH

The Congo Tetra

Phenacogrammus interruptus

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By Chase Klinesteker

Contributed specifically for MASI's DARTER

The Congo Tetra is considered to be one of the most beautiful of all characins. They come from the Zaire River Basin of the Congo River in Africa.

Their iridescent blue coloration, long flowing fins in the male, and peaceful disposition make it an ideal community tank fish. They are aggressive feeders at the surface and will eat a variety of foods, although they may nibble on soft plants if not fed some vegetable flakes. Males can reach 3 ½ inches with females slightly smaller, so plenty of open swimming room is needed.

They come from soft, acid, peaty waters, and require clean water low in nitrates for best health and color. 75 to 80 degrees temperature is ideal. They are shy unless there is plant cover, diffuse light, and they are in a school. They can be excitable and will jump if spooked, so keep them covered. Their lifespan can be 5 or more years.

Congo Tetras are considered somewhat difficult to breed mostly due to their need for soft, acid water and the sensitivity to pollution. Some folks feel that if they are raised in hard water, they will be unable to spawn.

My setup was a 10-gallon tank with undergravel filter of medium-hard tapwater that was treated with a peat moss box filter. Darken the tank and keep out of high traffic areas, as they can be shy in new surroundings. A grass matt or plants can be used on the bottom to hide the eggs.

It took 7 days for the fish to adjust to the breeding tank, so one could possibly use a dither fish or 2 to help them feel more comfortable at first. After spawning, the large non-adhesive eggs were then removed and put in an aerated 2-gallon container of rain water treated with methylene blue for anti-fungal treatment and to decrease the light (their eggs are light-sensitive). There was only a 25% hatch rate.

Having them spawn in soft acid water should result in a much better yield. The eggs take 4-6 days to hatch and need rinsing and fresh water 2 or 3 times because of infertile eggs and eggshells polluting the water.

When the fry become free-swimming, they can take newly-hatched brine shrimp, but growth is slow and they take 8 or more months to reach maturity. The fry can be slowly adjusted to harder water, but they are quite sensitive to large water chemistry or temperature changes.

The Congo Tetra stunningly beautiful fish that is peaceful and, for those willing to accept a challenge, well worth the extra effort to keep and breed.

A "*Hobbyist's*" Guide to Selling Fish

PART 2: *The Ethical Fish-Business*

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By Kevin Plazak

When you are selling fish, you are selling living things. Ethics start to get fuzzy when a life has a price tag. Some zoos get a bum rap as it seems like zoos are selling tickets to profit off of animals sitting in cages, more on them further down.

"And again I say unto you, It is easier for a camel to go through the eye of a needle, than for a rich man to enter into the kingdom of God". *Mathew 19:24*

A fish in a glass box is an awful lot like a cage by any standard. And if the sole reason that they are sitting in that box is so you can make some money, it becomes harder to make a case for this being an ethical choice.

"Is it ethical to keep fish?" is the most important question. My opinion is that it is ethical. PETA's opinion might be that it is not ethical because some of these fish might die. They are partially correct as fish will die, through no fault of their own. There are costs to every fish sold, and that cost is in money as well as a certain number of dead fish along the way to get them to you. That is just a truth. And it is the hardest part of my week, dealing with the costs associated with their deaths. How can that be ethical?

Ethics Lessons:

- These are helpless critters and you need to care deeply about them all.
- A happy fish keeper has happy fish.
- Be kind to your customers as they are often helpless critters too.

I have no defense for the death of a fish. 1 to 2% of every fish that comes through my hands will die either in receiving the fish, holding the fish, bagging the fish or putting the fish in the hands of my customers. 100 to 200 fish die every week in my custody. This number, when considered industry wide, is a pretty low number. I've been told 5% is a much more reasonable number to expect.

I take some solace from being a good vendor of fish, but it still bothers me. And the day it stops bothering me is the day I quit. THAT is ethics lesson number one - these are helpless critters and you need to care deeply about them all.

If you don't care that you lose a bunch of fish because they weren't that expensive, you are the reason people think fish keeping is unethical. Fish are alive, they matter and knowing that you are just trying to make the best day for them that you can helps make you an ethical fish keeper. Never stop trying to make their day as good as it can be.

So how can unintentionally but knowingly putting 100 to 200 fish to death, by just being in a fish business, be ethical? The most ethical path for species protection in a world controlled by humans is one where humans have empathy for fish. Empathy is fostered by familiarity– which is why zoos exist (see, I got back to the zoos!).

Urban and suburban settings are where a lot of people live. Wildlife is not often found in the middle of population centers so many humans have little or no chance to interact with

wildlife. And when you are not around a species, you don't really care about that species.

Zoos bridge the gap between wildlife and people. When kids that don't give a rip about a bear actually see one for the first time - suddenly bears matter a little more to them. As a result of that first interaction with a bear, some of these kids go on to work with bears, some in captivity, but many in their native habitat.

Home aquariums bridge the gap between wildlife and people. If you have aquarium fish in your home, there is a good chance that someone in that home will care more about fish. Some of those people will go on to work with fish in their native range and potentially make a difference in the existence of a species. Many fish species have been kept alive through refuge in home aquaria, such as the Goodeids *Ameca splendens* and especially *Zoogonetiquis tequila,* once extinct in the wild but now being re-introduced in part thanks to MASI efforts. These species were buffered from extinction because of home aquarists.

The hobby-path of Pam Chin, PCCA, is a good example of the aquarium hobby leading to the protection of species. When I was coming up through the hobby in the 80's, Pam was a member of both of my local clubs and she was a social butterfly - auctioning, loud laughter with a genuine love of the club and the hobby.

Pam is sitting on Lake Tanganyika as I write this and gathering information about the state of the lake and may even have been a part of discovering a new species on this trip. When she is on nearby Lake Malawi, she is often putting net busters in place that make fishing for threatened fish much harder for

More about Pam Chin and her efforts to save Rift Lake Cichlids at these links:
Author
Interview
Stuart M Grant Fund

irresponsible fisherman. She raises a lot of money to protect species, and it all started with her husband's crazy passion for cichlids. Like for Pam, the hobby leads to actual change in the world because a person chose to keep and care about a fish at home.

I keep fish because I love them. Because I have had such a long relationship with fish and the hobby, my fish actually helped me complete my degree in biology - a true story too long to get into here. Suffice it to say, my fish got me into a class that taught me that empathy for wildlife is the path to caring for wildlife. If you create a means where fish are in the hands of people, those people will have a greater empathy for fish. They will fight for fish. My reason for selling fish is to create empathy for fish in others which, in turn, helps species that need resources get those resources because more people care.

If you can't make money while selling fish, you still have a hobby and that's all right. Making money on fish is fun, but it isn't fun to expect a living thing to make you money. Did you follow that? Dealing with the cost associated to your well being, when you are expecting a living thing to make you money, is likely more expensive than the money you will make.

Ethical rule number two - you are not a helpless critter, but make your day as good as it can be. A happy fish keeper has happy fish. If the business makes you crazy, walk away. The fish liked you better as a caring hobbyist anyway.

Basically, be kind to the fish and be kind to yourself. Treat the fish to a nice snack once in a while - it may be a total waste of money but will put a bounce in your step for hours. Try to represent your fish as honestly as you can and take responsibility for your failures. Try to sell happy fish.

Be kind to your customers as they are often helpless critters too. Ethics sounds like a high-minded exercise in philosophy, but it's really just a way for folks to enjoy getting along with each other and to be satisfied with their choices in the process. Taking good care of the fish will put you in a good place which is how you take care of yourself.

Next installment:

Kevin's definitions: Let's be clear here, I feel ethics and morals are different. Morals are based on a person's beliefs and ethics are social standards. Some people believe it is morally appropriate to let the state kill a person and some people feel it is morally inappropriate. Both people are morally correct, however it is always ethical for the state to protect life, so it is never ethical for the state to put people in harm's way. Infer what you will about the author's beliefs on the topic…

A lot of people believe laws are ethical or moral when in fact they are just rules that have a result of punishment or no punishment. For example, you can legally keep eight hens in St. Louis and you can legally keep three hens in Portland, Oregon. St. Louis isn't more or less ethical in their choice; it is just an arbitrary number that was palatable to the constituents of the politicians at the time the law was passed. There aren't a "right" number of chickens to keep in much the same way there isn't a "right" number of fish to keep. It is just a law dictating the legal number of chickens within a boundary defined by still more laws.

So, let's loop back to the ethics of keeping fish before we tread further into religion and politics.

Pallid Shiner

Hybopsis amnis

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Rediscovered in Missouri after 63 years!

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Robert (Bob) Hrabik
MO Dept of Conservation
Ichthyologist, RET

Photo of *Hybopsis amnis amnis* from the Hatchie River, TN. SE Missouri specimens are *H. amnis pinnosa* or a hybrid of the two subspecies and looks similar. At right is preserved specimen from Cane Creek Ditch.

MO S&T Students, author in straw hat.

IT WAS TO be a fun-filled, educational day at Cane Creek Conservation Area on September 28, 2019. I was leading a class of ichthyology students from the Missouri University of Science and Technology on a field trip to sample and learn about lowland fishes.

The day was going well as the students were exposed to wetlands, swamps, meandering and sluggish lowland creeks, and ditch habitats. They examined and discussed the life histories of many species found only in the Bootheel region in Missouri. These included Flyer, Banded Pigmy Sunfish, and sand darters to name a few of about 40 lowland species.

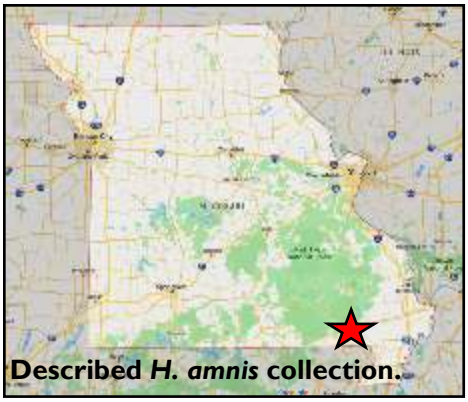
There was one place yet to sample, with an opportunity to see a few different species: Cane Creek Ditch where he students broke into two groups, sampled the ditch, and returned with their catches. Always looking for something different, I thumbed through a 5-gallon bucket of small fish.

Then it happened- A small minnow caught my eye. At first, I wondered why something from the *Hybopsis* genus of fish was in a lowland ditch because current members of this genus are primarily found in the Ozarks.

It hit me! Wow, could it be?!

…I searched the bucket more intently and… **Wow, again! There were several specimens and the pattern was clear: the ichthyology students, their professor, Dave Duvernell, and myself had found the long-elusive Pallid Shiner, *Hybopsis amnis*!**

Cane Creek Ditch



Described *H. amnis* collection.

Previous *H. amnis* distribution from USGS.

In Missouri, Pallid Shiner were last collected in the Meramec River and purportedly from a Bootheel ditch in 1956. The species was once widespread, occurring from northeastern to southeastern Missouri, but over time, it became quite uncommon and then simply vanished. Reasons for the disappearance are speculative, but changing land use and the channelization of the Mississippi River may have been involved. The once large fish kills in the Bootheel may also have hastened their demise.

Our collection that day means that Pallid Shiner are back in Missouri - or would it be more appropriate to say they are still in Missouri?

We know very little about their distribution and it raises a lot of questions.

Was 2019 a banner reproductive year for this fish thus we simply were in the right place at the right time?

Did the current Cane Creek Ditch population re-colonize from a source population in the Black River drainage further south in Arkansas?

Are environmental conditions better today than say, 50-60 years ago thus allowing for the species to repopulate parts of its former range?

Perhaps past researchers simply missed them because they were so rare, ?

These questions are all to be answered by future surveys and research of this species.

Minifins

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The Buffalohead Cichlid

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Steatocranus casuarius

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By Mike Hellweg, CFN
(Certifiable Fish Nut)

OVER 50% OF the fishes regularly kept in the hobby are members of one family - Cichlidae. There are cichlids found on 4 of the 7 continents, with Europe Australia, and Antarctica lacking any naturally occurring cichlids. They have fascinating behavior, are intelligent and often interact with their humans, adding to their endearment.

The vast majority of cichlids kept in aquaria today are found in just two lakes on the African continent - Lake Malawi and Lake Tanganyika. In fact, when folks mention "African Cichlids", they are usually talking about the Mbuna and Peacocks of Lake Malawi as if those are the only cichlids in Africa! They are surprised to learn that there are cichlids all over Africa from Egypt all the way west to Senegal and south to South Africa. Almost every river and lake on the continent is home to at least one cichlid species.

The smaller riverine cichlids of West Africa are my favorites, and those coming from West Africa are colorful and unique. The mighty Congo is the deepest river on the planet and home to the interesting buffalohead cichlid, *Steatocranus casuarius*.


Rapids on the Congo River

The male has a large bulbous, fleshy growth on his forehead that continues to grow throughout his life, until it sometimes becomes almost as large as his head. Females and juvenile males also have a small hump, so that can't be used as a sure sign of sex in smaller specimens. Males can reach 6 inches, though they are usually a bit smaller. Females top out at just under 4 inches, but are also usually just a bit smaller. Males are deep chocolate gray brown and have pointed tips on their dorsal and anal fin. The male's lips are also very large, and these, along with the fleshy growth, make him look like a comic book character. Females are usually lighter brown with darker brown bands and have rounded tips to their dorsal and anal fins.

Buffaloheads are rheophilic, meaning they come from fast flowing water. Their swim bladder is reduced in size to decrease neutral buoyancy and make it easy for them to stay in place in this churning current without expending too much energy. They move along the bottom in short hops, reminiscent of a darter. Keep this in mind when setting up their tank. They really like good water movement.

The water doesn't have to be churning, but it's a good idea to give them a power filter at least one size larger than that rated for their tank, and set it up on one of the short ends of the tank so the current flows from side to side in the tank instead of from front to back. A power head or wave maker attached to the short end of the tank would work just as well. While water parameters are generally not that important to buffaloheads, water

quality is. Give them large, regular water changes. They prefer their water a bit on the warm side, but don't go too crazy. Set the heater to 80 to 82 degrees Fahrenheit and they will be happy.

Wild buffaloheads are primarily algae eaters, though they probably consume a large amount of microfauna with the algae. Any commercial foods will be eaten greedily, but they should have a diet heavy in veggies. Mine get spirulina based pellets and flakes as a staple diet, with a weekly supplement of frozen brine shrimp, mysis and bloodworms. I only give them live blackworms when I want to encourage them to spawn, and then only for a few days to help get them in condition for spawning.

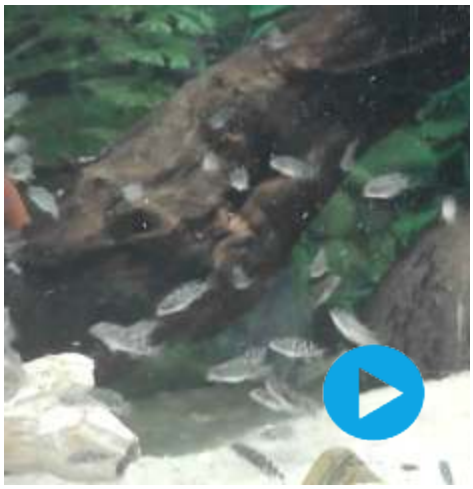
They need a fairly large tank. A four foot tank (33 XL, 55 gallon or even larger) should be the minimum size considered. With rheophilic cichlids, it's all about lower level real estate, so a tank with a larger bottom should be chosen. Cover the bottom with larger gravel, and add an assortment of pebbles, rocks, and cobbles of various sizes. Add several caves that are large enough for them to hide in - at least two caves for each fish in the tank so they have choices. PVC pipes or clay pleco caves work very well for this purpose.

Due to the strong current, true aquatic plants are not often found in their natural habitat, so they won't be missed in your tank. You can design a fantastic looking landscape using various rocks while hiding caves behind or under them. Be sure to support large rocks on the bottom of the tank so that any digging activity won't cause them to collapse, injuring fish or damaging the tank. Add a few clumps of Java moss attached to some of the rocks out of the current as these will provide grazing areas for fry between meals.

***Steatocranus casuarius* forms pairs that often remain together** and spawn several times. I believe strongly in the suggestion that you should start with a group of 6 to 8 young fish. They grow fairly slowly, but steadily, so in about a year or so you will have a pair or two form in the tank from this initial group. There will be some scuffles, but Buffaloheads aren't extremely aggressive and the strong current will keep them from spending much energy on fighting.

Once they reach sexual maturity, if they are being fed a good diet they will spawn without further intervention on your part. The pair will choose a cave and the female will lay her eggs inside. Sometimes the male is too big to fit in the entrance of the cave, so he releases his milt at the entrance of the cave and fans or pumps it into the opening. If none of the caves are to her liking, the female will often dig a suitable "cave" under a cobble or larger rock out of the current - or in at least one case, under the base of the ceramic cave I had provided!

You will know they have spawned when the female remains in the cave, even at feeding time. She will guard the eggs and then the fry and keep them in the cave until they are free swimming and ready to head out mostly on their own. They are surprisingly large, much bigger than most other cichlids at this point in their lives. Mom and Dad will guard the area, but unlike most other cave spawning cichlids, they don't spend a lot of time leading the juveniles around the tank. The fry will spend their time grazing aufwuchs and picking over every space in the tank and will spend a lot of time near the clumps of Java moss, grazing on the microfauna that lives there.



Growing buffaloheads will take finely ground veggie based flake, pellets and powdered foods as a staple diet. They should get some live foods in the form of newly hatched brine shrimp and microworms to supplement the food they are finding in the tank. Fry spend all day grazing, and return to their home cave at night for just the first few nights. Over a period of a week or so they will gradually expand their grazing area and exercise greater independence, and finally cease to return to the cave at all.

They do not school in the traditional sense, but they will remain in a pretty close-knit group for a month or two. Some juveniles will hang around the old homestead after subsequent broods are produced, while others seem to want to get as far away as possible. Sounds familiar, doesn't it? I'm not sure if buffalohead parents like having their semi-independent juveniles living in the basement, so to speak, but the adults at least seem to tolerate them, and the older siblings don't bother their younger brothers and sisters. In the 125 that I kept them in several years ago, I had a large group of juveniles of different sizes from three spawns all schooling together.

It is a good idea to gently remove most of the youngsters about a week after they are free swimming. This will allow them to get targeted feeding and all of the food without having to share with other spawns and their parents. Move them to a 20 long filled with water from the parent's tank and supplied with good filtration. Feed them well; give them large, regular water changes; and within 3 or 4 months they will be an inch or more in size and ready to move to new homes.

They are very intelligent and even at this size, they have a great piscinality and spend much of their time watching what is going on outside the tank, and interacting with their human, and as always, begging for food. Feed them well, but don't get carried away!

The Walstad Method for Planted Aquariums

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My Personal Experience

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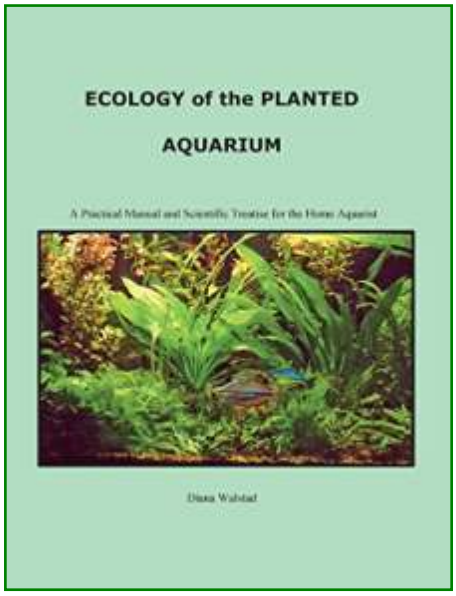
by Steve Coxon

Walstad's Basics:

1. Potting soil substrate
2. Light "siesta" during the day
3. Use of floating or emergent plants



DIRTED - TANKS aren't new. More than 30 years ago, a science teacher of mine had a metal frame tank with dirt, plants, and some mosquito fish. It baffled me because her tank did nearly everything I understood as a young aquarist to be wrong.

It was beside a window, had dirt instead of gravel, was given little regular maintenance, and had no light, heater, or under gravel filter. Perhaps the only thing she did not do "wrong" was overfeed her fish. Yet, the fish and plants thrived.

A few years ago, I was just getting back into the hobby after a hiatus due to moves and small children. I wanted a heavily planted aquarium, but wasn't ready to make a large investment of either time or money. I came across Ecology of the Planted Aquarium: A Practical Manual and Scientific Treatise for the Home Aquarist by Diana Walstad.

In the book, the author promises great plant growth while saving time and money. She eschews CO_2 injection, regular fertilization, and expensive lights, instead advocating for inexpensive lighting including some indirect sunlight and potting soil substrate.

Walstad follows three key principles:

1. Potting soil substrate. The soil plus fish waste offers everything needed by plants, including CO_2 from decomposition.
2. A "siesta" during the day to allow CO_2 levels to return. That is, a day-length of 14 hours with a 4-hour rest period approximately in the middle using inexpensive timers (e.g., 5 hours on, 4 hours off, 5 hours on followed by a 10-hour night).
3. The use of floating or emergent plants to remove nutrients efficiently and discourage algae growth.

First published in 1999, the book is now on its third edition, each with minor updates. The author has published both a practical set-up summary as well as updates, most notably on advances in LED lighting, on her website at http://dianawalstad.com. As such, I will focus on my own experiences with three aquariums that largely follow the author's recommendations.

Fishbowl Trial

I did not initially trust putting fish in a tank with potting soil. I decided to test the concept with only plants in a one-gallon fishbowl. I used one inch (damp) of MiracleGro Organic Choice Potting Mix capped with a ¾ inch layer of play sand. I used a clamp light with a bright white compact fluorescent light. The water was from the St. Louis County tap, treated with Prime. I planted easy growing plants including chain swords, cabomba, and (yes) duckweed. My kids were delighted to find snails shortly after set-up.

The trial went very well over its approximately eight month span. The bowl was unheated and averaged 66F in the winter and 72F in the summer. Possibly due to the low temperatures, the cabomba did poorly enough that I eventually pulled it out. However, the chainswords spread well and filled the bowl. The duckweed needed regular removal. I did not feed the snails and there were no algae problems. I had to dismantle the bowl as my family and I were away from home for three months.

20 Gallon High

Two years ago, I decided to try a Walstad set-up in a 20 gallon high tank with a goal of keeping an *Apistogramma cacatuoides* pair. The tank was set-up with the same soil type and depth along with the same sand cap. I planted chain swords, cabomba, and an Amazon sword. I added duckweed.

Along with the Apistos, who have 20-30 fry much of the time, the tank has housed a school of 12 black neons and a bristle-nose pleco from shortly after

completing a fishless cycle as well as some *Corydoras parallelus* and Beckford's pencilfish from MASI events. The latter have begun successfully spawning in the tank, which has matured into a jungle. The tank has a few Amano shrimp as well as a few assassin snails to keep the pest snail populations in check.

The nitrates remain undetectable and the phosphates are very low. However, plant growth is strong and algae growth is minimal. I remove a net full of duckweed and a handful of cabomba weekly. I use a Finnex Planted+ LED on a timer using the "siesta" schedule and heat the tank to 76F.

Initially the tank developed some hair algae on the cabomba near the surface, but it stopped growing without more than effort than hand removal. The driftwood does get some green beard algae, but it is slow growing and does not bother me. Unlike other tanks I have kept, the glass does not grow visible algae at all. India almond leaves are left in the tank to disintegrate and replaced as needed.

While Walstad does not advocate for them, I do regular water changes of 5 gallons biweekly of half tap and half spring water, keeping the pH around 6. During water changes, I siphon detritus from the top of the sand, but avoid disturbing the substrate.

About a month ago, after reading Karen Randall's Sunken Gardens based on Mike Hellweg's book review in a recent issue of The Darter, I purchased a CO_2 checker as well as some pre-mixed drop checker solution. It has remained green since that time, suggesting that the tank has appropriate CO_2. This likely comes from the soil decomposition.

My only real issue with the tank was the addition of corkscrew val, which grows well– not only where I planted it, but right up front and everywhere in between! It forms strong roots. To remove it from the soil, I use scissors to cut around each plant into the soil in a circle and slowly pull the plant out and lift it from the tank in a fine mesh net to reduce soil loss into the water column. I add a bit of sand over the holes.

Overall, I have been extremely pleased with the tank. While it is not easy to change the aquascape, it is a focal point in our living room and

provides ready life science lessons for our children. It certainly fit my desire to have a low-budget and low-maintenance tank as well as breeding Apistos.

10 Gallon

Finally, because I was so pleased with the other Walstad tank, I set-up a 10 gallon that fits perfectly on a small table in our family room about a year ago. The tank is lit with an inexpensive NICREW brand LED. I wanted to try slower growing crypts and anubias. Also, instead of duckweed, I used salvinia.

I obtained a trio of Gardneri killies from Charles Harrison. I added guppy grass to provide cover for the fry and now there are at least 10 Gardneri. The tank also contains a few Amano and bamboo shrimp. Unlike the 20, there are no visible snails. Like the 20, it did get some hair algae in the beginning and does have beard algae on the driftwood. However, there is no longer an hair algae and very little algae grows on the glass.

The plants are growing beautifully, and I have been able to export several crypts to my fishroom as well as salvinia and guppy grass to the compost. The tank has a small power filter and is heated to 78. It maintains no detectable nitrates or phosphates. I provide similar maintenance, but simply use treated tap water.

Conclusion

I highly recommend trying a Walstad method planted tank. They offer low-maintenance and low-cost heavily planted tanks. Aquascaping is not easy to manipulate, but with careful planning they can provide a beautiful home for your fish and invertebrates.

There is a wealth of information online, of course, but I believe that the method is to experience it.

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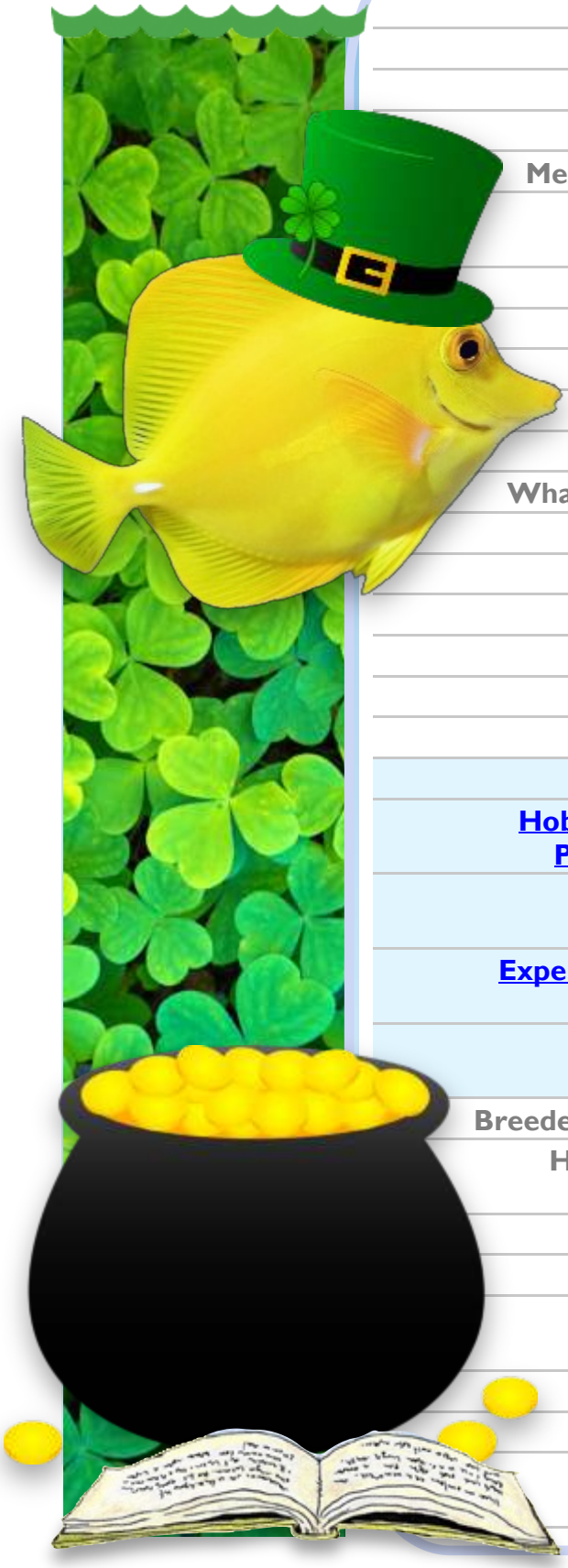
The DARTER

INSIDE THIS ISSUE

Cover - Shark, New STL Aquarium - Ian Eggert



Article Photos are provided by the Author unless otherwise noted.

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Do fish need plants?...

-

by Kathy Pilarcik Deutsch

Some fish will defy all advice. Make no mistake, fish have their quirks.

We as caretakers have the job to help the animals we have committed to. We do what we think is best, then see how the fish react and make changes.

TODAY I WAS adding a spider plant to a fish tank. *Chlorophytum comosum*, the common spider plant, is overtaking my home.

I won't kill them, since they are incredibly helpful in filtering the air. They are also happy to grow in my odd conditions. They are un-bothered when the pup nibbles on a leaf. And they make an accommodating home when a frog decides he wants to live in my house all winter. So, I won't throw them away. However, sometimes they go in fish tanks because I am out of room in planters.

Spider plants love water. I have used them as top-of-water filtration for decades. I cut holes in a screen that sits on top of the tank. I insert the roots into the water, and the screen keeps the crown of the plant and the leaves out. Yes, it looks... unkempt, just like my typical life. But if the fish like it, so what?

Therein lies the question. Do fish need plants? Do fish need structure?

Consider the fish species with with you are dealing. Any fish that eats plants and loves greens, wants plants. Yes, they may eat the plants- in fact probably will. This means you may need another tank with plants to replenish the eaten plants. And another tank is ALWAYS a good thing.

Most fish equate plants and structure with safety. They also equate them with territory. No doubt, allowing fish to create and defend territories can be fascinating. It is also misery when they beat each other up. Sometimes the only way to stop the warfare is with... another tank. Seriously, plants and structure are usually the saving grace that allows a bunch of fish to survive in a glass box.

Consider tank levels. If you have top swimmers, they need hiding places on top of the water. Mid level guys appreciate middle of tank things. And please, give the bottom dwellers tubes, submerged logs, clay pots with the bottoms broken out, etc.

MANY FISH that live on the bottom and has a down turned mouth NEED wood. They especially need soft, algae laden wood. But if they need wood to eat nothing can replace it.

Most fish need structure and plants but there are some fish that cannot deal with clutter. Any predatory fish, from gar to pike, need clear sight lines. They cruise the tank all day, pacing. They are looking for food and for enemies. Plants and logs get in the way. If a fish looks and acts like a torpedo, is restless, with a pointy nose, they probably just want a lot of room.

DISCLAIMER: a mating pair of pointy nosed predators want a place to do their thing. Something off to the side and way back of the tank is best. Be ready to grab babies before parents eat them.

A "*Hobbyist's*" Guide to Selling Fish

PART 3: *The Perfect Transaction*

-

By Kevin Plazak

THE FIRST TIME I heard the phrase found here, I had a hard time wrapping my head around it.

Perfect is perfect and done is just done. How can perfect just be done? Well, after spending an inordinate amount of time trying to process this saying from my science teaching friend, I finally threw up my hands in disgust thinking that some people just don't want to try.

But this saying haunted me. I generally don't walk away from something until it is done. I mean, really done. Put to bed, laid to rest, fait accompli... why we talkin' about old stuff? Perfect means it can't be any better. Done means you aren't gunna work on it any more. Somewhere those two things mean the same thing, but my life never encountered it. I know, this is simple stuff for those of you with the wisdom to understand simple wisdom. I am gifted with a brain big enough to do hard things which also means, I am gifted with a brain that can make easy things much harder than they need to be. Those double edged swords are a bugger.

But the upshot of this sword hacking and slashing my peace of mind is that I will dissect everything until I get it. And I do finally get it and the entire nuance it brings. Which made me understand my job a lot better, my relationships a lot better and my many (read: near-infinite) failings better. Let me break down the pathway to the perfect transaction. This is important, so I need to write this real slow so it can sink in... here we go!

"It's better than perfect, it's done!"

-- Derek Clark

Perfect ain't a thing!

There, I said it! I know, I know... you did a perfect spitball in grade school, you woke up and your hair was perfect AND you heard someone say that their order from a company was perfect. Okay, yes - there are perfect things, but you can't expect there will be a "perfect", ever.

And that is rule #1 of having the "Perfect" Transaction - expect that it will not ever be perfect. Expect that the Post Office will screw up your shipping or a fish will bury itself in the corner of a bag and drown or your three layers of plastic bags broke in transport... really, something can happen and often it does happen.

Rule #2 - make it easy. You cannot make everything bend to your will. Physics will continue be to a stickler about gravity and the forces unleashed when water is dropped inside a bag, inside a box will always be the same. Fish will keep being fish, customers will keep being customers... you can't expect any of them to go how you would imagine. You can reduce variables, increase safety, and create a realistic expectation... that's all you get to control. Ultimately, you aren't

shooting for perfect, you are shooting for easy.

A "perfect" transaction will always have some fun aspect to it so, rule #3, have some fun. Customers are a pain in the ass. And they can be the best part of the job. How you view your customer will help each transaction to go one way or another. I think of each customer as an opportunity for both of us to make money and have fun. Some customers I learn a lot from, for some I am the teacher and others we are peers sharing what we learn. And there is a lot of fun to be had with each and every one of them. Have fun with how you sell it, have fun with how you buy it, have fun with whatever goes wrong and make it easy for your customer to interact with you.

So, to recap these very important details above, perfection ain't a thing, transactions will go wrong now and again, and every customer can enjoy the results of this chaos if you try very hard to make it easy for your customer to have to deal with the results of a chaotic transaction. Embracing these three tenets of doing business will allow you to make good choices when you run into the truly bad customers.

Rule #4, for all transactions to be good, you can't build in a bad customer to spoil your fun. The truly bad customer will steal from you when they can get away with it, make you get so deep in your head you have a bad day/week and they will not have any fun interacting with you. Using the simple steps outlined above, you can quickly identify horrible customers as their transactions are so bad they are outside the normal "bad", they make every transaction hard for you AND there will not be any fun most of the time. Fire this customer. Block them, refuse to engage with them, send them to spam. You have to manage how much negative nonsense you can take.

Rule #5 - always be a good customer. When you are a jerk, you will accept others being a jerk to you. Be kind, assume they tried and if your supplier fails you again the same way, stop using them for whatever they are doing badly. Always speak up when things go wrong and be a polite as you can be when things go mostly right. At the end of the day, a supplier can make your life a lot easier and will make you a lot of money if you are watching your pennies.

Rule #6 - watch your pennies and count them all often. This is simple business - if you don't know if you made money, you can't have a perfect transaction. You gotta count the pennies, don't leave out one. If you drove three hours to make ten bucks, you should really consider a different vocation. When you count the pennies, you will know when a customer is asking for money back how much it costs you on the whole sale. If you made $100 and they are claiming $10 died, give it back, make it fun and try to make them feel good for asking.

Rules of a Perfect Transaction

1. Expect that it will not ever be perfect
2. Make it easy
3. Have some fun
4. Don't build in a bad customer
5. Always BE a good customer
6. Watch your pennies, and count them often

So, it's better than perfect, it's done! Your transaction is over, the post office lost the box for 24 hours, two fish died, and the customer appreciated your note letting them know the package is lost. You gave the customer a credit for the lost fish and the customer LOVES their new finny-family members. You made $20 after credits, spent 20 minutes on the sale and 10 minutes tracking the package. $40 an hour, freed up some tank space and you got a photo of the customer's daughter staring at the new fish.

And that same customer's friend just sent you a $50 order. That's how it's done!

Next time: How do I know if I am making any money?

Minifins

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The Serpae Tetra

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Hyphessobrycon eques

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By Mike Hellweg, CFN
(Certifiable Fish Nut)

The serpae tetra is commonly available in the hobby. Over the years, it has been known by a variety of common names including jewel tetra and blood tetra. They have also been bred into a longfin form that is beautiful, but the fins are usually somewhat shredded by their naturally somewhat boisterous behavior.

It has also been known by a variety of scientific names including *Hyphessobrycon callistus* and *H. serpae*, both of which are considered junior synonyms of its current scientific moniker of *H. eques*. It actually belongs to a complex of closely related species that are often intermixed in the trade, which scientists refer to as the "blood tetras". If you can find wild caught specimens, sometimes you can find three or four species mixed.

Some specimens are varying shades of blood red, with red extending into the fins, along with black and white. Others are tan or beige with blood red highlights. Yet others are more of a yellowish color. Eventually some scientist will look at the group more closely and clear things up. Until then, we can enjoy these beautiful tetras for what they are - true aquarium jewels.

As with many jewels, there is often a dark side to their beauty. When kept singly or in small groups, they have a reputation as being "nippy" or "aggressive". Like all tetras, they do have a well-developed set of choppers that are designed for nipping.

Like all tetras, they do have a well-developed set of choppers that are designed for nipping

In the wild they develop a pecking order by displaying for one another and nipping at each other's fins. In addition, like many other small, schooling tetras, they make at least part of their living by feeding on the fins of larger fish. That is likely why many larger fish grow extensions on their unpaired fins, to keep the little fin-nippers busy.

Male serpae tetras dance around displaying their large black dorsal fins for one another and for the less-flamboyant females. With a large group, this behavior is spread over a

One of the elongated fin types. © Hristo Hristov

large number of fish and not much damage is done. In a small group, or in a community tank with slow moving or long finned species, this behavior gets magnified as there are few targets and no dominant fish in the group to keep them in line, resulting in nibbled or torn fins in other species. Because of this, the serpae tetras get a bad reputation.

Keep them in a group of 15 - 20 fish in a three to four foot tank and you'll be rewarded with their outgoing piscinalities and they will be model aquarium residents that look like little jewels flashing in the light. Other fish will mostly be ignored. But no serpae tetra worth its name will turn down an occasional nip at long, flowing fins. As the serpae tetras see it, those flashy fish are just offering up an occasional snack. They feel they deserve it!

All of the serpae tetras in the trade have been farm raised in Florida, Europe and Southeast Asia for dozens of generations, so unlike wild caught fish they are not too picky when it comes to aquarium conditions. Give them clean water with decent circulation from a good power filter, some plants around the perimeter and maybe a couple of large pieces of driftwood and they'll be happy. You might even see an occasional youngster appear in the tank.

Water parameters are not too important - a pH somewhere around neutral, water that is soft to moderately hard, and a temperature in the mid-70's Fahrenheit are all they really need.

Feeding is not a problem. They are primarily carnivores in the wild, but since they have been raised on farms they are used to commercial prepared foods. They will appreciate a meaty treat a few times a week, so give them an occasional meal of frozen Mysis, brine shrimp, bloodworms or daphnia.

To condition them for breeding, separate the sexes for a week or so and feed them heavily on frozen and live foods like bloodworms, brine shrimp, black worms, chopped earthworms, etc.

A five gallon tank is an ideal choice for a breeding tank. It's a good idea to paint the outside of the bottom a dark color like flat black. Use it bare bottom for breeding.

Get double use out of the tank by filling it with water from the main tank and moving the female into it a week before spawning to condition her separately as described above. A filter isn't necessary. Just add a slowly bubbling airstone. Add a heater set to 78 degrees Fahrenheit.

The day before the spawning attempt, give the tank a fifty percent water change and siphon any debris from the bottom. Refill it with water that has been filtered over peat for several days. I do this with an old-fashioned air powered box filter filled with peat in a five gallon bucket of dechlorinated tap water. In a few days, the water in the bucket should look like strong tea and is now ready to use.

Add a spawning grate made of florescent lighting grid or large mesh needlepoint canvas (you want holes about 2 mm or slightly larger) to the bottom of the tank, and a pile of acrylic yarn spawning mops on one end. As an alternative, you can use Java moss. The breeders will use this acrylic yarn mop or moss as a spawning site.

Add the male to the tank just before lights out. The pair will usually spawn first thing in the morning, and spawning will be complete within an hour or so. Remove the breeders as soon as they are finished, or they will begin eating the eggs. If they fail to spawn by the second morning, separate them and condition them again for another week to 10 days.

The eggs will hatch in a day or so. They will look like tiny eyelashes with a large belly and eyes sticking to every surface in the tank for the first few days. On about the fourth day they will begin trying to swim, making darting movements and settling back to the bottom.

By 5 to 7 days after hatching, depending on temperature, they will be free swimming. At this point, it is time to start feeding them. The newly free swimming fry are large enough to take newly hatched brine shrimp and microworms immediately. They can also be fed commercial fry foods designed for egglayer fry.

I usually feed them brine shrimp in the morning and microworms in the late afternoon, and mix in a bit of dry fry food like Sera Micron or Golden Pearls once a day. A couple of small shrimp or snails will help clean up any uneaten food. After two weeks, start adding finely crushed flake food.

At this point swap out the airstone for a mature sponge filter. Change the water two or three times a week and add makeup water from the parents' tank.

The fry will grow quickly and after four weeks it is a good idea to move them to a larger tank. I do this by draining down their tank and gently pouring them into a larger tank. With a large spawn, at least a 20 gallon long aquarium with a good filter is needed for a grow-out tank. The fry grow quickly, and can reach an inch in just 8 weeks.

Don't let the somewhat exaggerated stories of their "aggression" scare you from keeping these glittering jewels. Give a large school of them their own tank.
You'll be glad you did.

My Experiences with *Hyphessobrycon sp. "malinowski"*

-

By Holly Paoni

I OBTAINED A SMALL breeding group of these fun tetras from another club member through our club's BAP mini auction.

After a few tips from the breeder I decided to give them a go at home myself. These were originally sold as a wild caught. Through my research of these fish, I've seen photos of them under more than one name, and found out they are often mislabeled or sent in place of a similar but easily distinguishable and related species, most commonly the kitty tetra.

So yeah, its one of those classification nightmares right now with these fish.... but they are so worth it!

They are a great community tank occupant. I've kept them with dwarf cichlids, big finned slow guppies to speedy danios without a nip. They are also quick enough to be fine hanging out with big nippy 4 inch Goodeids, even as smaller 1/2- 3/4 in juveniles without an incident. More later.

They have an attractive yet subtle coloration, that works very well in a well planted tank. The bronzy gold, red and white tipped fins, with some black on the body, really shows up well in these conditions. They are active, staying about mid-water, and only get to about 1.75 inches. That's a great size for many different tanks and tank mates.

So far they have eaten anything that's hit the water and have handled a wide variety of temperatures. I had some fry growing out in a 20 Long, upper level, warm tank, and while I was pulling some out to spread them around at 1/2- 3/4 inch, I had what I thought was 1 jumper, that landed in a cold water Goodeid tub sitting on the floor. It jumped from 78-80 degree water down to the high 60's... I quickly pulled that 1 fry out but it was just fine.

I had forgotten about the jumping incident until about 3 months later during winter and the tub on the floor was at 60 degrees. I saw an odd looking fish swimming in the tub so went digging and tearing up everything in that tub, draining the water down to 1.5 -2 inches before I could catch that tetra.

60 degree water didn't slow down its growth, or speed at all. It was just as big as its siblings raised 20 degrees warmer over the past 3 months. Since then I have torn that tub apart 2 more times, and found 2 more tetras. The last time, every last fish and speck of water was removed just to make sure!

These fish had been bred in St Louis area water, then again in my water, a tad softer, and yet again when my water became very hard as a result of local water supply changes so are tolerant of a wide range of water hardness.

I've got another batch of fry at the moment only about 2 weeks old as I'm writing this. The water got even harder on my end, I didn't have near as many hatch, but those that did, so far have been handling fluctuating tap water again changing to the opposite end of the hardness spectrum with small frequent water changes to re-acclimate the fish room.

Raising this tetra is the same as any other tetra, barb or danio. Small food, clean water. I have found the adults rarely predate on their own fry, but siblings do. So lots of cover is helpful in the nursery until they reach almost a half inch. Cover doesn't need to be extravagant. Najas grass, java moss, and or spawning mops works just fine- just give the fry lots of cover for protection from each other.

They don't school as tight as rummy nose tetras, but are active and out and about in small schools of 5+. As with any school fish, the more the merrier!

Over all, despite the classification issues, these are a great species to try. Easy to keep, not fussy about water chemistry or temperature. They could fit into a several set ups and are fairly easy to breed.

Axolotls in Your Home

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Ambystoma mexicanum, the Mexican walking "fish"

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by Edgar Valencia-Morales

AXOLOTLS (*AMBYSTOMA MEXICANUM*) are very interesting and fascinating creatures. Originally from lake Chalco and the water channels of Xochimilco in Mexico city, they have seen their small habitat shrink even more due to pollution, introduction of non-native fish, human consumption and the expansion of Mexico city's urban area.

Luckily, there are several Universities and Research institutes around the world that keep collections of the different morphs studying their amazing capacity to regenerate practically any part of their body after injury. There are also numerous clubs and civil associations led by very enthusiastic people and hobbysts that keep them as pets. Universities and clubs might be the only option for axolotls to avoid extinction and, hopefully, their ticket to return to their natural habitat if the conservation programs for Xochimilco are successful.

Here are some general information and tips to help you give these amazing creatures a try.

What is an Axolotl?

Axolotls are salamanders, a type of amphibian. However, unlike other salamanders, they are able to complete their life cycle without acquiring the full characteristics of an adult, called neoteny. They can mate and reproduce without ever leaving their aquatic habitat and without losing their gills or their "tadpole like" tail.

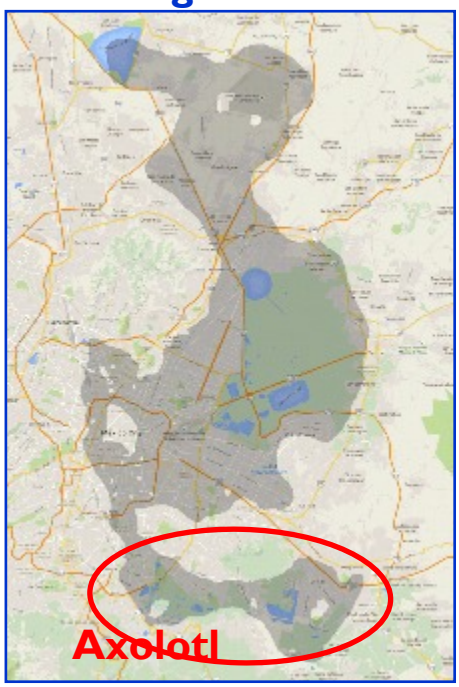
Since they do not go all the way to adult, most of their skeleton is made of cartilage, making them less resistant to "crashes" or bumping against things. Their skin looks rough in texture but is really soft and smooth to touch and also not very resistant to cuts or abrasion. Handle them with care.

"Adult" axolotls are about 10 inches (25 cms) in length but may be over 12 inches. Females are sometimes "heavier" and more rounded than males and even though they do not reach complete adult appearance, they do present sexual dimorphism. Males can be told from females because males will have two protuberances (papillae) right at the base of the tail where the female cloaca is. Females do not have these papillae.

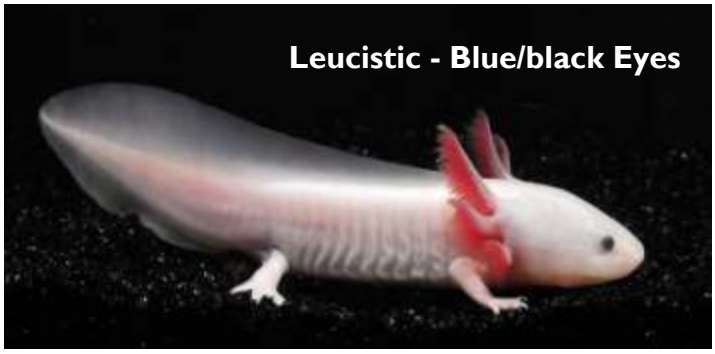
Axolotls come in several color morphs. The more common ones are: wild type (greenish/grayish), melanistic (black), leucistic (yellowish/white with blue/black eyes) and albino (pink eyes). Genetically modified varieties created in research received the gene for the green fluorescent protein (GFP), which make them glow under blue or UV light.

Axolotls are carnivorous and they will eat anything that they think

Shrinking Habitat:



Shaded area was water coverage in 16th Century Mexico City Basin, verses blue of current extant.



fits in their mouths. In the wild they eat crustaceans, insects, fish, worms, tadpoles and some mollusks. They are ambush predators with an amazing attack speed and compensate lack of good eyesight with a very developed sense of smell. Diet for babies and juveniles may also include some algae -and their siblings! Adults do not usually adopt a cannibalistic behavior against similar sized tankmates but they will eat their eggs and babies.

Axolotls are nocturnal. They remain inactive during the day, just swimming to the water surface if they need to get some air. These relatively hardy and adaptable animals have very basic demands that make them good pets as long as you follow some minimal "rules."

Life span for an axolotl in the wild is between 10-15 yrs. In captivity, they can live 20+ years. Thus, they might be easy to care for, but will require some commitment.

Axolotls at home.

Where to get an axolotl?

You can find axolotls from time to time in pet stores and aquarium shops. There are several sites in the internet that sell them. Some reptile shows like those organized around St Louis have them from time to time and luckily for you, you can see them also at many fish club auctions. I got both of my axolotls at our local club's auctions.

Before you order any living creature from a webpage, do your homework and check the vendor's reputation and reviews. Contact them and ask questions about shipping and handling, maintenance and any warranties in case something goes wrong. If possible, ask for a picture of your future pet or better yet, a video at feeding time. Check the section about diseases to have an idea of how a healthy axolotl look and act like.

Tank size

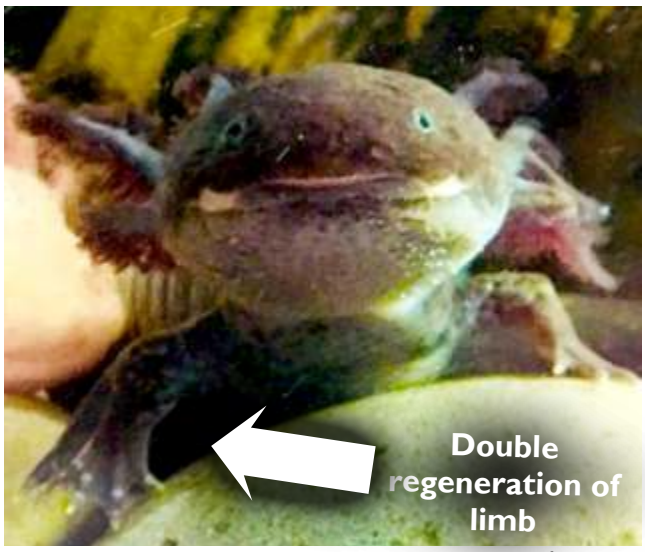
Axolotls are solitary animals and are not particularly active. A 10 gallon tank is big enough for 1 adult- even a 5 gal might do. Because they spend all their life underwater, setting up a palludarium or having areas with "land" in the tank is not necessary. Fill the tank to the level that you like, although the best option would be to have as much water as possible. A lid is recommended although they are not particularly known as jumpers.

A word of caution if you plan to breed them, younglings are cannibalistic and the parents may also eat the eggs. A tank will be needed for the eggs to hatch and several small containers to separate the babies until they get up to about 3-4 inches (see below).

Substrate, decorations, light.

Axolotls naturally occur over a mud bottom so are not particularly careful when trying to eat something, leaving 3 options for substrate: No substrate at all, fine sand/tiny pebbles or rocks big enough they do not fit into their mouths to be swallowed.

No substrate helps with the cleaning routine. Fine sand will not block their intestines if swallowed, but if too fine, it will create a sand storm in your tank every time they move or with the movement from your



filter/aeration or during water changes and irritate their gills.

Big rocks can create a more aesthetic view than a bare bottom without the risks of ingestion, but can accumulate a lot of waste between them. I have big rocks in my tank. Avoid small rocks for the reason mentioned above and rocks with sharp edges that might injure their legs or skin.

Add wood and plants if you like. Plants will need to tolerate low temperatures though. Axolotls are not going to actively mess with your plants but be aware that they are not ballet dancers and will land on or trample on them. Axolotls often shake violently while eating, which may bump plants and other decorations. Floating plants are good options. I have some cuttings of golden pothos, *Epipremnum aureum*, in their tank and keep them there until they develop roots and are ready to be potted then replace them as needed.

It is also nice to have place where they can hide during the day. Add pleco caves, clay pots or PVC pipes to create caves for them. They can get big and are not particularly agile, so these "caves" need to have some space for them to maneuver without getting stuck. I use clay pots and a "reptile cave".

As mentioned, axolotls are nocturnal and do not depend on their eyesight as adults, babies use eyesight a little more, to get food and move around, so they really don't care if there is a light. Add a light for your viewing pleasure or if you have plants in the tank. Axolotls will adapt to bright light, although they might be happier with dimmer lights or having a refuge when the lights are on. I have a dim blue light in my tank and it also gets some indirect sunlight in the morning.

Use low wattage lights or LED lights to avoid undesired excessive heating. A word of caution if you have the morphs with the GFP gene. They do glow under UV light but a blue light will do. DO NOT USE A UV LAMP AS YOUR MAIN LIGHT, UV is harmful to them and to you.

Axolotl is a word from Nahuatl, the language spoken by the Aztecs before the Spanish conquest and still spoken in Mexico. The word has several possible meanings, but the most accepted for these creatures is "water dog" or "water monster."

Water parameters and filtration.

Previously, the waters where the axolotls live in the wild were clear and low in nutrients. Now they have become turbid, rich in organic matter and low in oxygen. A study by Nandini et al. in 2015 has shown waters of that habitat now have a high organic matter content, remain alkaline most of the time between pH 6.9 and 9.5 and have oxygen levels lower than 4 mg/ml during summer. Axolotls have not adapted very well to those changes in the wild and you should be able to give them some more favorable conditions at home.

Perhaps the most critical water parameter for an axolotl is water temperature. Axolotls should not stay over a few weeks at temperatures above 75°F (24°C). They will show signs of stress and their skin and gills and will become susceptible to fungal and bacterial infections. The ideal temperature range is between 65° to 72°F (18-22°C), therefore no heater is needed in their tank. In Missouri, keeping them at the ideal temp in a warm home can usually be accomplished by putting the tank in a basement or in a location close to the AC without direct sun. Of course, you can also keep them cool with the help of a chiller or by adding some ice cubes periodically if needed. In our home, we have not had problems keeping them in my living room and no ice has yet been needed.

Keeping your water close to neutral (pH 6.5-7.2) will help keep them happy. Axolotls are not good swimmers, but will appreciate some moderate current which helps with the amount of oxygen dissolved in the water. Adding some air stones will help with oxygen levels and will have the bonus effect of helping their gills develop because they will be getting most of their oxygen through them and will skip trips to "gulp" air from the surface. I use 3 air lines with air stones and a cascade filter hanging on the back of my tank.

Provide good filtration and have a good routine of water changes and replenishment using dechlorinated tap water. Axolotls are messy eaters and big poopers and will require siphoning the substrate or the tank bottom when making partial water changes. Pay attention to the media in your filter. I like to do a very special large change of water (95%) every 3 months and make sure I take out as much "processed

matter" as possible. Also make sure and under no circumstances start a siphon by sucking the hose...YUCK! You will be surprised of the water color coming out of the bottom- double and triple YUCK!

Axolotls can take a lot of abuse of water parameters except for the temperature and will forgive some negligence occasionally, but do not push it or they will get sick.

Tankmates

There are three factors that affect tankmate selection for an axolotl. First, water temperature. Not a lot of organisms available in the aquarium trade are happy at the same temp as your axolotl. Many tropical ones will get ich or other parasite/pathogens at that temperature. Some options might be goldfish (*Carassius auratus*), some barbs (*Pethia conchonius*), some goodeids (*Xenotoca* spp), some loaches such as *Beaufortia kweichowensis* and some snails. However, before you put them in the same tank, consider factors two and three.

Factor two is the axolotl's mouth and diet. As stated, they are carnivorous and have big mouths. They will try to eat anything that fits in their mouths if it smells good and by axolotl standards, that is almost anything. Any tankmate needs to be either, big, fast or "sour" enough to avoid being eaten.

If still thinking about a tankmate, factor three is the axolotl's gills. Some fish think the gills look a lot like little bloodworms or tubifex worms and try to eat them. Some tankmates may nibble and then quit, some may come back for more. An axolotl can recover from the loss of a few filaments but if all are removed things are not going to end well. The axolotl may survive gulping air from the surface, but sooner or later the stress will kill it or an infection will start in the gills.

There are options for tankmates, but be very careful and keep an eye on how things go. I keep 3 small goldfish and some snails with mine. I've been thinking about a loach, but have not found one big enough to try but will keep looking.

Food

Axolotls are carnivorous, not picky and really messy eaters so you have several food options. There are pellets designed specifically for axolotls that can be bought from several suppliers or online. They can also be fed trout or goldfish pellets and will also take frozen foods such as bloodworms or mysis shrimp.

Live foods are also an option and according to some this is the best option. Axolotls will be perfectly fine with a diet of nightcrawlers- worms often sold as bait. They can also eat ghost shrimp, feeder guppies or minnows although the guppies or other feeder fish should not be gill nibblers. Crickets, mealworms, wax worms are good alternatives too. Larger mealworms and crickets might bite them during ingestion so use the smaller ones. Waxworms should not be their main food because of the high fat content. Some say you can give the big ones frozen pinkies as used for snakes but I advise against it mainly because of the water quality issues and because of the risk of "choking" while swallowing or indigestion.

Axolotls are not really good at controlling their appetite and they can eat a lot if overfed, which may result in problems such as bloating, indigestion and other digestive problems. Avoid overfeeding them. Eating 2-3 times a week should be ok with them. A well feed axolotl can go without food for 2 weeks with no problems, which makes it easier to go on vacation if you do not have anybody willing/available to feed them while away.

From the time of the Aztec empire until recently, Axolotls were collected and consumed as food. Fried Axolotl or Axolotl's tamales were considered a delicacy.

I tried to feed mine with pellets and bloodworms, but the ones that they did not eat got lost between the rocks and did not help with water quality, so, I changed to live food. Now I hand feed nightcrawlers and about once a month ghost shrimp, 5 dozen at a time, released into the tank. Shrimp that are not eaten immediately help with any algae. When my axolotls were little, I gave them the small nightcrawlers or chopped the big ones into pieces, feeding leftovers to my fish. Now, they eat big worms without problem. I just squeeze the worms to remove the dirt in their digestive tract and then rinse them with tap water to remove the dirt on them. After that, dinner is served.

With patience, axolotls can be trained to eat from your hand. Just hold the food in one place and they will come to your hand when they smell it. That way I make sure no food gets lost at the bottom. Their teeth are more like little stumps and not sharp, so, even if they miss and bite, it won't hurt. The lack of teeth is another reason not to feed them pinkies. They need to swallow a pinkie whole, which will give their stomach extra work digesting it.

Regardless of what you decide to feed do not overfeed because it will affect their health and cause issues with water quality. -did I mention that they are messy eaters and big poopers?

Diseases

Axolotls can handle some less than optimal conditions for a time and are amazing at healing and regenerating wounds/limbs, but that doesn't mean they are immortal nor that they do not get sick. They are susceptible to bacterial infections, fungal infections, parasites and other problems. Stress is the main culprit that gets them sick at home. The main causes of stress are water temperature, over feeding, water quality, wounds and pesky tankmates. Keeping those factors under control usually results in a happy axolotl.

A happy axolotl will look a little round, with bright eyes, and without reddish or whitish spots on the skin. It will show extended gills having multiple filaments (bright red in some) that will "flap" from time to time but not constantly. When healthy, it won't move a lot, remaining at the bottom of the tank most of the time and rarely going up to get air from the water surface. It won't have wounds or ulcers and if gets one, it shouldn't have any "cotton-like" fungal filaments around it. Having good diet and water quality, slight injuries should heal on their own.

Any axolotl that does not look healthy as described or shows sudden changes in behavior such as moving a lot, rapid breathing, floating in the tank, wounds, etc. should be monitored closely.

Some problems may be solved with an improvement in water quality, diet and sometimes a saltwater bath. Fungal or bacterial infections as well as parasites will require medicine that should be prescribed by a veterinarian. Unfortunately, there are not many veterinarians around that are familiar with our not so common pets. So, prevention is your best option and as long as you keep things the way they should be, your axolotl won't have any problem.

Reproduction

It is possible to have axolotl reproduction at home. Here are the basics:

Begin with a pair, male and female. They are more likely to reproduce during winter/early spring when temperature drops and days are short. It is possible to stimulate them during a different season by cooling their water with either a water change or by adding ice. The male will show interest in the female and if she accepts him, he will release sperm packs, called spermatophores, that the female will pick up. Anytime between 12-72 hrs later she will lay between 100 and 1500 eggs! Eggs will be attached to decorations or plants if available. Once the eggs are laid, remove either the parents or the eggs otherwise they will become caviar.

Toothless, of "How to Train Your Dragon" is likely based on an Axolotl

The higher the temp, the faster the eggs will hatch. Remember that higher for axolotls would be above 72°F (22°C), do not go over that. Hatch will take about 15 days at this temperature. Keep the eggs in a container with good aeration and moderate current. Some recommend adding methylene blue to avoid fungi. Remove any eggs that look bad.

Once the larvae hatch, they will not eat anything until they have absorbed their reserves, about 48 hrs later. After that, the fun starts because now you have to feed them. Axolotls have bad eyesight, but babies depend more on it than adults to find food and will eat only "moving things." Those could be tiny bloodworms, Daphnia, or newly hatched brine shrimp.

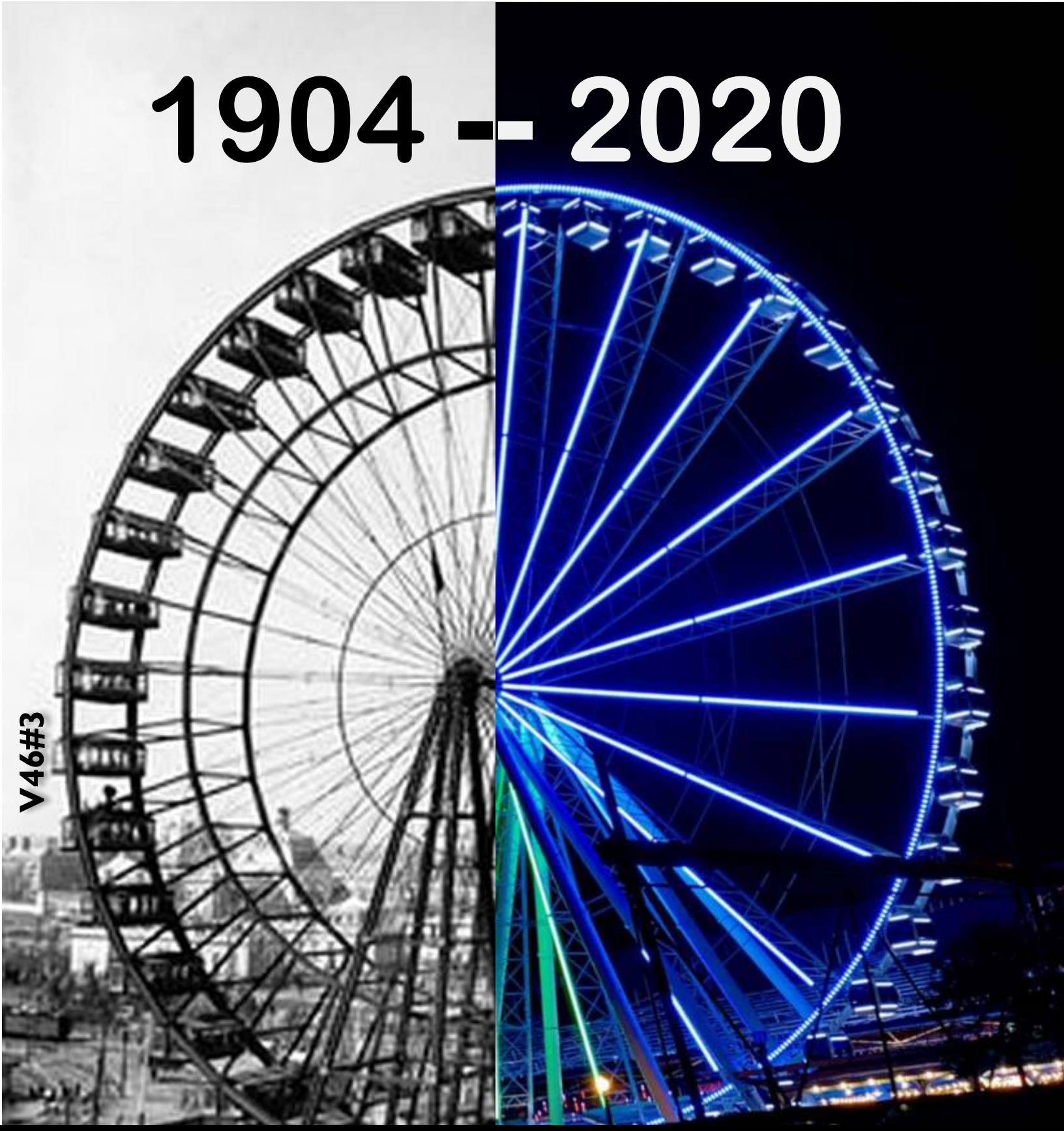
Unlike frogs, axolotl larvae will get their front legs first in about 9 days. Once those legs develop, they'll start moving and hunting and that's when the population starts going down because they are highly cannibalistic in this stage. It is recommended to keep about 100 babies in a 20 gal tank with a water level just high enough to cover them. Feed them twice a day if possible, and keep an eye on water quality too. The good news is that at this stage, they are easier to move to non live food such as pellets or frozen foods.

Rear legs will appear later and when that happens, the babies look exactly as miniature versions of their parents. Having four legs allows them to move more and means the cannibalistic behavior increases. Even if they have enough food, you may need to reduce the numbers in each container to avoid problems.

With a good diet and proper conditions, axolotls will reach good size in a few months. As they grow, their cannibalistic instinct diminishes and several can be kept in the same container without problems.

Axolotls are very cool creatures, relatively easy to take care for and undemanding. If you want an unusual, long lived pet that comes with special superpowers, perhaps an axolotl is what you are looking for.

1904 -- 2020



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INSIDE THIS ISSUE

Cover - St Louis Ferris Wheel - 1904 & 2020

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The Nitrogen Cycle and Importance of Water Changes

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Beginning of a Fish Tank Series

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By Jake Harris

When I bought my first fish tank, I knew so little about aquariums and the micro-ecosystems they create. I put the water into the tank, added some gravel and decorations, turned on the filter and assumed that we were ready to add the fish. After all, the water is clean enough for me to drink, so it should be clean enough for fish, right?

To my horror, I watched as my first fish died one by one and I had no clue what I did wrong! If you have bought your first fish tank, are thinking about buying your first fish tank, or have heard about the nitrogen cycle but don't completely understand what it is, then this is a must read article for you!

This article will give a basic rundown of the nitrogen cycle, what it is, it's importance, and how to prevent "crashing" your nitrogen cycle. I'm going to skip a few parts that aren't absolutely essential, but if you learn the nitrogen cycle you'll be able to keep almost any fish alive.

Imagine you're in a room with no way out. (If you're claustrophobic, don't imagine too hard.) Someone opens a hatch in the roof and lowers your food. It's a bit more than you can eat, so you eat some and let the rest set out because there's nowhere to put it. Eventually you'll need to go to the bathroom, however, there are no toilets. ...As you can imagine, that room would get very gross very quickly! Rotting food, feces, urine... ugh! And you're stuck in there! You'd probably die from all that nastiness.

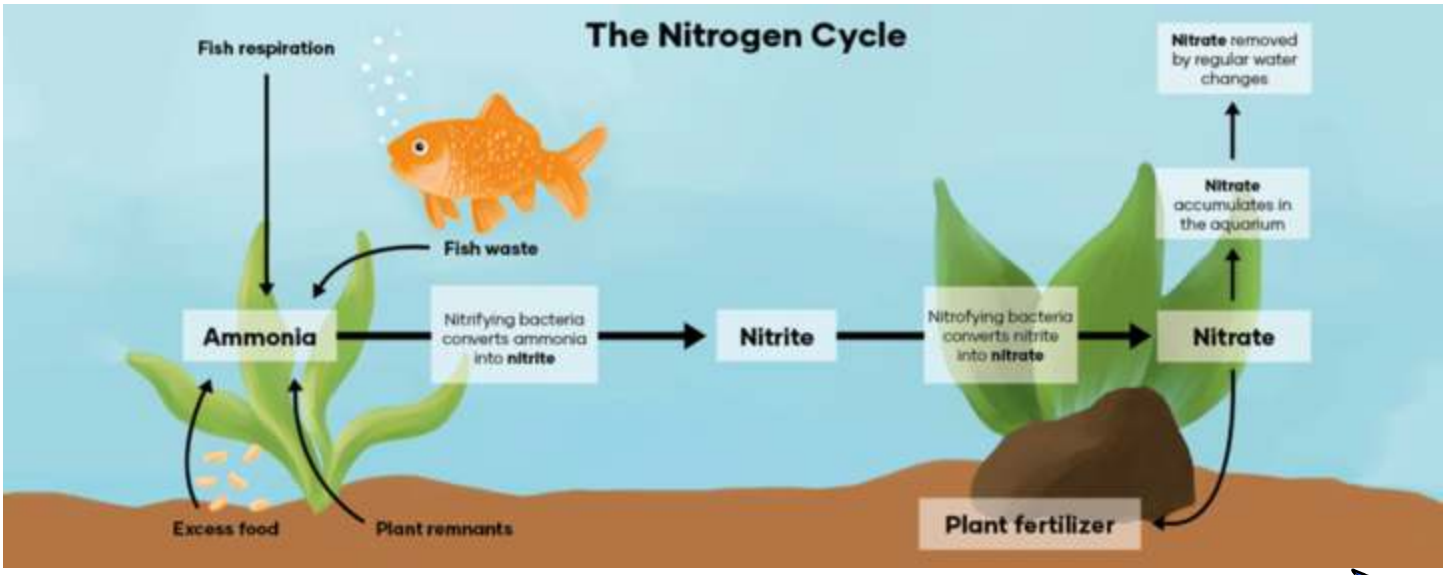
Our fish are stuck in a similar situation. They live in a small glass box stuck in the same water as their rotting food, feces, and other waste. Those elements of food, feces, and anything rotting release a chemical into the water called Ammonia. Ammonia is very toxic to fish and kills them rather quickly.

However! Fish have allies that eat ammonia and convert it into something less toxic! These allies are commonly referred to as "beneficial bacteria" or "nitrifying bacteria", and refer to all of the "good bacteria" that help keep your fish alive. We will simply refer to them as beneficial bacteria.

The beneficial bacteria then eats the ammonia and turns it into a different, but less toxic chemical, called Nitrite. Then the Nitrite gets converted yet again, by other beneficial bacteria, into Nitrate. Nitrate is the least toxic of the three chemicals, but still toxic, and in high enough concentrations will kill fish as well. These are the terms that you'll need to know: Ammonia, Beneficial Bacteria, Nitrite, and Nitrate.

Without beneficial bacteria, your tank will be full of toxins harmful to your fish, so it is very important to understand where beneficial bacteria live, and how to keep them alive. In order to keep beneficial bacteria alive, you need to understand where the beneficial bacteria lives.

Beneficial bacteria doesn't just float around in the water. It lives on a



surface. Any surface will do, the walls of your tank, the gravel, the leaves of plants, the roots of floating plants, or the filter pad or sponge in your filter.

Objects with more surface area can hold more beneficial bacteria. For example a piece of glass will hold less beneficial bacteria than a piece of sponge that's the same size, because the sponge has all those holes and pores which give the beneficial bacteria more surface area to hold onto and live. That's why most filters have some sort of sponge or fibrous pad in them. The beneficial bacteria can cling to every single edge of every single fiber of that filter pad- which is a lot of real estate!

A beneficial bacteria can die in several different ways. It can dry out, it can be starved, and it can be poisoned are the 3 most common ways. I've killed my beneficial bacteria in just about every way possible.

- **I've dried it out** by allowing the water level in my tank to evaporate below the intake of my filter, draining the filter and exposing all my beneficial bacteria to the air for too long.
- **I've starved it** by not keeping any fish in a tank for too long, and without fish there's nothing to produce ammonia for the beneficial bacteria to eat.
- **I poisoned it** when I was very young, by cleaning the filter and tank with bleach, soap, and other sanitizing chemicals.
- **I've also, just very recently, removed it** on accident, by removing a large amount of floating plants at one time.

It's a fallacy to think that beneficial bacteria only lives in your filter. By removing the floating plants, I removed all the beneficial bacteria that lived on their fibrous roots. In fact, in a tank that's been running for a while, it's likely that most of your beneficial bacteria lives outside your filter. What I have found is that beneficial bacteria usually begins in the filter, because you're running water through a fibrous surface, but eventually distributes itself rather evenly throughout the entire tank, so even removing a decoration or a plant will remove some beneficial bacteria.

The whole process of growing and culturing your first beneficial bacteria can take two weeks to two months, but the patience will be worth not killing fish.

When your tank is ready for fish, it won't be ready for ALL the fish at one time. You'll want to add fish slowly in order to allow the culture of beneficial bacteria time to catch up. If you have no fish in the tank while the tank is growing it's first beneficial bacteria, a process called "cycling", then there is probably not enough ammonia in the tank to support a large population of beneficial bacteria. Large populations of any living thing need a large amount of food. So by adding lots of fish at one time, you may be adding more sources of ammonia than the current amount of beneficial bacteria can handle. This can cause ammonia levels to spike, and will likely result in dead fish.

Now we know how to keep beneficial bacteria alive into order to convert the toxins called ammonia and nitrite into nitrate, but how do you get rid of nitrate? The best way to get rid of nitrate is by making "water changes". A water change is removing water from the tank and replacing it with fresh, de-chlorinated water. Most tap water contains very little nitrate, so removing the water from the tank with a high nitrates, and replacing it with dechlorinated water from the tap with lower nitrates, you can to dilute nitrate to a safe level.

Here's a practical example of how water changes work.

Let's say I have a fish tank without a water change in a while. I test my water and I see that my nitrates are at 100 ppm (100 parts per million). Most fish can only tolerate a range of 0-40 ppm nitrates, but some fish are more sensitive than others and lower nitrates are ALWAYS better.

Important side note: Add new water close to the same temperature as the water already in your tank to avoid "temperature shocking" your fish.

I realize that I have a problem! I already have more than double the "safe" amount of nitrates!! I drain half of my tank's water and now have a half full tank. The water remaining in the tank still has 100 ppm nitrates. So I top off with dechlorinated water. My tank is now full- half of new dechlorinated water of ~0 ppm nitrates and half of old water with 100 ppm nitrates. Of course, the two waters, new and old, mix and their average will now be at 50 ppm nitrates.

Fifty ppm nitrates is still too high! So I repeat the process of draining half my water and refilling again with dechlorinated fresh water of ~0 ppm nitrates. Now when the waters mix, 25 ppm nitrates is within the safe amount. But if it's lower that's always better. As a rule, I don't change more than 50% of the water at a time, and no more than twice a day unless there's an emergency. This helps limit the mistakes made.

Now that you have a basic knowledge of the nitrogen cycle, and why water changes are important, you can keep almost any fish alive.

Some of Jake's fish

Why Local is Best

...for me

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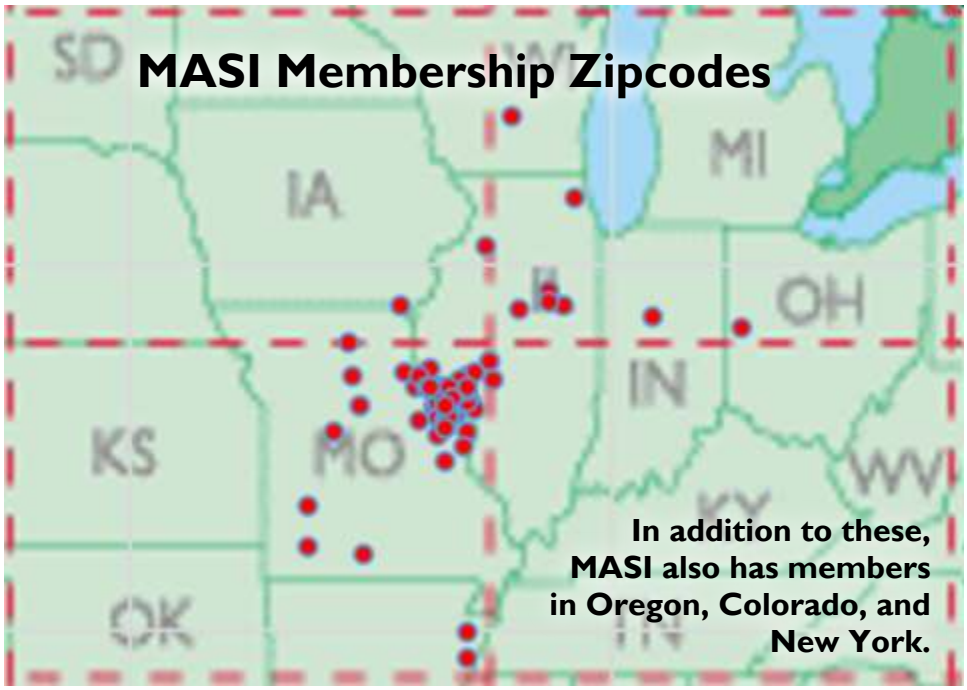
By Kathy Pilarcik Deutsch



NO DOUBT, IT is alluring. New species, fresh from the wild. Unnamed, wild caught, and the first to be seen in the hobby. ...and there they are, just a couple clicks away. I have been there, more times (and more fish deaths) than I want to think about.

Before the Internet, there were paper fish lists that we received as a part of my job at Beldt's Aquarium Wholesale. Anyone reading this knows that gripping excitement of seeing "first time available"... and when it was financially feasible, we ordered.

After ordering we had the mad scramble of research to understand the needs of what we were getting. If it appeared to be a South American from fast moving streams, we tried to set up a tank with extra water movement, hiding spots, and (ever hopefully) similar water quality conditions. We also needed to know what foods to try- and when to try them? Remember, many species only eat at certain times of the day and they may only eat when they feel safe.

This was part of our job as the wholesale recipient, to figure out the fish and pass on that info to the people who would buy them for their shops. Information, along with the desperate struggle to keep them alive, get them healthy and get them to eat before we could pass them into the retail chain.

Wild caught fish generally have a gut bacteria derived for life in the wild. They may have parasites which don't really bother them but may help them survive. Once you take the out of their wild environment, transport and plop them into new surroundings and new water, you get reactions. Often heartbreaking reactions.

Locally raised fish are:

- Accustomed to the local water
- Accustomed to people
- Comfortable eating flake or processed food at times when people feed them
- Unbothered by weird tank decorations, plastic plants, unnatural lighting
- Usually unconcerned by tank mates that are COMPLETELY foreign to them

Basically, they are already somewhat domesticated.

The best thing about acquiring locally raised fish is availability to speak to the people who raised the fish. I was personally so grateful when I could speak to the importer or the original fish collector about the needs of the fish we imported. We failed often, but sometimes that conversation was the key to keeping the fish alive and thriving.

We were rarely sent sick fish. More often, we just did not know how to care for them. The most trivial information sometimes held the clues to solve the problems.

MASI members are fortunate to have a thriving club with many members who raise fish, herps, inverts, crustaceans and plants. Buying, or at least getting information, from them means I have a better chance of keeping the beings alive. By talking to them I learn something new all the time. The money we trade for their locally-cared for animals is a tangible form of respect for all the HOURS they put into their work.

THANK YOU, Locals!

Spawning *Ctenops Nobilis*

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By Rick Tinklenberg

The Nobel Gourami, *Ctenops Nobilis*, also referred to as The Frail Gourami, is one of the Asiatic Labyrinth fish.

In 2005, when I was able to procure this fish, I had little experience with labyrinth fish and wanted to expand my fish keeping knowledge. Considered a difficult fish to keep, I still wanted to give them a try, because they are rarely available. Also, I knew that many times "difficult to keep" meant travel worn and sick from importation and my fish supplier usually got healthy stock.

Nobel Gourami's are native mainly to temperate regions of India and Bangladesh, where heavy rainfall and temperatures between 60 and 90 degrees are the norm. Usually they are found in small ponds and slow-moving creeks and rivers where dense growths of floating plants make catching this fish difficult. Surprisingly, water parameters are medium hardness with a ph. of 7 or just below. Part of this fish's range is the Assam state in India, which is said to have among the highest rainfall annual totals in the world. So, *Ctenops Nobilis* has an ever-changing environment, which I would think would make it more tolerant in the aquarium.

These fish are browns and tan in color with broken white stripes. The male has a red edge on the caudal fin, while the female is fuller in the ventral area. Both sexes have a very pointed head, large eyes and reach a length of 4 inches. While brooding, the female changes to a mottled appearance to blend in better.

I introduced the 6 fish acquired to a well established 20 gal. long aquarium on a top shelf in my fish room. The tank was furnished with Java ferns, terra-cotta pots & pieces, and the surface of the water was covered with water sprite. The tank was equipped with a tight-fitting lid to keep them in the tank and a florescent hood to keep the plants happy. The *Nobilis* were offered a varied diet of which they ate frozen bloodworms and community flakes. Tap water was used for weekly water changes and the tank was kept at about 78-80 degrees with medium hardness.

Being on the top shelf meant I had to stretch some to see into the tank, which gave them more privacy. They settled in nicely with none of the difficult fish problems.

Eventually one fish started keeping to herself up in a corner of the tank. Her color pattern became mottled and she stopped eating. I didn't think she was sick, and her buccal area looked full. She was brooding. I had noticed no spawning activity, but they were on a top shelf, afterall!

She stayed in her corner for about 20 days, until I could wait no longer! I was afraid she would either release the fry and the others would eat them or she would give up and eat them herself. So, I took her out and stripped her of (very surprising to me) 168, ¼" long fry. I used the same stripping technique as for East African Cichlids and she did simply fine. The fry took live baby brine shrimp and crushed flakes from the start and were unproblematic to raise.

Because my tap water parameters are similar to their home water and because the fish started out healthy, I had a very positive experience with this species.

Fish-Day Dreaming Makes Me a Better Fish Keeper

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By Kathy Pilarcik Deutsch

THE OTHER DAY, the family was gathered around the oak table, post-dinner. We all quit talking, and began watching the bowfront full of guppies and cories. Back and forth the fish schooled, lulling us into a quiet moment. My daughter pointed out a particularly flashy male, courting several girls. We commented on the *Barbatus* cories, nosing the gravel. It was, like many other times, peaceful and relaxing.

Today I was reflecting on that as I fed the tanks. Fish -dreaming (staring at tanks while daydreaming) has been part of my life since my childhood. Both my kids had tanks of carnival-won goldfish since they were babies. We stare at fish.

When I worked at Beldt's tropical fish hatchery, part of the job was to evaluate fish health very quickly, as we fed. Every day, as I feed the fish in the tanks at home, I am still looking for things I don't even know I am looking for. My hobby of fish-dreaming comes in handy every day, with my fish and my other animals.

When I fish-dream, I am not consciously looking FOR anything. But sub-consciously I guess I am taking mental notes. Is the water crystal clear and moving? Are the plants green and thriving or is there moss clinging to them? How's the filter doing? I touch the tank to check if it is too hot or cold. And, how are the fish doing? Are they behaving like their species should? Are they schooling or hiding or scrubbing algae like a healthy fish would? Is a former boss fish now acting like a loner? Are the gills pumping?

Evaluating a tank of fish quickly, every day, is a key to keeping fish successfully over time. And I don't think it can be learned, rather, it is absorbed over time. In my case, the problem is that I become complacent. I see the fish and the tanks several times a day and I overlook problems. Sure, the flow is slow, but do I need to clean that filter RIGHT NOW? ***(Yes!)*** If I ignore that slow filter, then two days later, I have gasping fish and a panic at ...usually!... 10 PM.

Observing normal behavior in any species helps to identify UNnormal behavior later. When I am fish-dreaming, I watch every fish who is out at that time. I try to fish-dream at night and at morning, when I can. Some livebearers rest near the bottom or in plants near the top at night. The catfish come out in the evening. I only see my *Synodontis* rarely - at night, and I confess I forget they exist. I do feed the tank with Syno. Food and hope they get it. When a *Synodontis* is out and restless, the water quality at the bottom of the tank is not great.

Fish establish their own levels in a tank. Some enjoy the top, some middle, etc. If you see a group of fish out of their comfort zone, something is wrong. Maybe a plant broke loose and changed the landscape. Maybe a different species moved into the area. Maybe a heater is malfunctioning or maybe the filter flow is different. In any case, fish out of their home areas are uncomfortable. When we fish-dream, we passively note where each fish group is living normally. Any change in their movement will trigger something in the back of our brains to tell us that there may be a problem.

This is a long-winded, common sense-based defense/excuse supporting why I stare at my fish for some time every day. It has been a valuable exercise for me and I think the fish like the interaction with us others who live just outside their watery territory.

Spawning *Taeniacara Candidi*

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By Rick Tinklenberg

TAENIACARA CANDIDI IS a very pretty little fish, also known as the black stripped dwarf cichlid. Torpedo shaped body, reaching only 2 inches with a black stripe running its entire length. This fish makes up in color and finnage what it lacks in size.

The male's fins are blue, red and black, set off by the lanceolate shape of the caudal fin and long delicate ventral fins. The female's fins are similarly colored, with a rounded caudal and shorter ventrals. Both sexes have dashes and dots of metallic blue and green around their noses, eyes, throat and gill covers. To see the male with his fins, erect, showing off for his attentive female is an impressive nature moment.

Originating from the central Amazon river, Rio Negro and Rio Branco near Manaus, Brazil. This fish is found in both dark and clear waters near the bank where roots, plants and leaf litter provide plenty of hiding places. In this habitat, water has an exceptionally low conductivity and ph., with temperatures that vary thru out the year.

When I brought these fish home, they were supposed to be a trio, which was great, since this fish, like many of the *Apistogramma*'s, likes a harem. It turned out later that one of the females was a young male who became a dither target for the dominate male.

Using a previously purchased reverse osmosis unit to soften the water in some of my aquariums, I put the *T. Candidi* into a 20 long with softened water. At the time, my tap water was relatively soft, and I was mixing it with RO water to get a TDS reading of about 125 micro-siemens and the *T. Candidi* liked it fine. I read that this fish did not like big water fluctuations, so I did 10-15% water changes every week or two, which they also liked.

The tank was well established with Java fern, Java moss and water sprite on the top and was on a middle shelf near my sink so I could watch the fish. I put 2 small terra cotta spawning huts in the tank and the female picked the one on the left. The temperature was kept near 80 degrees and they were offered a varied diet of flake food, frozen bloodworms and live baby brine shrimp- which they loved.

Soon what turned out to be the dominate male began showing off for the female and she turned yellow and black, but not as intense in color as the *Apistogramma* females do. I never saw the eggs or larvae, which literature says the female hangs on the side walls of the cave. The female would shepherd the fry around while the male "protected" them from the smaller male. The fry took live baby brine shrimp from the start and were no trouble to grow out.

I had this tank of *Taeniacara Candidi* set up for 2 or 3 years and passed on many young to other hobbyist. Over time, new breeding pairs would establish themselves until finally the line just faded out. I really enjoyed keeping this fish and may do so again.

Minifins

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The Masked Julie

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Julidochromis transcriptus

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By Mike Hellweg, CFN
(Certifiable Fish Nut)

East African cichlids from the Great Rift Valley lakes Malawi and Tanganyika continue to enjoy considerable popularity in the hobby. Some aquarists even specialize in these fish to the exclusion of all others. One fun group of East African fish is the small cigar-shaped Tanganyikan cichlids of the genus *Julidochromis*.

Currently there are 6 species in the genus, each with several locality variants. *Julidochromis transcriptus* is one of the smaller known members of the genus, reaching just less than three inches. They are found in rocky areas of shallow water near the far north end of Lake Tanganyika, in places like Gombi, Bemba, Kalambo, Katoto, and at least six other locations.

Each location variant has a unique color pattern, some so different that if you didn't know better, you'd swear you were looking at different species. These locality variants will interbreed, so do not keep them together in the same tank.

Like all Tanganyikan fish, the Masked Julie prefers very hard, alkaline water with a pH around 8.0, total hardness over 300 ppm, and carbonate hardness over 100 ppm. The easiest way to maintain this in the aquarium is to use one of the commercial substrates designed for Tanganyikan fish and to add a commercial buffer- sometimes called "cichlid salts".

The current 6 formally described species in this genus:

- ***Julidochromis dickfeldi*** Staeck, 1975
- ***Julidochromis marksmithi*** W. E. Burgess, 2014
- ***Julidochromis marlieri*** Poll, 1956
- ***Julidochromis ornatus*** Boulenger, 1898 (Golden julie)
- ***Julidochromis regani*** Poll, 1942 (Convict julie)
- ***Julidochromis transcriptus*** Matthes, 1959 (Masked julie)

Do not confuse cichlid salts with either marine salt mix or with table salt! What people call table salt, or simply salt, is only one of many types of crystalline chemical compounds collectively known to chemists as "salts". These compounds are what "cichlid salts" refers to, but not to table salt. Do not add table salt or marine salt mix to your Tanganyikan cichlid tank! The special Tanganyikan cichlid salt buffers on the market are designed to add the specific chemicals, minerals, and trace elements found in the Great Rift Lakes to your water to make it more suitable for these fish. Fortunately, in most areas of the USA we have water that is already very hard and alkaline, which serves our purpose very well without any additives.

The waters of Lake Tanganyika are fairly stable with a temperature in the mid to upper 70's Fahrenheit. The water is usually clear and low in dissolved organic substances, so good filtration and large, regular water changes are required.

In smaller tanks, hang on the back type filters are ideal. For larger tanks, canister filters do an excellent job. Be sure to regularly maintain the filter according to the manufacturer's instructions.

If skimping on water changes, the pH will begin to drift lower and the buffering capacity will slowly decrease, eventually leading to stress on the fish then disease and death. Long before death happens, they will stop thinking about spawning, so if you want to breed them, consider water changes one of the keys to success.

The Masked Julie likes to be in or near cover most of the time. It's a good idea to design their tank around

this propensity for cover. It prefers tight crevices to other types of caves, so the ideal rocky area designed for Masked Julies would be a pile of rocks going across the entire back of the tank from the base to near the surface, and even filling part of the front of the tank.

Stack the rocks carefully to create myriad narrow caves and crevices. There are no plants in this part of the Lake, so most aquarists leave them out. If you would like to use them, plants like Anubias and Java fern attached to the rocks, or any of the *Vallisneria* found in the hobby will all do well in harder, more alkaline water.

Most of the Julies available today are raised by commercial breeders so they are already accustomed to high quality flakes and pellets as a staple food. Many breeders use these foods exclusively, but no one food contains everything so it's not a bad idea to mix in frozen or live foods occasionally.

In the wild they eat different kinds of freshwater plankton that live in the lake, so feed them something similar in your tanks. They will eat frozen brine shrimp, daphnia, bloodworms, mysis shrimp, and small live foods like baby brine shrimp, daphnia, Grindal worms and similar fare. Since the adults are fairly small themselves, they will eat baby brine as a daily staple. But if you don't want to feed BBS to the adults, at least start adding it as soon as you see fry in the tank.

If you are interested in getting them to spawn for you, it is best to start out with a group of six to eight juveniles and let them grow up together. Males and females look almost identical, so it is very difficult to single out a pair, and even if you can do this, not all "pairs" are compatible. Letting the fish choose their own mates is the most reliable method. When well fed and given plenty of places to hide, eventually a pair will form.

You will know a pair has formed when you notice two fish hanging out together driving the other fish from their part of the tank. Longtime friend and MASI member Ralph Wilhelm loved Julies and got me interested in them. He said to let the pair form from a group. When this happens, one or more of the extra fish will be hanging near the surface.

Remove these fish as you see them since they are definitely NOT part of the pair. After you have removed all of the other fish, the two that remain are a pair. Pretty simple - and it works! In larger tanks with a big pile of rocks, you might wind up with a dominant pair and another satellite pair that takes over a small corner of the rock pile. If not, by removing the weaker fish to another tank, often another pair will forms in the new tank, so be prepared for this to happen, too. It's more common than you might think.

Unlike other cichlids, there is no complex spawning dance or display of colors, etc. I've never seen jaw locking, biting or any other courtship display. The best way to know you have a pair is as I described above - the two fish remaining in the rock pile after you've removed all of the subdominant fish.

When they finally do spawn, the female will lay a couple dozen eggs on the walls or ceiling of a chosen cave. Hobbyists rarely see them. Many times, the only sign of a spawn is that fairly decent sized fry, often nearly a month old, are seen moving amongst the rockwork. After hatching, the larvae hang from the cave ceiling for another week or so before finally emerging as free swimming fry. Again, this stage is rarely seen by hobbyists.

Once they are free swimming, the fry are large enough to take newly hatched brine shrimp or microworms. They will also eat finely ground flakes or pellets. While most other cichlid mothers guard the fry closely, the mother Julie does not. Instead, both parents guard the area instead of the fry, which are able to wander around and find food in the myriad tiny crevices in the tank.

Interestingly, fry and juveniles from earlier spawns are all allowed to remain in the vicinity of the parent's cave. Youngsters of all sizes can be seen swimming about the rock pile all day long, picking at the rocks, looking for food.

I have a large rock pile in one of my tanks that goes from the front of the tank to the back, nearly up to the surface, and covers about 4 square feet of floor space in the tank. It is alive with activity of all ages from newly free swimming to nearly adult sized juveniles from the original group of six *Julidochromis transcriptus* "Bemba" that I added to the tank. Two pairs and their progeny call it home.

I can sit and watch them for hours!

The young fish seem to grow quickly at first, and can reach three quarters of an inch in just 5 to six weeks. After this, growth slows considerably, and it will take nearly a year for them to reach maturity.

In order to catch them, you may have to disassemble and remove the rock pile very carefully. Once you disturb the rock pile, the original pair won't spawn again for months, so be sure you want to take it apart before you do this! Remove all of the rockwork and net out most of the fish, leaving a group of young fish to re-colonize the tank.

A good sized colony can number in the low 100s, so be prepared to make room for them, or find them homes. And don't forget to sit in front of the tank and enjoy just watching your fish!

REFERENCES:

http://www.tanganyika.si/DistributionMaps/Julidochromis/

Making an Automatic Siphon for Tub Overflow Protection

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By Chuck Bremer

Reprinted from:

Champaign Area Fish Exchange (CAFE): In Sein Menu April 2020

I PUT SEVERAL TUBS outside during the summer but live in an area that may have 1-2 or more inches of rain in a single rain event. It seems that the young fish often collect near the rim and go over the edge when one of these rain events overflows the tub rapidly.

A siphon was needed that would start operating when the water breached a preset level to keep the tub from running over the edge.

Many fish keepers drill their tubs/tanks to remove water with no mess or spill, but it is easy to make an automatic siphon/overflow that can do the same thing.

It was easy to design and construct a cheap automatic siphon that would remove excess water and keep the water level below the rim. All that is needed are a few PVC plumbing parts available from any hardware or home store.

The principle is to set the outlet of a permanently filled siphon at the desired maximum level of water so any excess runs out the siphon. As long as the siphon retains water over the rim it will continue to function anytime the level inside the tub/tank rises.

PVC Parts list - in this example I'm using ¾" PVC made for a tub of a foot or more in depth.

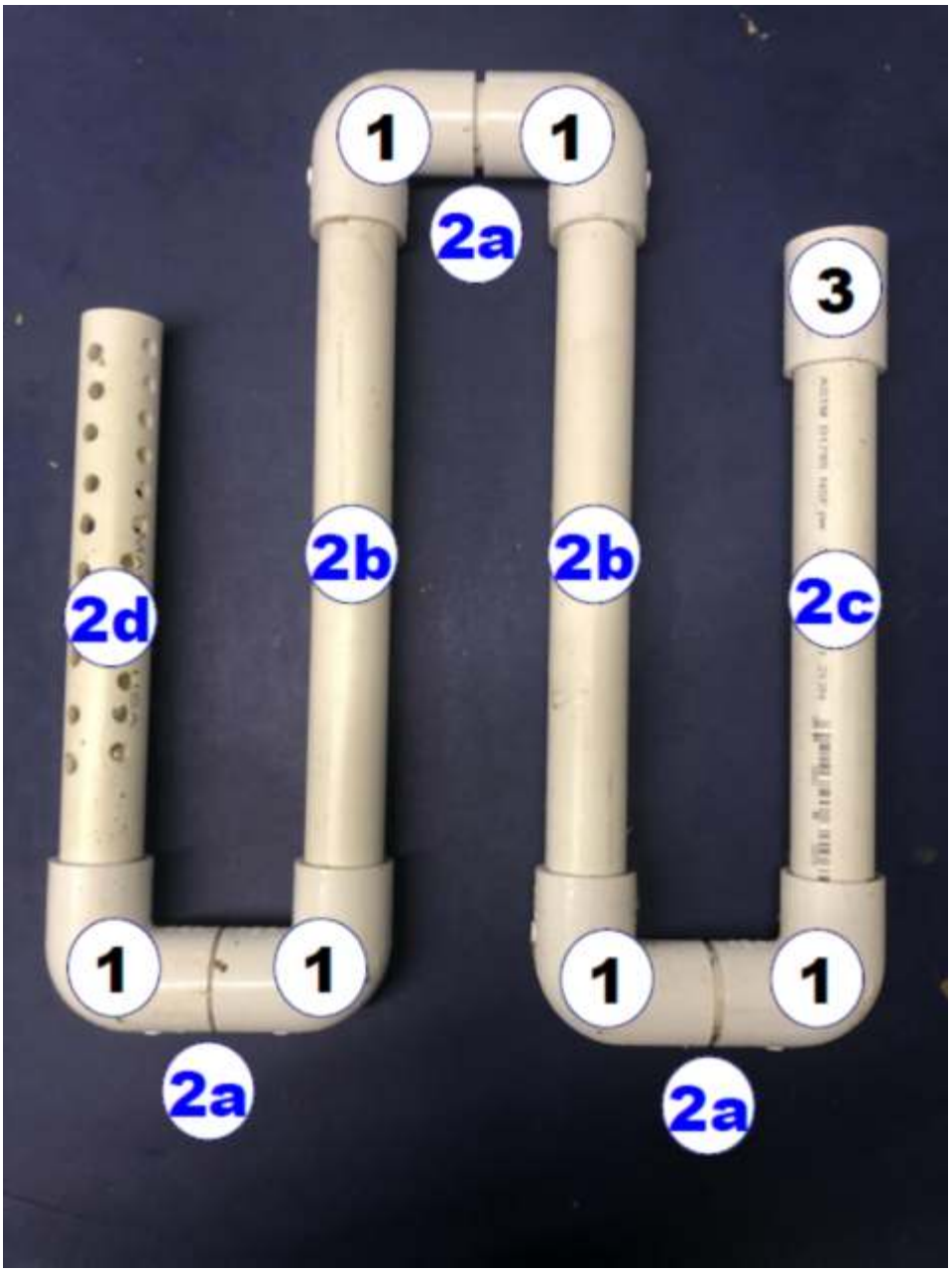
1. **6 X ¾", 90 degree PVC Elbows**
2. **Length of ¾" PVC pipe** to be cut into 7 pieces:
   - 2.A ***Cut*** 3 : 2 ½-3" connecting pieces to turn the elbows into U turns, adjust as necessary for tank rim width and size of PVC used
   - 2.B ***Cut*** 2 : 10" length main pieces just short of the depth of the tub/tank, for shallower tubs, adjust X to fit the depth (X=10"). IMPORTANT: These 2 pipes MUST be the same length!
   - 2.C ***Cut*** 1 : 8" standpipe for outside the tub/tank, in this example we want the water to stay at Y"=2" below the rim of the tub/tank so cut this piece at X"-Y" = 10"-2" = 8". If the water should stay 3" below the rim, cut at 7" (10"-3"), etc.
   - 2.D ***Cut*** 1 : 7" standpipe for inside the tub/tank, cut this one about 1" shorter than c), adjust length to fit the depth,
3. **1 PVC connector fitting** (optional), to be used as adjustment if needed

Cut the PVC into the required pieces above. In this case for a 10" main piece b), it will take about 36" of PVC. A 10 foot piece of PVC will yield over 3 auto siphons.

Make 3 U bends by attaching a 90 degree PVC elbow to each end of a)

Connect the 3 U bends by using the main pieces made in b)

Drill holes in the piece made in d) to allow water to flow freely into the tube and connect it to one of the U bends.



Connect the outside standpipe made in c) to the other end.

The autosiphon is finished!

To place into service:

Twist the autosiphon to fit in place so that it will hang tightly to the side of the tub/tank.

Prime the autosiphon by placing into the tub and forcing all the air out of the PVC. Pick up the water filled tube by the center U bend and lift out of the water. Keep the siphon upright so it does not loose it's prime, slide it back down over the side of the tub so that the perforated standpipe is inside and the non-preforated standpipe is outside the tub.

If the water level is above the top of the outside standpipe the excess will run out and adjust to that level.

Even if the water level lowers from evaporation over time, when it exceeds the height of the outside standpipe it will begin to run again.

The optional PVC connector can be used as a level adjustment. It was very difficult to get the outside standpipe cut at the proper length. Trimming to lower the water level is easy...unless you over trim. Instead of having to discard mis-cut standpipes, they can be lengthened by about 1" by just putting a PVC connector on the end. In the spring and fall, when larger rain events are more common I like to keep the water level a bit lower so leave the connector off. In the heat of the summer, with fewer large rain events, adding the PVC connector raises the water level over that period.

Small fish are much less likely to enter the holes of the autosiphon than flowing over the side of the tub in a heavy rain. Remember the water pressure in the tube is very low so the water will flow slowly but in proportion to the height above the outlet. In a heavy rain it flows faster the deeper it gets, however, for very large surface areas taking a lot of water from rain at one time, use more than one siphon.

If you like to change water in your outside tubs, by using an autosiphon, all you have to do is add water and the overfill will flow through without disturbing the fish.

In the fall, to remove water prior to taking down the tub, just remove the outside standpipe and the water level will drop to that level without having to bucket brigade it out.

A ¾" siphon was chosen because it will run at low pressure and the larger diameter will remove more water. Smaller diameter siphons create additional friction and move less water and larger diameter siphons risk moving fish or becoming air-blocked more often during the summer.

In an indoor tank with more slowly added water, a smaller diameter siphon could work successfully.

Meet Me at the Fair: The First Commercial Aquarium in St. Louis

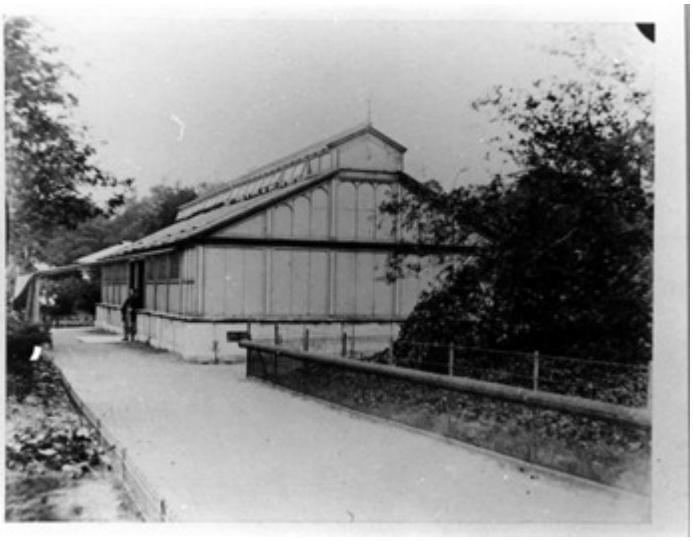
By Thomas M. Keevin

With the opening of the new St. Louis Aquarium at Union Station on December 26, 2019, St. Louis finally has a "real" commercial aquarium in our fair city. There have been a number of previous "teasers' with grand plans for new aquariums and failed attempts, with the World Aquarium probably being the last and undoubtedly the most infamous failed attempt. So, with all the bad, distasteful, history behind us and hopefully a bright future, what was the FIRST COMMERCIAL AQUARIUM in St. Louis?

The aquariums in the U.S. Commission of Fish and Fisheries Building, the Palace of Forestry, Fish and Game and to a lesser extent, the whale exhibit in the U.S. Government Building at the Louisiana Purchase Exposition (1904 St. Louis World's Fair) would certainly qualify as our first commercial aquarium in St. Louis. Collectively, they certainly could be considered an early version of today's public aquariums. Certainly, the US Fish Commission Building would qualify as a stand-alone commercial aquarium, reminiscent of a smaller version of the Wonders of Wildlife National Museum and Aquarium in Springfield, MO. Like the commercial aquarium in Springfield, it had aquariums with both freshwater and marine fish, recreational and commercial fishery exhibits., and fishing related displays. The whale exhibit in the U.S. Government Building (both a Blue Whale cast and skeleton) are reminiscent of the Finback Whale skeleton and humpback whale model in the National Aquarium in Baltimore Maryland or the Blue Whale model at the Aquarium of the Pacific in Long Beach, California.

The aquarium sections (fish tanks) were the "hit" of both the U.S. Fish Commission Building and the Palace of Forestry, Fish and Game. The judges of the Exposition awarded Pennsylvania's displays in the Palace of Forestry, Fish and Wildlife five awards including the Grand prize for "Aquaria of Live Fish and Accompaniments".

Early commercial aquariums were often attached to other totally non-fish related exhibits- much like the Palace of Forestry, Fish, and Game and the U.S. Government Building. For example, the "first recognized public aquarium" in the world is considered to be the Zoological Society of London's (ZSL) London Zoo's "Fish House" which opened in 1853. Philp Henry Gosse was instrumental in the establishment of this ZSL London Zoo's "Fish House". Gosse was a renowned Victorian naturalist but was, above all, a marine biologist, designing and popularizing the aquarium, a word he invented. He found the term in use during that period, "Aquatic Vivarium", awkward and uncouth and so coined the term "Aquarium".



The first public aquarium in the world: The Zoological Society of London's (ZSL) London Zoo's "Fish House", exterior photographed from the south, circa 1875.

The first aquarium in the United States was opened by P.T. Barnum in 1856 as part of his established Barnum's American Museum in New York. This aquarium has an "interesting and sordid" history. It was the first aquarium to display live whales, predominantly Beluga Whales. The whales where captured off the coast of Canada and transported to New York City. The animal keepers knew little about the requirements of whales, such as feeding habitats, water chemistry requirements, and proper filtration techniques. This resulted in the whale's death soon after their arrival, with few living more than a week in their enclosures. Barnum, being a shrewd businessman, published obituaries

The interior of the ZSL "Fish House", circa 1875.

in the local newspapers "mourning" the deaths while announcing the arrival of new replacements. The Barnum National Museum was closed in 1865 after a fire razed the museum to the ground. -So much for an early commercial aquarium conservation ethic!

The first commercial aquarium buildings in St. Louis were only in operation for seven full months, from April 30th to December 1, 1904 but during that period, the St. Louis World's Fair was attended by nearly 19.7 million people. Although no official attendance records could be found for the specific buildings that housed aquarium related exhibits, the aquarium area in the Palace of Forestry, Fish and Game was a popular attraction and was often extremely crowded.

The three buildings with aquarium related exhibits were all demolished after the 1904 World's Fair ended. You could watch the demolition of the aquarium buildings for 25 cents! Only the fish tanks in Pennsylvania's exhibit in the Palace of Forestry, Fish and Game were removed and were used to create the Philadelphia Aquarium at Fairmount Park in 1911.

Even though nearly 19.7 million people passed through the entry gates and crowded the fairgrounds, the 1904 World's Fair was held 116 years ago, which means that there are no attendees alive today. All the crowds of people with excited faces shown on historical photographs are all dead, so it is impossible to interview the historical figures who were responsible for creating the aquarium exhibits or the excited fair goers who visited their displays. We are left with only a few formal written histories and the interpretation of a few publicly available photographs.

The most historical information regarding the aquarium-related exhibits I found from the U.S. Fish Commission Building because the Commission produced a 54-page publication written by W. de C. Ravenel (1904), with details of the fish tanks and detailed descriptions of every fishery display in the building. General information for the Palace of Forestry, Fish and Game is limited, for the most part, to tour guide books written for fair attendees.

In addition to Ravenel, there is, however, considerable information concerning Pennsylvania's contribution to the Palace's exhibits thanks to two articles published in the Transactions of the American Fisheries Society by Tarleton Bean, 1904; and William Meehan, 1904; a two-volume book written by James Lambert, 1905; and personal accounts written by William Meehan in Pennsylvania Commission reports and summarized in a 1998 article by Jay Osman. A detailed and very interesting account of the history of the Smithsonian Institution's whale cast and skeleton displayed in the U.S. Government Building is provided in a 2019 article by the Smithsonian.

There are fewer photographs of the aquarium-related exhibits at the fair than you might expect. For example, I couldn't find a single photograph of a fish-occupied aquarium. In 1904, cameras were much bulkier than they are today and certainly wouldn't have been carried by most fair goers because of their large size and expense. The fair organizers also placed size restrictions on cameras allowed on the fair grounds. This likely would have restricted semi-professional or advanced amateur photographers and explains why there is no multitude of good amateur photographs. Most existing historical photographs are the products of professional photographers. Because of this lack of photographs, I have attempted to describe, based on the available written documents and few photographs, each of the three buildings with aquariums or what would be considered aquarium worthy displays such as the whale exhibit.

THE U.S. COMMISSION OF FISH & FISHERIES BUILDING

A post card with an artist's rendition of the U.S. Fish Commission Building

The U.S. Fish Commission Building, located 175 feet west of the main U.S. Government Building, was 136 feet square, with a central open court 74 feet square. Although part of the U.S. Government Building complex, it was constructed as a separate building because of water supply needs consisting of large reservoir tanks for salt water and fresh water, with a capacity of 40,000 and 32,000 gallons, respectively, and the needed machinery room space for the electric pumps, filters, motors, air-pump, refrigerating machine, etc. The interior of

the building was ornate with shells, dolphins, and other fish-forms making the ornamentation. The U.S. Government Building complex also housed the large flight cage that is now part of St. Louis Zoo and which was a factor in determining the present location of the zoo in Forest Park.

In the central portion of the building was an open court which occupied 5,476 square feet where the Commission displayed general exhibits. The comprehensive exhibits were included all things related to the commercial fishery of the United States including fishing equipment, products of the fishery, fish culture, Eastern Oyster culture, sponge culture and so on. For a description of the exhibits, check out: https://babel.hathitrust.org/cgi/pt?id=loc.ark:/13960/t50g4gs51&view=1up&seq=9

The description of the 1904 exhibit on the freshwater Mussel Fishing and Pearl-Button Industry of the Mississippi Valley is reminiscent of the current mussel displays at the National Mississippi River Museum and Aquarium in Dubuque, Iowa or the National Pearl Button Museum in Muscatine, Iowa. Today, freshwater mussels are considered the most endangered aquatic group of organisms- which was not the case in 1904 when there was a booming pearl button manufacturing industry that utilized them. Freshwater mussels are an incredibly interesting group, their reproductive behaviors being absolutely fascinating, but remain a taxonomic group that is underrepresented in modern commercial aquariums. These mussels have an interesting story of evolution, ecology, over-exploitation, massive population declines, extinctions, and conservation efforts to tell!

Photographs of portions of the freshwater mussel fishery and pearl button exhibit at the National Mississippi River Museum and Aquarium in Dubuque, Iowa. Photo on left of pearly buttons made from freshwater mussels collected from the Mississippi River and photo on the right of a historical clamming boat and gear (Photographs by Thomas Keevin).

The stated purpose of the aquarium in the U.S. Fish Commission Building was to show: "(1) all the fresh-water and salt-water fishes propagated and distributed by the Commission; (2) all other important fishes and other water animals of the interior, Great Lakes, and both Atlantic and Pacific coasts which it may be possible to obtain and transport; and (3) ornamental and curious species of fishes and invertebrates of our fresh waters and coasts."

The U.S. Fish Commission Building contained 40 large tanks, which lined its walls and covered 13,000 square feet. The tanks were of various sizes: two were 12 feet long, 6 feet high and 7 feet wide; four were 5 feet long, 3 feet high and 5 feet wide; five were 3 feet long, 2 feet high and 2 feet wide, and twenty-nine were 7 feet long, 3 feet high and 6 feet wide. These aquaria were separated from the case exhibits of fishery related displays and the square central court, which surrounded them, by corridors 15 feet 9 inches wide. These corridors were in semi-darkness, while the tanks were lighted only from the rear, so that the animals were plainly visible and the general effect was very pleasing. Over each tank was a large circular window for ventilating purposes, and lower down there was a square window in which a comprehensive tank label made of translucent paper was lighted from behind. Opposite the tanks the walls of the corridors were covered with a continuous series of plate-glass mirrors, which reflected the tanks and gave the effect of increased size. In the center of the building was a pool, 24 feet square, open to the sky and surrounded by 12 columns, which support the roof.

Historical photograph of the pool in the center of the building with seals visible in the corner.

Based on the tank dimensions provided in the Fisheries Commission report, the tanks would have collectively held approximately 38,240 gallons of water. Based on the provided dimensions of the pool, 24 by 24 feet with no depth given, but using an estimated depth of 6 feet, the pool itself would have contained approximately 26,000 gallons of water.

There are no published records concerning the species of fish and invertebrates that were put on display in the aquarium tanks. The statement provided was: "The number of different kinds of animals on exhibition at any one time was upwards of 100, and may at times have reached 150. The species were constantly changed, however, by the arrival

of fresh lots, mostly brought in the special railway cars of the Commission. The central pool contained seals, sturgeon, large catfish, and various turtle species."

THE UNITED STATES GOVERNMENT BUILDING

Post card with an artist's rendition of the U.S. Government Building which displayed a cast of a Blue Whale and its' skeleton.

The U.S. Government Building contained no aquariums, but it did have a skeleton and life size model of a Blue Whale. As I previously described, the U.S. Fish Commission Building, part of the U.S. Government Building complex, did contain aquariums and fishery exhibits. The Smithsonian created the world's first full cast of a whale, which also was the Blue Whale exhibited at the 1904 World's Fair. This type of marine mammal model you would see in a modern aquarium today such as the present day exhibits in the National Aquarium, in the Aquarium of the Pacific or in the New England Aquarium. A very interesting history of the preparation of this specimen, extracted below, can be found at https://ocean.si.edu/museum/century-whales-smithsonian Give it a read you will enjoy it!

The next 4 paragraphs are from that Smithsonian article:

> On July 12, 1903, the whaling station at Hermitage Bay received word that one of their steamers had hauled in a blue whale, measuring 78 feet in length and weighing 70 tons. Lucas instructed the captain to tow the body "into shoal water [about 10 or 12 feet deep] just as the ebb tide set in." Once the whale was in position, "tail toward the beach and the head seaward," resting on its left side, Lucas, Palmer, and Scollick rowed out in a dingy and began the process of preparing the cast. For the next ten hours the Museum workers layered burlap, excelsior, and buckets of plaster of Paris over the whale's body.
>
> They took molds in sections, working down towards the median line of the stomach. Because whale flesh decomposes rapidly, the exhausted group had to continue working until the entire cast was complete. They left the head, which decomposes more slowly than the rest of the body, until last. When "the whale was hauled out on land and decapitated ... as soon as it was severed from the trunk we took a complete cast of the member, jaws and all, both inside as well as out," and molded the flukes separately.
>
> For the next several days the station workmen helped strip fat from the blubber. The Museum workers were determined that "every part of the whale's frame, even down to the smallest and most minute bones," would be collected and treated with care.
>
> The expedition returned to Washington, D.C., on July 22, with the skeleton and molds in several large crates. Lucas oversaw the modeling of the specimen, which he had to have completed in time for the St. Louis Exposition the following year. He wasted little time in staging the work, and news of the National Museum's "cetacean monster" captured the American public's imagination.

Historical photograph of a life-sized Blue Whale model cast being prepared in 1903 by Smithsonian staff for display at the 1904 St. Louis World's Fair (Photo courtesy of the National Museum of Natural History)

Historical photograph of a life-sized Blue Whale model cast by Smithsonian staff and its' skeleton featured in the U.S. Government Building (Photo courtesy of the National Museum of Natural History)

It took eight months to complete the enormous mannequin, which was performed in a huge shed built especially for the purpose. The whale form was covered in paper maché, using old paper money pulp from the U.S. Treasury, and painted by Palmer. In early March 1904, the whole was disassembled into sections and shipped by rail to St. Louis. The immense blue whale cast hung from the rafters and was described "as the most striking object . . . showing the natural appearance of this greatest of all living creatures.

When the blue whale cast returned to Washington, DC from St. Louis in 1905, it was suspended from the roof trusses of the South Hall in the Art and Industries Building. After the new U.S. National Museum, now the National Museum of Natural History, opened in 1910, the blue whale cast was moved across the Mall, mounted on a pedestal, and placed at the center on the Hall of Marine Life. For fifty years this seventy-eight-foot cast of the blue whale enchanted visitors to the Museum." The original Blue Whale was replaced by a new, even bigger, Blue Whale model around 1960.

THE PALACE OF FORESTRY, FISH AND GAME

Historical photograph of the south front of the Palace of Forestry, Fish and Game building. It contained 60 aquariums with native fish sponsored and maintained by the states of Missouri, Minnesota, New Jersey, and Pennsylvania (Photo courtesy of the Missouri Historical Society).

The Palace of Forestry, Fish and Game was considered the least elaborate architectural palace at the World's Fair. The building was 300 feet wide and 600 feet long, containing about four acres of gross space, and was built for $170,454. To the west of the building, Missouri maintained a three-acre area with an artificial lake, 200 feet long and 50 feet wide, where fishing demonstrations and contests were held. In penned enclosures at the lake's shores were river otters, beavers, raccoon, mink, swans, grouse, quail, and other native animals. River otters are still the first exhibit you'll see as you enter the fresh-water building at the Tennessee Aquarium and are a popular exhibit at the St. Louis Aquarium at Union Station. So, much has changed, but so much has stayed the same – cute is still popular.

The Palace contained exhibits from 24 different countries and numerous states dedicated to the preservation and utilization of trees, fish and animals. Showcased displays of taxidermy animals, model ships, fishing and gaming equipment highlighted each participant's exhibit. The most popular area in the building was the aquarium section consisting of 60 fish tanks, a 55 by 45-foot pool and a 40-foot diameter salt water basin dedicated to ocean sea life.

Although general references and tour guides indicate that the Palace contained 60 aquariums, the exact details of tank sizes, species displayed, number of tanks per each state are lacking. Minnesota, Missouri, New Jersey and Pennsylvania all apparently had displays of aquatic organisms. Depending on the historical publication, the aquariums were described as either "large tanks" or "enormous tanks". So, it is probably safe to assume that they weren't your run-of-the-mill thirty-gallon fish tanks.

Pennsylvania, for which we have the most information, had 35 aquariums with predominantly food and game fishes of the state. Pennsylvania's display also included a waterfall running through a cement canal into a great pool which contained large fish. William Meehan, in charge of the Pennsylvania exhibit's collection of material, installation of the exhibit, and the care after being in place, provided a description of the stream and pool as follows: "At the east end of the space extending southward is constructed a circular

WATERFALL AND POOL, PENNSYLVANIA EXHIBIT

Historical photograph of the Pennsylvania waterfall and pool exhibit. The pool contained large fish (From Lambert, James The story of Pennsylvania at the World's Fair St. Louis, 1904, Vol.II).

pool, twelve feet in diameter and five feet deep fed by water falling over an eight-foot cascade at the east end of the aquarium, and along a winding stream bordered by living evergreens, ferns, cat-tails and rushes. The stream contained live fish and in the pool were huge specimens of catfish and carp, some weighing twenty to thirty pounds each. The pool attracted scarcely less attention than the aquaria itself. All day long the projecting railing was overhung by large and curious crowds, who watch with interest the movements of the huge fish."

Historical photograph of an aquarium grotto under construction in the Palace of Forestry, Fish, and Game.

Missouri's tanks (number not provided) were arranged in a sort of grotto. Minnesota also had a grotto with fifteen large tanks arranged on the two sides of a fifteen-foot aisle. New Jersey designed a great swampy pool that occupied the center of the building with large game and food fishes of the Atlantic coast.

Transporting fish to the World's Fair in 1904 was much more of a logistics nightmare that it would be today. To put travel into perspective, remember that Ford's Model T didn't come onto the scene until 1908, four years after the Fair. Transporting tens of thousands of fish and keeping them in a displayable condition for an extended period would be a monumental task even with today's technology. Fish for the Pennsylvania aquarium exhibits, were transported from Pennsylvania to St. louis by a special train car, the Susquehanna, designed to maintain and carry fish. From the railroad depot to the fairgrounds, the fish would most likely have been transported by a horse-drawn wagon.

Not all went well for the Pennsylvania fish tanks in the first aquarium in St. Louis as described below by William Meehan. Although, there is no information concerning fish survival in tanks hosted by other states, or the fish tanks in the U.S. Fish Commission Building, it can be assumed that all the fishes in the tanks in the Palace suffered similar problems. In 1904, aquarium science was not what it is today and the

Historical photograph of the Pennsylvania Fish Commission's fish transport car, the Susquehanna (Photo courtesy of the Pennsylvania Fish and Boat Commission).

problems associated with St. Louis' water quality- ie: water purification methods, and summer heat were not well anticipated.

Per William Meehan: "Nearly five thousand fish were brought in the first shipment and it was attributed to the skill of Mr. Nathan R. Buller that on that one thousand two hundred miles journey only three died. It is to be regretted that condition could not continue, but they were scarcely placed in the tanks before my fears of the unsuitable character of the water provided by the Exposition authorities were realized. The water instead of being clarified by subsidence as it should have been was filtered first by the city of St. Louis with lime and again on the Exposition grounds by means of alum water; water filtered by any process is not well adapted for the maintenance of fish life that which was supplied was so heavily impregnated with lime and alum as to form a heavy deposit on the iron pipes, was necessarily fatal to nearly all the high-grade fishes. The trout, pike-perch, whitefish and blue-pike died within twenty-four hours. Yellow perch and several other species, notably blue catfish, died within a few days. At the expiration of ten days there were not more than fifteen species of fish alive, although curiously enough among those which seemed able to accept filtered water were several thousand Lake Erie minnows. Under the circumstances I felt it my duty to refuse to send another load of fish until the water was put in a better condition. After several weeks this was done by reducing the quantity of alum. I then shipped the second load, taking charge of the car myself. This was in early June, although the water was very warm, less than one dozen fish were lost in transportation. I regret to say that on my arrival I found that the Exposition officials had not kept their pledge to install the refrigerating plant to supply clear water. The consequence was when the fish arrived the water in the tanks had a temperature of over eighty degrees. The trout and many of the lake fishes consequently died very quickly. The refrigeration plant was installed in August, and on the 18th of August, Mr. A.G. Buller, Superintendent of the Erie hatchery, brought down a third lot, losing less than a dozen on the way. Owing to the chilled water in several of the tanks and by heavily icing the water in other tanks were able to carry no less than thirty-six species of Pennsylvania fishes until the middle of September."

Enthusiasm for Pennsylvania's exhibit was high, with many visitors returning several days in a row to walk through the fish grotto. Even after the fish started dropping dead because of excess lime, aluminum, and heat, the vacant tanks

attracted crowds that came to marvel at the new technology. The judges awarded Pennsylvania the grand prize and four gold medals for their exhibits in the Palace.

THE 1904 WORLD'S FAIR AQUARIUM(S) MEET THE ST. LOUIS AQUARIUM AT UNION STATION

I think I have made my case that the first public aquarium in St. Louis was built for the 1904 World Fair. The Palace of Forestry, Fish and Game and the U.S. Fish Commission Building collectively contained 100 large fish tanks with both marine and fresh-water fish and three large observation pools containing large marine and fresh-water fish, turtles, and sea lions. The U.S. Fish Commission Building was certainly a stand-alone public aquarium, with the same fish/fishery based "theme" as the Wonders of Wildlife National Museum & Aquarium in Springfield, MO, and comparable in size to small commercial aquariums in existence today. If throwing the U.S. Government Building into the mix, it adds a major whale model and skeleton to display. Even today not all public aquariums are under one roof. The Tennessee Aquarium has a fresh-water fish building and a marine fish building as part of their aquarium complex. They also have a third building, off-site fish conservation research building- which most people don't know about, that is only open to the public for tours on special occasions.

Let's put this all into perspective. By comparison, the St. Louis Aquarium at Union Station has 44 "exhibits". The World's Fair aquarium buildings held 100 large fish tanks, three observation pools, one stream with a waterfall and pool, one Blue Whale model and skeleton - a big deal in 1904, cute river otters, and a large number of fish, fishery science, and fishing exhibits. The World's Fair exhibits didn't contain a 250,000 gallon Shark Canyon and certainly no sharks, skates, or rays as far as I could ascertain and its largest glass fish tanks were only 3,770 gallons. But remember, by 1904 standards, the aquariums were beyond state of the art- they were futuristic. Even after the fish started dropping dead in the Palace of Forestry, Fish, and Game because of excess lime, aluminum, and heat, the vacant tanks attracted crowds that came to marvel at the new technology. This was something to behold in 1904!

The approximately 1,500 buildings at the 1904 World's Fair were designed to survive for the duration of the fair and then to be torn down. Their architectural ornamentations were made of plaster of Paris and the buildings were designed to be disposable. Only two major buildings were built to survive and are still standing today, the Palace of Fine Arts is now the St. Louis Art Museum in Forest Park and the Administration Building is now Brookings Hall, a part of Washington University. It is unfortunate that a third building, The U.S. Fisheries Commission Building, wasn't build to survive after the fair as the St. Louis Aquarium in Forest Park. Remember that Pennsylvania's tanks in the Palace of Forestry, Fish and Game were moved to Pennsylvania after the World's Fair to start the Philadelphia Aquarium at Fairmount Part. What worked for Philadelphia would have worked for St. Louis. If the Fish Commission Building had survived, maybe a public aquarium would have been a continuing part of our St. Louis culture today, as it is in some other major cities. We would have had a 116-year history of generations of St. Louisans learning about fish, aquatic invertebrates, and aquatic conservation, an educational/conservation role that has been left unfilled since 1904. Hopefully, the St. Louis Aquarium at Union Station will take up this banner and become part of our culture!

Acknowledgements

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I also wish to Acknowledge other sources for the use of the historical photographs, as noted in their captions.

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How the Goldfish Fad Holds St. Louis


HIGHLY CULTIVATED "RUYKIN"

Men of wealth have taken up the hobby and spend large sums to procure rare specimens, stores where they are sold are crowded and the libraries are having difficulty providing books about them - One man has been cultivating Oriental breeds here for half a century


"LIONHEAD"

ST. LOUIS is obsessed with the goldfish fad. Without any boosting, without publicity, quietly, almost unobserved, the hobby has spread until its devotees are numbered by the hundreds. Stores where the fish and accessories to their cultivation are sold are doing a big business. Books about goldfish are in great demand at the libraries. They have become more than pets for the children or part of the decorative scheme of the home. Men of business, men of wealth, men of all callings have become interested in them.

When goldfish and men are mentioned in the same breath at once the listener stands at attention to hear a joke; nothing serving better as a symbolic antithesis to man than a fish. Yet the gentlest of all fish, the ornamental branch of the carp family, is being cultivated, cherished and loved, individually and collectively, by real muscular men, men who do things in life, who love the prowess of the field, who scorn the inane.

The culture of goldfish was a pastime in the Orient before Columbus navigated the Western Hemisphere. The Japanese, Chinese and East Indians bred goldfish of fantastic shape and variegated colors as a fad, an art and semi-religious practice and are still engaged in the fascinating pursuit. In fact, some of the most expensive fish come from Japan and some are happy in St. Louis aquaria.

Primarily men of the Occident emulated the East through a development of the artistic: an aquarium of brilliantly colored and peculiarly shaped fish scintillating in a sunny window corner not only pleases the eye; but serves as a nerve tonic, a thing conducive to peaceful thoughts. Dr F. J. Artz has been rearing goldfish, in the beautiful rustic pond that dots the ground surrounding his home at Twelfth and Lami streets, for the past 50 years and is, no doubt, the most experienced native pisciculturist in St. Louis. He vouches for the mental blessings that fall to him who cultures the goldfish.

The spirit of competition pervading the United States has injected a new element into the culture of goldfish and it has become a gentle game.

Who might evolve the most beautiful type, the most fantastic?

The instant competition entered into the spirit of fish culture the fad became one for men, entirely out of the realm of the endemic; to the four corners of the earth in this day and you will find aquarium societies whose memberships are comprised mostly of men.

Every man likes to outdo his fellow, whether it be in the winning of a particular woman on in rolling a cigarette.

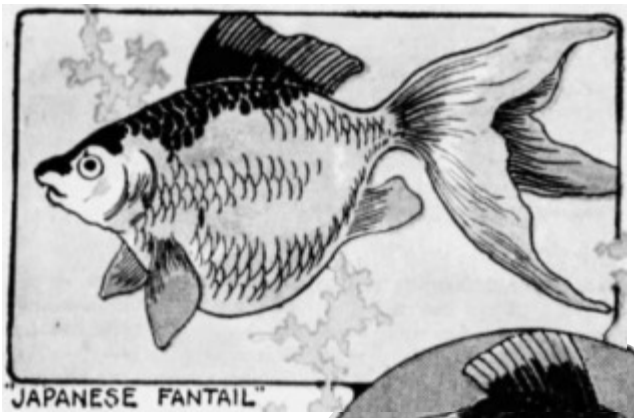
But hist! a little digressive confession in the going: Any man will talk baby-talk to a mute pet if he thinks no one is in earshot, such outbursts of affection have been heard even in the practice of pisciculture right here in St. Louis. This is to show the lowbrow who thinks fish culture is for the mollycoddle that big men can be tender and affectionate.

More than 100 names of local men and women breeding ornamental goldfish as a pastime are listed on the books of S. Chichester Lloyd, president of the National Aquarium Society of America, and the St. Louis branch, in its infancy, has more than half that number for its active membership.

St. Louis has been somewhat tardy in its appreciation for really expensive fish and possibly Lloyd is the only possessor of fish valued above $100 each. In many Eastern

cities fanciers own fish ranging from $50 to really $2000 each

New York has a public aquarium replete with highbrow fish and these aristocrats of the depths attract more attention during the course of a single year than do the rare and beautiful flowers in the famous gardens of Henry Shaw in 10 years. And this is taking into consideration the overwhelming resident population of New York and the high number of transient visitors, too.


"JAPANESE FANTAIL"

St. Louis is not only willing to be shown the value of pisciculture in its most artistic consummation, but is in the very act of looking in! And be it known, goldfish culture is not a game for the rich alone - its pursuit is inexpensive. Indeed, it offers possibilities for earning money, not trifling sums either, but great mortgage-devouring sums. Patience and care are the essential capital stock. Some of the best baby goldfish can be had for 50 cents each and with patient rearing earn an interest which runs rapidly into the decimals of dollars and - beyond!

The St. Louis society is advocating a public aquarium. In this movement, it will have the aid of the Zoological Society, co-operation having been offered by George Dieckmann, president of the latter. All Aquarium owners are interested in the movement.


"FRINGETAIL TELESCOPE"

Thinking of goldfish the majority at once pictures one of those dinky glass globes reposing on a window sill or hanging from a brass chain and containing a few common goldfish bought at the dime store, which swim everlastingly in circles and misery. These constitute the goldfish hell, and, to these there is no further reference than to deplore the practice and express the hope the S. P. C. A. will enlist more active members.


"VEILTAILED ORANDA SHISHIGASHIRA"

Probably Dr. Artz has maintained the most ideal aquaria and outdoor pool in St. Louis. At present the pool is empty, a temporary condition, obviously because of weather changes. Dr. Artz, however, will shortly stock his pond, start his miniature waterfalls and begin the rearing of fancy fish as has been his wont for these 50 years.

Adolphus Bush III is interested deeply in his splendid aquarium at Grand View Farm, St. Louis County. He is owner of valuable specimens. Wallace C. Capen has an invaluable collection of finny aristocrats - so have Emile R. Cramer, E. A. Faust, C. B. Nicholson - but Capen, perhaps with the exception of Chichester Lloyd, owns the finest fish in St. Louis.

A list of goldfish owners would include Louis C. Koehler, F. H. Wood, Fred C. Lake, Mrs. James Livingston, Theodore Benoist, Miss Julia Papin, Miss Kathleen Murphy, Edward M. Flesh, Mrs. J. T. Drummond, Edwin A. Lemp, August C. Erker and T. H. Gerbart.

Chichester Lloyd, leader of piscicultural art in this country, says he rears annually more than 20,000 baby Chinese, Japanese and East Indian goldfish in his back yard in anything that will hold water, from dish pans to discarded concrete wash tubs and casks.

There is much talk among fish fanciers of the "balanced aquarium." To those who purchase bargain fish globes this might mean an aquarium balanced on a chain. The term is unfortunate, "reciprocating aquarium" would be more accurate. Lloyd says that in the balanced aquarium there should be a gallon of water to each half inch of fish exclusive of tail, five saggittaria plants or two bunches of myriophyllum, or one of anacharis to each fish. The gallonage of the tank may be determined by multiplying the length in inches by the depth and this by the width and dividing by 231, the answer being the number of gallons. There should be one tadpole and three snails to each fish. Tanks so arranged will be reciprocating and need no change of water. Animals consume oxygen and give off carbonic acid gas and plants commute carbonic acid gas and give off oxygen, therefore unless oxygen is added to the water by plants or artificial aeration, animal life must cease. Tadpoles and snails act as scavengers for the fish and keep the aquarium free of slime.

The highest development of goldfish was not introduced into America until about six years ago when the Philadelphia Aquarium Society by way of Germany some

rare specimens of the veiled tailed dragon-eyed goldfish. A man to whom a goldfish was simply a goldfish and nothing more and had brought home one that cost him a quarter of a dollar in a paper pail, might have learned with amazement that a perfect specimen of this fish cost from $100 to $2800.

Today they may be had at prices ranging from $5 to $50, because of the breeding of several thousand in the United States. These prices are for baby fishes but an inch long! The demand exceeds the supply. As fanciers gobble up these aristocratic finny infants the general public knows nothing of them.

Odd variations in form obtained through scientific breeding are not more amazing than the exquisite color schemes intermingling with the scintillating texture of the skin. These highbrow fish are practically free of scales, a few remaining here and there, like spangles of gold, to make the design more striking against marvelous tones of crimson, purple, blue, orange and pearl. There are occasional black dots not unlike purposeful beauty spots.

But one fish in five million, it is estimated is perfectly marked and the one might be worth actually twice its worth in gold! So after all goldfish and goldmines might be somewhat analogous. There are two, three and even four, long, sweeping tails to a fish, each separate and distinct. The eyes measure a trifle over a third of an inch in diameter and are often turned upward.

The Oranda Shishigashira, or lion-headed fringe-tail, has recently been bred in America. After its second year this fish grows a hood and long tail. A pair might be had for $1000.

To enumerate and describe the variations of aristocratic goldfish would lend to these paragraphs the air of an essay and at once be a digression. The intent is to throw illumination upon a fastly growing and misinterpreted fad, showing why men are interested in what, to many, seems to be an attraction for children.

A much more attractive scavenger for the aquarium than the snail or tadpole recently has been introduced into this country and he is worthy of mention in that he is luring considerable interest than rightfully belongs to the goldfish, this busy creature is the 'Takanohadojo, familiarly styled Dojo. He comes from Japan.

The Dojo is much like an eel in shape, and in Japan is used for food. In the aquarium he is of interest every minute. Not a fragment of food is allowed to decompose, for the Dojo eats everything that might be eaten. In his frantic pursuit of food the Dojo has a habit of plowing through the sands of the aquarium with his face. He moves rapidly, passing sand through his gills as he goes. This queer antic is at times extremely comical. No matter how secretly food is dropped into the tank, the Dojo discovers it Instantly. Sight of the food does not seem necessary, the odd fish having some secret method of gathering news.

The Dojo may be kept out of water for considerable time with no fatal result, indeed, he is shipped from Japan, packed in moist grass only, and is kept alive in his container for weeks.

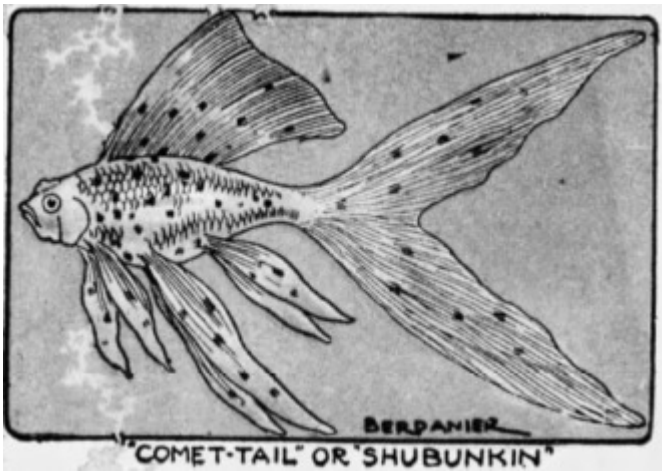
The head of the fish greatly resembles that of the carp and is well provided with barbes, in fact, it has a well developed mustache.

The actions of the Dojo are graceful and he appears like a waving band of ribbon as he swims here and there among the plants. The skin is smooth and slippery to the touch and shines with a dull, golden sheen. They do not molest goldfish or other creatures of the aquarium. They have a curious habit of resting the forepart of the body on the pectoral fins and staring at the observer out of bright red eyes.

The Dojo seems to be somewhat of a thinker and will sit for hours on the tip of his tail - buried in thought, perhaps. About the head his appearance is not unlike the walrus.

The Dojo promises to hold an interest all his own, most particularly because of his business-like characteristics, and also because of the spectacular character of is antics.

Japan has been the source of our fancy fish supply for centuries and probably will continue to be so. Her annual exportation of goldfish alone, runs far into the millions of fishes and since the European war has severed abruptly the supply of tropical and other varieties of aquarium fish, American fanciers have been paying attention to the more easily obtained species of America and the Orient.



"COMET-TAIL" OR "SHUBUNKIN"

Lloyd says the great mistake made by the neophyte in fish culture is feeding the fish anything and everything. Foods containing flowery substances are decidedly indigestible.

Editor's note: This article, published in 1916 and the succeeding published in 2019, contain clues to the earliest days of a St Louis Aquarium Society. Additional information about this early version of the Missouri Aquarium Society between 1916 and 1950 would be welcome to assist writing future articles.

Missouri Botanical Garden Bulletin

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AQUARIUM EXHIBIT

Through the instrumentality of the St. Louis Aquarium Society, the Garden is fortunate in being able to establish a display of fancy fish, exhibited in specially prepared aquaria which have been installed in the alcoves of the aroid house. The attractive rockwork around the aquaria eliminates the artificiality generally associated with such displays. An additional feature of the exhibit is the use of various aquatic plants suitable for aquaria. Such plants are indispensable for maintaining the life of the fish, possessing the power of generating oxygen. Pure oxygen is essential for fish, while carbon dioxide is a plant necessity ; thus a balance is maintained, the oxygen given off by the plants being utilized by the fish, while the carbon dioxide exhaled by the fish is absorbed by the plants. Without this reciprocal relation it is impossible to attempt fish culture successfully. It has been repeatedly demonstrated by specialists that aquaria containing sufficient plant life may be tightly covered, the plants giving off enough oxygen to support a proportionate number of fish. The feces excreted by the fish are absorbed by the plant roots as food.

The ornamental value of plants in aquaria is another important feature. The plants used may be either native or tropical, placing stress upon those which possess to the largest degree oxygen-generating properties. The best plants for this purpose are: pond-weed (*Potamogeton crispus*), fishgrass (*Cabomba caroliniana*) , eel-grass (*Vallisneria spiralis*), water-weed (*Elodea canadensis*), and ribbon arrowhead (*Sagittaria subulata*).

Pond-weed (Potamogeton crispus) .—A native of Europe, forming greenish brown growths. The leaves are lanceolate with undulated margins and the flowers white. One of the best oxygen generators, but an exceedingly noxious weed in outside ponds.

Fish-grass (Cabomba caroliniana).—A native of North America. The green leaves are produced in fan-shaped formation from the central stem which reaches a length of four feet. The plant is quite attractive, but is a rather poor oxygen generator.

Eel-grass (Vallisneria spiralis) .—A grass-like plant native of North America, with strap-shaped leaves varying from one to three feet in length, light green in color, and translucent. The star-shaped, floating pistillate flowers are connected to the base of the plant by a long filament which later becomes spiral, submerging the flower for fertilization. The staminate flowers are globular, produced at the base of the plant, from which they break away, rising to the surface of the water. They float with the stream, pollen exposed, so that when contact occurs with the pistillate flowers, pollination readily takes place. This plant is a very good oxygen generator.

Water-weed (Elodea canadensis var. gigantea).—Native of North America, moss-like in growth. The leaves are in whorls upon light green stems which form strands reaching several feet in length. This is an excellent oxygen generator, growing completely submerged. It may become a pestiferous weed in lily ponds.

Ribbon arrowhead (Sagittaria subulata).—Native of North America. The submerged leaves are equitant, strapshaped, dark green, one foot in length. The growth above water bears lance or sagittate leaves. This plant is one of the most valuable for aquarium purposes, multiplying rapidly by stoloniferous growths and supplying a plentiful amount of oxygen. A very noxious weed in ponds.

PLANTS SUITABLE FOR AQUARIA

Botanical name	Common name	Habit	Habitat
Aponogeton distachyus	Cape pond- weed	Floating	South Africa
Aponogeton fenestralis	Lace-leaf	Submerged	Madagascar
Azolla caroliniana	Water moss	Floating	North America
Cabomba caroliniana	Fish-grass	Submerged	North America
Callitriche verna	Spring starwort	Submerged or floating	North America
Ceratopteris thalictroides	Water fern	Leaves floating or above water	Tropics
Cryptocoryne Griffithii	Mosaic leaf	Submerged	Malaya
Cyperus alternifolius var. *variegatus*	Variegated umbrella plant	Leaves above water	Madagascar
Cyprus Papyrus	Egyptian pepper plant	Leaves above water	Egypt
Eichhornia speciosa	Water hyacinth	Floating	Southern United States
Elodea (Anacharis) canadensis	Water-weed	Submerged	North America
Eriocaulon septangulare	Hair grass	Submerged or above water	Southern United States
Fontinalis antipyretica	Willow moss	Submerged or above water	North America
Heteranthera limosa	Bog herb	Floating	North America

Botanical name	Common name	Habit	Habitat
Hippuris vulgaris	Mare's tail	Submerged or above water	North America
Isoetes Engelmanni	Quillwort	Submerged	North America
Jussiaea longifolia	Primrose willow	Floating	Brazil
Lemma minor	Duck weed	Floating	North America
Limnobium Spongia	American frogbit	Floating	North America
Limnocharis Humboldtii	Water poppy	Floating	South America
Ludwigia Mulerttii	Water purslane	Floating	Amazon River
Myriophyllum proserpinacoides	Parrot's feather	Floating	Tropics
Nuphar sagittaefolium	Spatter-dock	Submerged or above water	North America
Pistia Stratiotes	Water lettuce	Floating	Tropics
Salvinia natans	Floating gem	Floating	Tropics
Potamogeton crispus	Pond- weed	Submerged	Europe
Sagittaria subulata	Ribbon arrowhead	Submerged or above water	North America
Trapa natans	Water chestnut	Floating	China
Utricularia vulgaris var. *americana*	Bladderwort	Submerged	North America
Vallisneria spiralis	Eel-grass	Submerged	North America

FISH TO BE FOUND IN AQUARIA

Among the curious fish from foreign lands will be seen the *Mollinesia latipinna*, or sail fish, with its huge, brilliantly colored dorsal fin which it expands like a sail when courting. These fish are natives of the bayous and small streams of the Gulf and particularly of Louisiana and Mexico.

The Mexican sword-tailed fish will be found in another tank, where it is readily distinguished by its long saber-like tail. The colors of this fish baffle description.

The South American peacock-fish, one of the smallest known fish, while called the "millionfish" in its native waters on account of its vast numbers, is shown here in a small family, as, like the two above-named fishes, it is tropical in nature and requires much heat during the winter. It shows all colors of the rainbow and is covered with dots exactly like the eyes of the peacock's tail.

Another rare South American fish, the danio or zebra fish, resembling a miniature striped bass, will be found in several forms. It is incessantly active and scarcely ever stops for breath, taking its food in quick, snappy darts.

The paradise fish is another interesting variety, one of the earliest known aquarium fish. Its brothers, the fighting fish of Siam *(Betta pugnax* and *Betta rubra)* , will be found near it. These latter fish are used for fighting by the Siamese, great fortunes and estates or women changing hands on the results of these singular battles. These fish are desperately pugnacious and will fight until one or the other is literally torn to pieces. The negro fish, the stilt fish, the ruby fish, and the albino fish will also be found in this collection. In another alcove will be found the sacred blue carp of Japan and the sacred red carp of the same country.

The East Indian and Japanese shubunkin, or brocaded goldfish, will be found in an alcove where are displayed Japanese lion-headed goldfish, Korean eggfish, Chinese moor (black) dragon-eyed goldfish, and the more beautiful forms of goldfish, such as butterfly-tails, lace-tails, fan-tails, and comet-tails, scaled and unsealed, in colors from gold to blue and mottled calicoes.

Among the wild native fish will be seen the rainbow darters, the sculpin or toad-fish, the various minnows and horn-pout, the red and common sunfish, the purple minnow, the rainbow dace, the striped dace, the common shiner, and the darters or top-water minnows with their wonderful checkerboard colors.

AQUARIUM MANAGEMENT

The chief sources of failure in the management of aquaria are overcrowding, overfeeding, sudden temperature changes, lack of proper plant life, and insufficient lighting.

The tendency to overcrowd aquaria is a common fault. A safe rule to follow is to allow one gallon of water to every one-inch fish; thus a ten-gallon aquarium may contain ten one-inch fish or two five-inch fish. When the fish continually come to the top and gasp for air it is a sign either of overcrowding or of the presence of some decomposed matter in the water.

Overfeeding of fish is an evil usually due to ignorance. Under natural conditions, in order to procure food, fish have to exert themselves, but as such exercise is not possible in a confined aquarium, food must be given in smaller amounts. No more should be given than can be consumed at once, and if any remains after five minutes it should be removed with a dip tube. When the temperature of the water is 60° F. or higher, daily feeding is permissible, but as the temperature goes down feeding should be reduced to two- or three-day intervals.

If change of water becomes necessary, sudden fluctuation of temperature should be avoided, as it is quite

often the primary cause of disease. Every few days a tenth of the volume of water may be changed slowly. A sprinkling pot is desirable for adding water, the small streams becoming well aerated.

An evidence of sickness in fish is the dragging of the back fin which normally is carried upright. The movements also become sluggish and a tendency to hide in a dark corner is noticed. The body becomes thin, the fins split and are streaked with red, and the excrement shows a pale color. Sick fish should be removed quickly from the aquarium, and if the disease affecting it be contagious, the tank should be disinfected by adding three grains of potassium permanganate to a gallon of water, having previously removed the fish and the snails.

The mineral constituents of the water are absorbed by the fish and plants to such an extent as to necessitate addition of these materials at intervals. A mixture of three parts of evaporated sea salt to one part of Epsom salts added at the rate of one teaspoonful to twenty gallons of water every two weeks will prove beneficial. Acid conditions resulting in the crumbling of the shells of snails may be eliminated by keeping a piece of plaster of Paris or gypsum in the aquarium. In dissolving, it neutralizes the acid, but as it only dissolves under acid conditions there is no danger of the water becoming too alkaline.

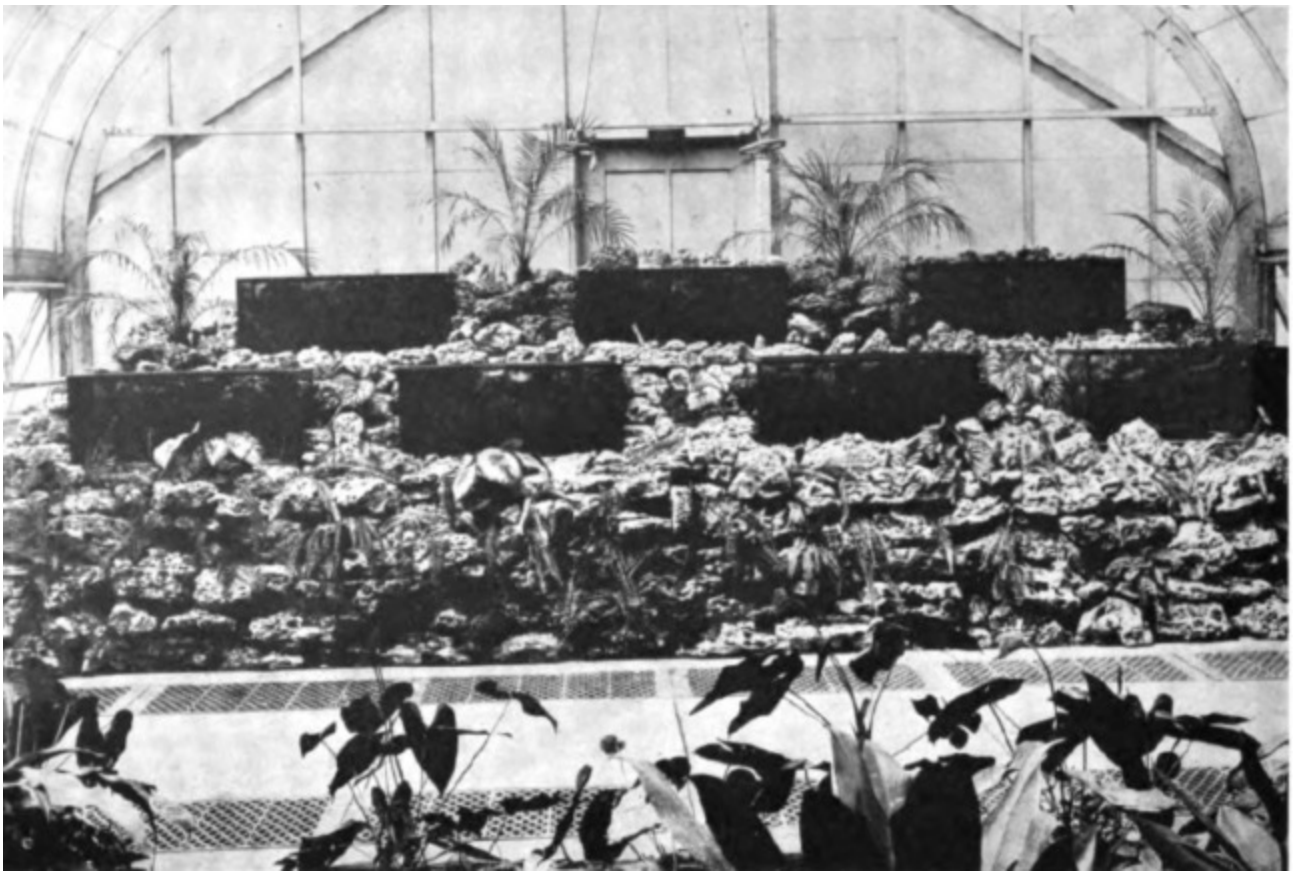
In order to get rid of a good deal of decomposing matter in the aquarium, Japanese, African, and European red snails, as well as water mussels and weather-fish, are extremely useful and should find place in every tank. The mussels are necessary for keeping down algal growth.

Planting is done directly in sand which is spread to a thickness of one inch. Two inches of water is then added, the roots spread out, and another one-inch layer of sand and pebbles placed on top. The aquarium should be allowed to stand at least a day before the fish, are added.

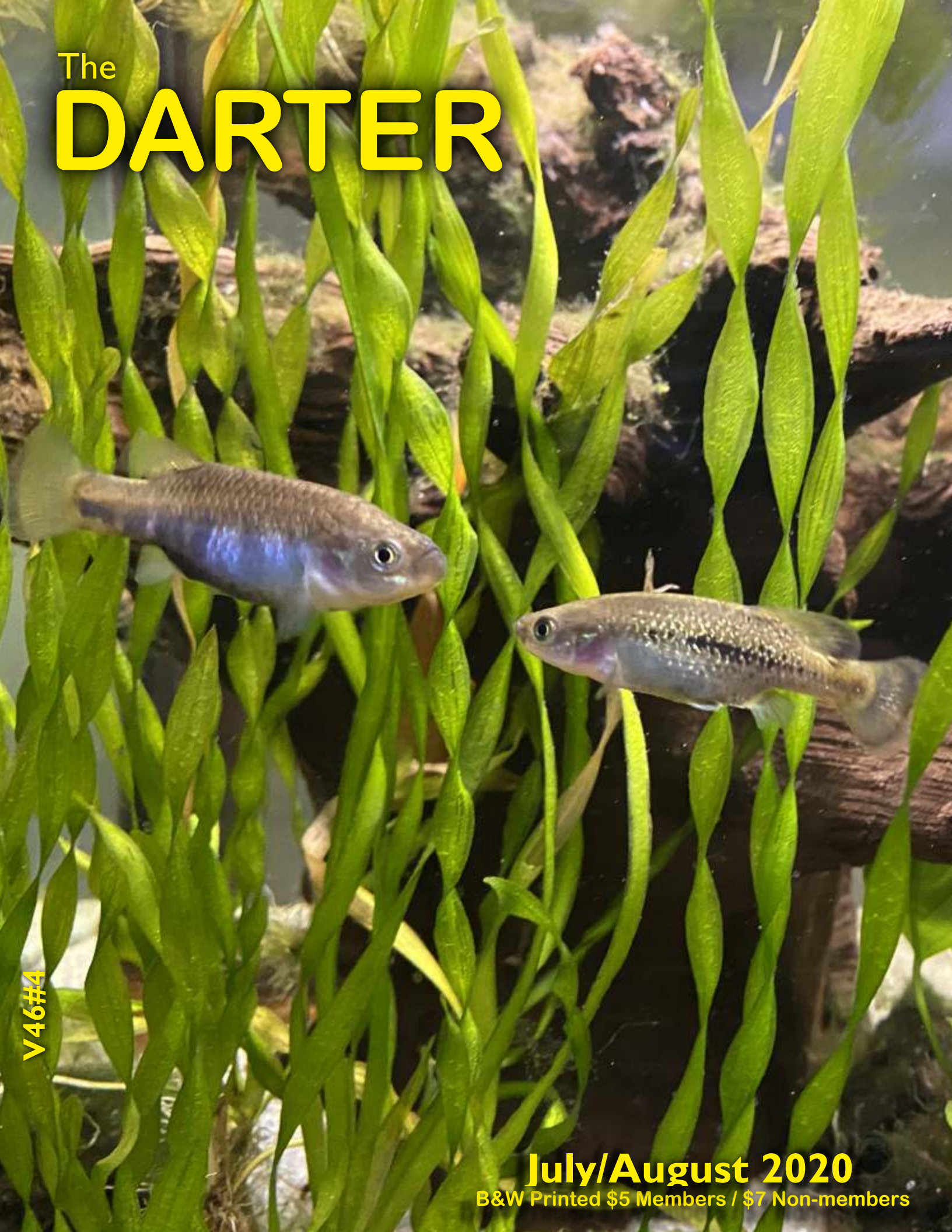
A globe is one of the worst possible containers for fish. When filled the air surface is small in proportion to the water bulk; the convex surface of the globe acts as a lens, focusing light into the eyes of the fish ; proper plant growth is difficult, and in addition overcrowding and overfeeding are apt to result.

2020 ANNUAL REPORT OF THE DIRECTOR
referring to 1919

Aquaria and Collection of Fish.—The alcoves of the aroid house, formerly devoted to the exhibition of orchids, have been adapted for a display of fancy fish. Some 35 aquaria, with an appropriate setting, have been established here, and, through the cooperation of the St. Louis Aquarium Society, a most interesting lot of fish—mostly tropical—are now on display. An opportunity is likewise afforded of including practically all of the aquatic plants suitable for aquaria, and there are now to be found here about 30 varieties of plants, growing either completely or partially submerged, such as it is not ordinarily possible to show in a garden.



AROID HOUSE WITH ONE OF THE ALCOVES SHOWING AQUARIA



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INSIDE THIS ISSUE

Cover - *Allotoca maculata* - Pat Tosie

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Meet MASI Fishy Folk: Phil Nixon

CAFE Member Interview with Phil Nixon

by "La Truite"

Reprinted from the Champaign Area Fish Enthusiast's (CAFE) In Seine Menu, June 2020

Phil Nixon with his tanks. This particular tank is home to some red-faced Top Minnows.

Phil is also a MASI Member

PHIL NIXON, OUR CAFÉ treasurer, is by profession an extension entomologist, now retired. His interest in insects and fish began when he was about 11, playing in a central Illinois creek near his home south of Springfield.

His older brother had a three gallon fish bowl in which he had kept Goldfish. Phil thought he could bring some Creek Chubs home and put them in it. He learned about water changes and that the Chubs were better behaved than the Goldfish who regularly attempted Harikari by leaping out of the bowl onto the floor.

At an early age Phil was interested in biology and one day collected a Mason jar full of pond debris, water, and its inhabitants. His brother had a small microscope that Phil used to classify the animals in his sample which he was able to do pretty successfully and record. No comment about whether the Chubs got live food supplements from these early collecting trips.

When Phil was about 13 he upgraded to a 6 gallon rectangular tank with an air pump-powered box filter and later replaced it with a hang-on-the-back airpowered filter. These were the kinds of filtration available in small tropical fish shops in the mid-60s. In high school Phil got another 5-gallon tank and attended Springfield fish club auctions and populated the tank with Swordtails and Corys.

After high school, Phil attended a community college while living at home and took biology courses in preparation for transfer to Southern Illinois University. He considered high school teaching until a course in educational psychology dampened his interest in education. While at Lincoln Land Community College he did a 4-H entomology project and took an entomology course spawning his interest in that area. His 4-H insect collections advanced from the county level to the State Fair where they were judged by University of Illinois entomologists. They remembered him eight years later when interviewing him to be a U of I entomologist.

He moved his tanks and fish to SIU and added a 15-gallon tank to his collections, which he recalls had grass pickerel, silversides and a large-mouth bass. He completed bachelors and masters degrees in zoology, specializing in entomology, with botany minors at SIU.

Phil did his Ph. D. in entomology at Kansas State University. He moved his aquarium systems to his aunt's house and among other species, raised Oscars, at first not so successfully. Young fish died for no apparent reason, until he discovered that young Oscars need dither fish to chase. This gave him experience in keeping angelfish as they were inexpensive and easy to rehome once the Oscars grew up. A lab on campus was doing research on roaches which supplied his Oscars with live food.

After receiving his Ph. D., he and Carie married and moved to the Chicago area where he was hired as a University of Illinois Extension Entomologist. There for seven years he

organized lectures and consultations, largely with commercial firms that in some way dealt with insects. Phil and Carie bred native Killifish and were members of the Chicago Killifish Association.

In the early 1990s the Nixons' moved to Champaign, first living in Dobbins Downs, later buying a house in rural Tolono. They joined CAFE around 1991 with Phil becoming Librarian and a board member about a year later. He ceased to be Librarian when the library was sold about a year ago. Phil has served two stints as President of CAFÉ, the most recent for more than ten years until becoming Treasurer in 2016. He is an auctioneer at CAFÉ auctions, as well as those of MASI and Tri-County. They are members of the Illinois Audubon Society and Carie is a board member of the Champaign County Audubon Society. They are also members of the Bonsai Society of Central Illinois of which Phil is President.

Currently the Nixons' have 30-40 tanks, including three 75's and a 125. Most of the tanks contain sponge filters, supplied with air from a large in-line piston pump. Most of the tanks are located in the basement, and the air runs through 2-inch diameter PVC pipe along the ceiling.

The Sailfin Shiner tank has an underground filter, and the 125 Bristol Shubunkin Goldfish tank has a canister filter. Several tanks have power filters, with the Goldfish tanks also having sponge filters. Some tanks are lit by LED's, but most have fluorescent lights. Almost all tanks have plants grown in trays of topsoil covered with gravel. These include several species of Cryptocoryne, Vallisneria, and Aponogeton. Many tanks also have Najas or Java Moss.

Fish include Shiners, Killifish, Carie's Goldfish, and Dwarf Bristlenose Plecostomus. They regularly supply plecos to Sailfin Pet Shop. Phil's fish are primarily natives whose parents or grandparents were collected by him, many on trips to North American Native Fishes Association annual conventions, where he is their auctioneer.

Meet MASI Fishy Folk: Bob & Lora Watson

Watson Couple Enjoy Collecting Rare Fish

© Mary (Galer) Herschelman

Reprinted with permission from

June 29th, 2020, Montgomery County, IL

The Journal-News

Abigayle Sturgeon, granddaughter of Bob and Lora Watson of Hillsboro, checks out one of the fish tanks in her grandparents' home. The Watsons collect colorful and unique fish in their 60 aquariums. They also enjoy teaching their grandchildren about taking care of fish and helping to preserve rare breeds and fish that are often extinct in the wild.

HOBBIES COME IN all shapes and sizes. Some like to hike in the great outdoors. Others like to try their hands at photography or golf.

But Bob and Lora Watson of Hillsboro found a hobby that keeps their fins busy, caring for thousands of rare and unique fish in their home.

"My husband has always had fish," said Lora Watson. "Then about eight years ago, we really got into it."

Watson said her husband saw an ad online for a fish show from the Missouri Aquarium Society near the airport in St. Louis, and the couple decided to check it out. While they were there, Bob signed up to become a member of the club.

They now belong to five different organizations dedicated to collecting and preserving rare fish, and have 60 aquariums in their basement where they care for them.

As their hobby took to the water, the Watsons began to learn more about caring for fish. Her husband was interested more in "live bearers," which are fish that give birth to babies, instead of fish that lay eggs. Although, they do have fish that lay eggs as well.

"We learned about what temperature the water needs to be for different fish and how to treat it," Lora said. "It's always a learning process."

She said they have about 50 different species of fish in their home, and caring for them includes weekly cleaning of all the tanks. Watson said it can be an all-day process on her own, but that she and her husband can do it together in about four hours.

To clean the tanks, they carefully wipe down all the exposed sides and vacuum out the "gunk," replacing 25 percent of the water with fresh water.

"They enjoy it when I clean their rooms," Watson said with a laugh.

The fish eat typical fish flakes like many pet fish, but also live worms and the baby fish eat brine shrimp.

"For my husband, he just really enjoys the fish and finding those rare ones that don't exist in the wild," Lora said. "For me, it's just a lot of fun."

One of her favorite parts is watching the bearers give birth. Just this week, a white swordtail had 40 to 50 babies. She said the most they have ever counted was 80 babies from one birth, and all of them lived.

Lora said one of their most unique fish is the Rio Otapa, which are originally from a river in Mexico, but are quite rare. Because of poachers in that area of the river where they live, part of the river is a "no collection" area until the population rebounds.

"However, because of people like us, we no longer need to disturb the wild ones as long as we can keep them in the hobby by raising them and sharing them with other hobbyists," Lora said.

The Watsons have raised the swordtail fish for several years, even winning second place in an annual show from the American Live Bearers Association one year.

"That one is really special to us because it was a nationwide show and we competed with people from all over the Americas," she said.

That plaque is displayed in their basement near the aquariums with other awards they have won. Another plaque is dedicated to an article they wrote from one trip when they took their grandson, Skyler, with them on a collecting trip, and he discovered a fish not native to that particular area.

Although breeding the fish is a hobby and not a business for the couple, they do sell some of the fish and ship them nationwide. Lora said the fish have to fast for two to three days before shipping, and are then put in a bag (similar to if someone purchased one from a pet store or won one at a carnival). The fish have to fast so they do not create waste in the bag during shipping. She then packs styrofoam around the bags and ships them. So far, all their fish have arrived safely at their destination, even though one order took two weeks to arrive in New Jersey.

At this time, the Watsons only ship fish to the continental United States because they worry about the safety of the fish in sending them afar to other countries. They are also careful to ship mostly in the spring and fall due to extreme temperatures in the summer and winter months. She said that due to the pandemic and lack of shows, their aquariums are pretty full at this time, and she hopes the shows will be able to start up again soon.

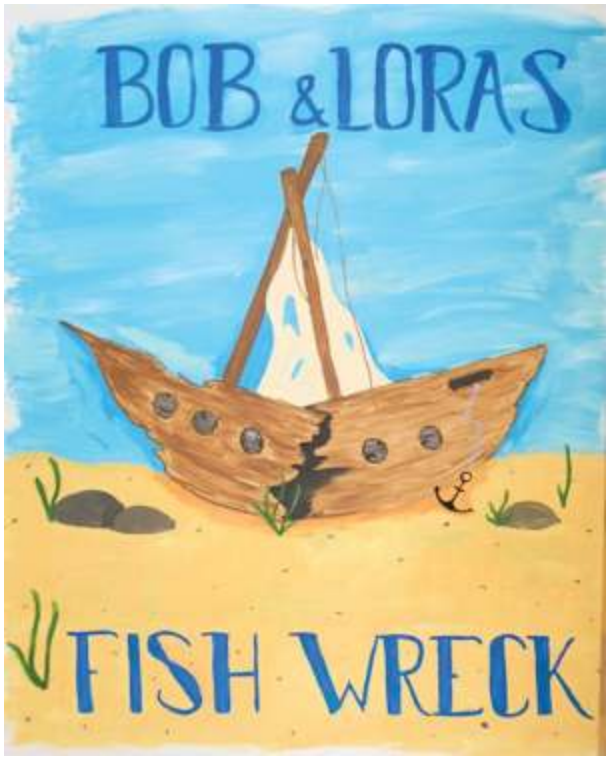
During the summer months, they host what Lora affectionately calls "fishy summer camp," keeping a large variety of fish in barrels in their yard. Lora said they thrive in the outdoors, growing and becoming more vibrant in color. They also help to keep the mosquito population down, eating the eggs the pesky bugs lay in the water.

"It's just become something we both really enjoy," Lora said. "And we enjoy doing it together."

Lora Watson and her granddaughter, Abigayle Sturgeon, check out her "fishy summer camp" where they allow the fish to enjoy the outdoor life during the summer.

The couple have also met lots of new friends who collect fish in Illinois and Missouri.

When she's not caring for fish, she's the apartment manager for Village Apartments in Hillsboro and her husband is the owner of Watson and Sons Electric. They also manage several rental properties and enjoy spending time with their children and seven grandchildren, with a new one due in November.



This mural leading to the Watsons' basement was painted by their daughter, Kelly Watson, in tribute to their growing hobby.

Changes in the MO Dept of Conservation handling of Crayfish

–

By Mike Hellweg

AS SOME OF you may have heard, recently a couple of local shops have been cited by the MO Dept of Conservation (MDC) for selling what, up till now, have been popular Crayfish- the Mexican crayfish and the blue "lobster".

The controversy has popped up on our social media pages, too. Only the genus *Cherax*, the rusty crayfish and the self cloning Marmorkrebs are outright banned, meaning you cannot possess them. The other crays have been legal but now things have changed for them.

Since the regulation is written rather confusingly, I checked with the MDC and got their official statement. People can still keep crays that they already have, but live crays can no longer be bought or sold except for food or for scientific research. Crays can also be caught and used for bait, and one species can still be raised and sold for bait - the virile or Northern Crayfish, but this does not include the aquatic hobby.

Basically, it means no more crays in the auction. I have amended the auction rules, and Holly is amending the swap rules to the same effect. NO crayfish of any species may be sold. Those rules will be posted on the MASI website and circulated, before the our next public Auction.

Marmorkrebs: Elizabeth Pennisi, Science, 2018 “ An aquarium accident may have given this crayfish the DNA to take over the world”
https://www.sciencemag.org/news/2018/02/aquarium-accident-may-have-given-crayfish-dna-take-over-world

https://alchetron.com/Marmorkrebs

Cherax - Common Yabby
https://nas.er.usgs.gov/queries/greatlakes/FactSheet.aspx?SpeciesID=58&Potential=Y&Type=2&HUCNumber=

MO Dept Conservation, Regulations & Feedback:
https://mdc.mo.gov/about-regulations/wildlife-code-missouri/comment-existing-regulations

https://mdc.mo.gov/newsroom/crayfish-regulation-discussions-continue-0

Cherax destructor - Common Yabbi, a large crayfish that comes in several colors

The Search for the right Cattail!

-

By Chuck Bremer

CATTAILS! Been around them all my life and didn't realize there were so many!

I grew up on a a farm and soon after we constructed our first farm pond, when I was very young and impressionable, the cattails showed up as the first inhabitant. I always thought there was only one kind of cattail and that no outside body of water was complete without them.

Fast forward about 50 years and well into my fish keeping days... where my focus, not unlike that farm pond, has been on creating mini aquatic communities. I like to create a balanced community in a small space, therefore small fish and usually small plants. When graduating to outdoor tubs I took this desire for miniatures back outside to create outdoor tubs as miniatures of the outdoor habitats I knew.

I decided that any outdoor habitat has to have cattails– to match my mind's eye of that early farm pond. That's when things got a bit more complicated!

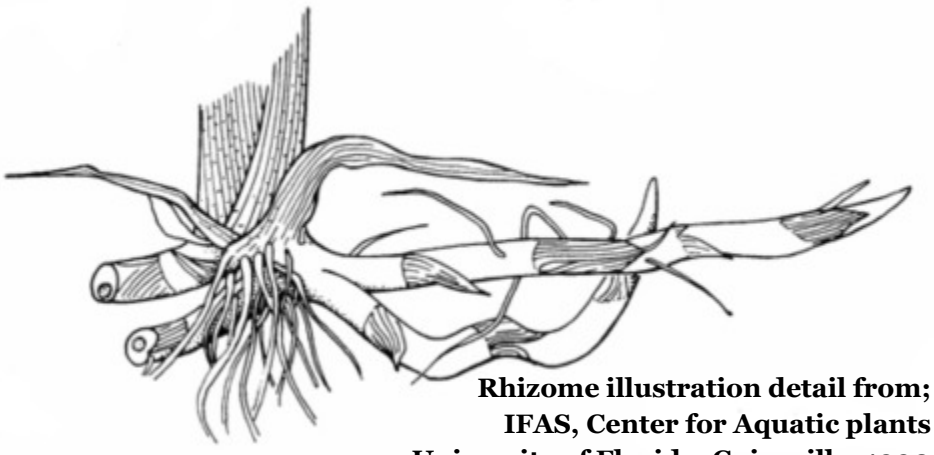
I remembered cattails as an up to 3/4" wide broadleaved, grassy plant growing in the edge of the water that bloomed and produced a seed stalk and hotdog shaped inflorescence up to 6 inches long and about an inch in diameter.

Below ground the cattail has a corm like root system that grows about six inches below the surface of the mud and, depending on the species, may grow in water up to 3 feet deep. The leaves consist of vertical veins with large air filled cells and are arranged alternately on the central stem or spike. New spikes form at nodes of the corms/rhizomes and the plant can spread rapidly.

Cattails have a long history with humans around the world and are eaten, used for building and tools and also for medicinal purposes. Euell Gibbons in his book "Stalking the Wild Asparagas" titles the chapter on cattails as "Supermarket of the Swamp" which others have now paraphrased as the "Super WalMart of the Swamp".

One of it's values is Edibility- the young shoots and the corms/rhizomes, said to taste like cucumber, are dug and eaten raw, steamed or boiled. The pollen can also be used as flour for many purposes. Per surface area, cattails can produce more starch than the equivalent area of potatoes! The North American Indians introduced the first European settlers to the cattail as a staple and helped many survive the Northeastern winters. Even in hard times cattails are easily dug even from below a sheet of ice as they begin to develop and emerge in the spring.

Other uses include the tough leaves as thatch for roofs, cording for binding, weaving materials for various



Rhizome illustration detail from;
IFAS, Center for Aquatic plants
University of Florida, Gainsville, 1990

purposes and tinder for fire making. The tough and straight central stem can be used as a hand drill or arrow shafts and stem extract can be used as a styptic or wound dressing.

Even though the common cattail is a bit large for my smallish tubs, while looking over possibilities for outdoor gardening I was astounded to find that there wasn't just one species of cattail but several and the one most likely to fit best in my small tubs was the one commonly called the dwarf cattail or *Typha minima*. Thus began a hunt.

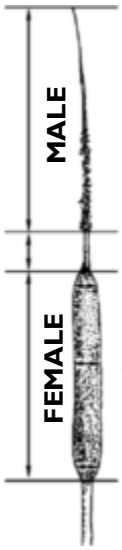
It turns out that there are several species of cattails, up to 30 around the world, and the one I grew up with in Southern Illinois is not morphologically like most of the other commonly available species in that it has wider leaves than many.

Most of the species are similar in that they have narrower leaves, less than 3/4" wide and of varying heights from 2-8', depending on the species.

Nearly all species commonly found in the aquatic hobby look identical in a pot waiting at the water-garden center for sale because cattails usually bloom only on the second or third year's growth and the flower contains the most easily distinguished characteristics.

The smaller species are also not commonly found in the wild in the US and are shipped to the garden centers in the spring before blooms develop. Since growth is new every year, all have short stalks at that time- no matter what the species. My experience was that no matter what the species was marked on the pot the chance of getting it correctly identified was not 100% - even with two pots sitting side-by-side. Nor did I know enough about the different species to know that not all would be miniatures when fully grown.

The major characteristics of the cattails are not just the leaves but as with many groups of plants, the flowers. Each cattail plant is monoecious and has both male and female blooms on the same plant. In most species, both sexes can be found on the same stalk with the male flower above the female separated by a space. The male flower (stamina) is much more fragile and exists only to pollinate the female (pistil) which will then develop the familiar fruiting structure or "cattail". After pollination the male portion often falls from the stalk leaving a sharp elongated tip above the remaining "cattail".



From my bumbling search to find the best species for my outdoor miniature tubs I developed the following guide to the most commonly found cattails in the US, including garden centers.

Common Cattails available in the United States

Narrowleaf Cattail - *Typha angustifolia*, likely originated in Europe but became introduced so early into North America, possibly even by migrating birds, that it is a common cattail in the wild even across the northern half of the United States and all of Canada. In many places it is the predominate species and is often sold and used for water gardening.

Broadleaf Cattail - *Typha latifolia*, native to North America, is the most often found broad leaved species with leaves of a blue color up to one inch in width. It is not quite so tall as *T. domingensis* so fares better and is already likely native in most areas so not considered as invasive. Several varieties of *T. latifolia* have been developed with striped leaves for use in waterscaping: var = *variegata*; and these are often offered for purchase in garden centers.

Hybrid Cattail - *Typha x glauca*, is a hybrid between *T. latifolia* and *T. angustifolia* or *T. domingensis* that

Cattails Commonly Found in the United States

Species	Common Name	Origin	Leaf Width In.	Height to Ft	Flower Parts - In.		
					Gap	Len	Dia
Typha angustifolia	Narrowleaf Cattail	Europe	0.5	5	1	5	0.5
Typha domingensis	Southern Cattail	N America	0.5	6	0.5	6	0.75
Typha latifolia	Broadleaf Cattail	N America	1	5	0	5	1
Typha laxmannii	Graceful Cattail	Europe/Asia	0.5	4	2	4	0.75
Typha minima	Dwarf Cattail	Europe/Asia	0.25	2	0.25	2	1

may occur either artificially or naturally in the wild. It is often called Blue or White cattail and the initial crosses are considered to be sterile but backcrosses do occur. However, the cross occurs so easily and the seedlings are so vigorous and rapid growing, up to 4 meters (12 ft.) per year, that it needs no sexually reproductive phase to spread rapidly and is already considered one of the more invasive cattail varieties.

Southern Cattail - *Typha domingensis*, from the southern parts of North America, is very common across the southern US but has not invaded the northern portions where it is considered an undesirable pest. Most states have prohibitions against this species, although it is found on occasion to have been imported and established in small areas. For most water garden uses it is too tall, rising to 8', to make an attractive plant in proportion to others in the waterscape. This species is rarely offered for purchase.

Graceful Cattail - *Typha laxmannii*, sometimes also called the/a Dwarf Cattail, is a native to Europe and Asia and is often sold for waterscaping because it is somewhat shorter than either *T. augustifolia* or *T. latifolia*, the other narrow leaved cattails. *T. laxmannii* is considered invasive and as such is prohibited in some Midwestern states. Because of its slightly shorter height and alternate common name it may on occasion be sold as one of the

dwarf types and can then become confused with *T. minima* - even being cross-labeled on occasion.

Dwarf Cattail - *Typha mimima*, sometimes also called the Miniature Cattail is native to Asia and the Alpine lakes of Europe and is the smallest of the cattails normally used for waterscaping. As the smallest it is also more easily out competed by the other species if they should be planted together. Early in the spring in the pots at purchase it looks identical to the other narrow leaved species. Even though *T. minima*'s adult leaves rarely exceed ¼ inch they may be so narrow as to appear nearly round and at the small size when just emerging from the substrate the other narrow leaf species look similar.

Dwarf Cattail (other) - *Typha gracilis* - is not currently considered to be a valid species but it is still sold by some under that name especially in

Europe. To further confuse the name of "Dwarf Cattail", most scholars consider the real *T. gracilis*, named by Rafinesque in his 1836 book on N. American Flora, to be a subspecies of *T. angustifolia*, and it was synonomized in 1909, but a few consider it a synonym of *T. minima* which serves to point out the continuing confusion between the dwarf and narrow leaved cattail types.

Cattails are easy to grow.

Plant them directly into the substrate in a larger pond for maximum spread or into a pot when spread needs to be controlled, such as a water garden or tub. They do best in loamy and even clay soil but because of their height and ability to catch the wind some rocks or other weights can be used to reduce tipping when potted. Cattails need water and, although they may grow some if not covered in water, most species need to be covered with water three or more inches deep to thrive. Depending on species, some will grow in water several feet deep. Most species are considered winter hardy and will even withstand freezing. They do best in full sunlight but will grow more slowly also in partial shade.

Most species of cattail are also considered invasive, especially non-native ones. Check in your area for the species you intend to acquire before doing so. Although a naturally invasive group, cattails can themselves be overcome by many reeds and rushes such as *Phragmites*, common reed grass, over time. It is interesting to watch a fresh body of water to see the progression of species in the natural ecology.

You will find the cattail group an interesting and beautiful addition to any water garden, large or small.

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Speichert, Greg & Speichert, 2004, Encyclopedia of Water Garden Plants, Timber Press.

Numerous online State Conservation Dept flyers on invasive and local species

Why Can't I Get Rid of that @#$% Duckweed?

–

By Mike Hellweg


Mix of *Spirodella polyrhiza* and *Lemna minor*

Duckweed is an oft cursed plant in the aquarium hobby. Some of our fellow hobbyists absolutely hate it and will curse not only the plant, but also anyone who keeps it, while others have learned to love it and actually attempt to grow it!

It can be very useful, but it is much maligned as it very quickly gets out of hand and becomes an infestation that, once established, becomes very difficult to eradicate –as I can well attest.

But why does this happen? Why does duckweed do so well at taking over? And most of all, how can we get rid of it once and for all? To get answers to these questions, first we need to understand our adversary.

Duckweed has been around a long time, and the fossil record shows that some of the earliest duckweed was annoying the dinosaurs during the Cretaceous Period. It is now found pretty much worldwide and is likely dispersed the same way it moves from tank to tank for us, by sticking to things that move from one body of water to another. Since it is both eaten by and dispersed by waterfowl, someone at some point gave it the clever common name of duckweed. Anyone who has seen a nature video of wildlife in swamps has seen duckweed sticking to the various animals who make their home in the swamp.

The most widespread species is likely Lemna minor, which originally occurred in Europe, but which has been spread to Asia and North America by migratory water fowl. While many of the smaller species in the genus *Lemna* look fairly similar, there are actually some fairly easy to differentiate species like *Lemna trisulca*, which is a popular and useful plant for breeders as its intertwined chains form tangled hiding places for young fish near the surface.

A Bit of Science

While we look at duckweed and talk about its leaves, technically it doesn't have leaves! Nor does it have stems. Instead it has a thick, flat, fleshy structure with a single hairless root in *Lemna*, two to several hairless roots in *Spirodella* and *Landoltia*, and no roots at all in *Wolffia* and *Wolffiela*. This fleshy structure has spongy air bearing tissue called aerenchyma that helps the duckweed float. Most species float on the surface, but some float just under the surface. Some species have a single vein, while others can have two or three veins. Yet others have none at all. If you care to look for the veins, they can be seen most easily with a magnifying glass and backlighting.

One reason duckweed are so resilient is that it often produces tiny, rootless, starchy daughter plants instead of normal daughter plants. These are called turions, and instead of floating they drop to the bottom. Fortunately for us, fish will gobble them up, but if they aren't eaten, they rest for several months and then pop up to the surface. That's why even if we think we've eliminated duckweed from a tank, sometimes it comes back after a long absence.

Duckweed often flower even in our aquaria, but the tiny blooms are almost never seen. Male (stamen) and female (stigma) parts of flowers are separate and are hidden in a small slit in the plant's surface. Fortunately for us hobbyists, it requires plants from two separate clone lines to produce fertile seeds, and most often in our aquaria the plants come from a single clone line.


Bloom

Insects pollenate them in the wild as they walk over the surface of the plants, and individual plants can also pollenate one another as their stigma and anthers (the pollen bearing part of the stamen) are rubbed together when plants are moved by wind, current, and wildlife.

Fruits produced by pollination are tiny, often smaller than a grain of salt. Each fruit has from one to several seeds, so the seeds are even tinier. That's why sometimes we get duckweed in with other plants, even though we have cleaned them thoroughly; a seed or two get past us, germinates, and soon a single duckweed becomes a whole tank.

Surprisingly, duckweed is now considered to be in the Araceae or Aroid family, the same family as more universally beloved aquarium plants like *Anubias*, *Bucephalandra*, *Cryptocoryne*, and pond plants like *Colocasia* (Elephant Ears or Taro), and the much more popular floating plant *Pistia* (water lettuce).

There are around 40 species of duckweed divided into 5 genera - *Lemna*, *Spirodella*, *Wolffia*, *Wolffiela*, and *Landoltia*. Nearly half of all known species are found in North America. They are among the smallest of all known flowering plants, with blooms that are so small that it is difficult to see them without a powerful magnifying glass or a microscope.

As you can imagine with such tiny plants, their fruits and seeds are even tinier, often less than 1 mm in diameter. But their more usual (and more annoying) way of reproducing is by producing vegetative clones. The *Lemna* produce daughter plants or clones in a tiny budding pouch at their basal end (where the root grows). Each plant can produce up to a dozen daughter plants over the course of a 2 month lifespan.

Under ideal conditions, they can actually double in number every 16 hours, and if left unchecked, a single plant could produce enough daughter plants to cover the entire surface of the planet in just over two months.

Fortunately, many animals love to eat them, and they cannot stand desiccation for more than a few hours, so those of us on dry land are fairly safe from them.

In fact, we land lubbers can actually eat them. Duckweed are more protein by weight than soybeans! They also contain B vitamins, carotenoids, and other nutrients, and can be cooked and eaten like spinach (but don't do this with duckweed from your tanks as it can contain residue of chemical or drug treatments you've given your fish!).

Research is ongoing now to figure out ways to convert aquatic wastes to human nutrition, and duckweed is one of those plants being studied. In addition to being eaten directly, it can be dried, processed and used provide up to 60% of the diet of cattle, ducks, chickens, rabbits and fish (think Tilapia here).

Duckweed do so well in our aquaria because we provide them with light, water and nutrients. They float at the surface, so they have access to all of the carbon dioxide that they need. Duckweed soak up phosphorus and nitrogenous wastes produced by fish. That's where they can become useful to us - we can remove excess phosphorus and nitrogenous wastes from the tank by simply removing excess duckweed on a weekly basis. This can be composted and later used as food for plants in our gardens. Many fish such as swordtails and many Killies like to have some cover on the surface of the tank, and duckweed fills this roll admirably.

As long as the duckweed is thinned out every week, it will not become too much of a problem. But let it go another week, and suddenly it's a problem. If you let it go too long, it becomes a thick cover on the surface of the tank and can cut down oxygen exchange, causing problems for the fish, cutting down light for plants, not to mention annoying the hobbyist.

The other major problem with duckweed is how easy it is spread from one tank to another. All it takes is one tiny plant stuck to a net, the siphon hose, your hand, etc. So, if you don't want it to spread, be very fastidious in cleaning between working in a tank with duckweed and one without it.

So, how do we control duckweed?

The easiest way to control duckweed is to prevent it from entering our system to start out with. If you buy a bag of fish that has duckweed in it, be sure to remove the duckweed before even floating the bag.

When I float bags, I rinse them first under running water to remove any potential hitchhikers from the outside of the bag. But usually I simply put my new fish into buckets first and clean any plant matter from the water with a fine mesh net, adding water from the quarantine tank until the fish is mostly in my water, then netting the fish and putting them in their new

If left unchecked, a single plant could produce enough daughter plants to cover the entire surface of the planet in just over two months!

home. This stops most duckweed from entering my system.

Any new plants are carefully washed under running water and inspected for duckweed and other pests before adding them to the quarantine tank. Obviously, any driftwood, rocks or other items are also thoroughly cleaned before adding to a tank.

Sponge filters are great for moving from tank to tank and allowing you to set up a new tank immediately. But they are also great for moving duckweed, its turions, and fruits and seeds to another tank. So be sure to rinse them thoroughly before adding them to a new tank, and watch for telltale signs of duckweed floating on the surface.

Once you notice that duckweed has entered a tank, physically remove as much of it as possible by SLOWLY swirling a fine mesh net just under the surface of the water. Be sure to keep the fish away from the net.

I'm not sure if they're still available, but for many years Python made a small surface skimmer that worked perfectly for removing duckweed quickly from a tank without bothering the fish. After physically removing as much duckweed as possible, carefully wipe it down from the sides and under the rim with a paper towel and dispose of that towel.

This will get MOST of the duckweed, but some will still get by, and it won't get the turions at all. Most of the turions can be removed from the substrate with an aquarium vacuum, but not all. You'll have to be vigilant and continue to manually remove new growth as you see it. Eventually you'll get it all.

Another trick is to remove as much as possible as described above. Then add a powerhead/water bottle duckweed extractor as illustrated with the opening just under the water surface so that it creates a whirlpool on the surface and swirls and removes any remaining duckweed over the course of a few hours.

This is a simple device made from a powerhead placed upside down in the tank. The intake filter is a water bottle with the bottom removed. Add a clump of filter floss to the water bottle, and you're ready to go. Be sure to carefully disassemble and clean this unit as you move it from tank to tank.

Homemade Duckweed Extractor

If you don't want to try something like this, buy a couple of young goldfish, gold barbs, sailfin mollies, young Uarus, or other surface feeding vegetarian fish. Goldfish seem to work best. Clean the tank as much as possible, then move the goldfish to the tank and don't feed them for a few days. They'll eat all of the remaining floating duckweed, and also hunt down most of the turions in the substrate. Move them from tank to tank as needed.

If you have a large tub or pond with a duckweed infestation, you may be tempted to use a chemical control agent. These do work very well, but they can also stunt other plants, especially other Aroids.

In addition, when the duckweed dies, it releases all of the nutrients that it had tied up back into the water, creating an algae problem or worse. It's best to manually remove it with a skimmer and simply learn to live with it, or add a couple of young barbs or goldfish to the pond or tub just to control the duckweed.

Finally, you can learn to respect the duckweed and use it to your advantage. As mentioned above, it is excellent for removing phosphorus and nitrogenous wastes and for shading the tank and making some fish feel more comfortable. It will compete with algae for nutrients and works very well at keeping annoying algae at bay.

The key here is to keep the duckweed from getting out of control by regularly thinning it out. A weekly removal should be enough. Don't allow it to cover more than a third of the surface of the tank.

If you've got fish that actually want a vegetarian diet, you can grow as much as you need to feed them in other tanks and, when doing regular maintenance, instead of throwing it away, move it to the vegetarian fishes' tanks and let them feast!

Getting a duckweed infestation is not the end of the world. It can be controlled and even eliminated without having to completely dismantle the tank and throw everything away. Who knows, you may even come to appreciate it!

WATER SNOWFLAKE LILY, *Nymphoides indica*

by Chase Klinesteker

Sent to MASI by Chase from the SouthWest Michigan Aquarium Society (SWMAS)

The Water Snowflake Lily flower is delicately beautiful

THE WATER SNOWFLAKE or Banana Lilly is a tropical ornamental pond plant. Its' flower is only about ¾ inches in diameter with bright white feathered petals which are are star-shaped and stunning.

It is related to the Banana Plant and reproduces mostly by rhizomes, although plantlets can form at the leaves. The bright green floating heart-shaped leaves are 2-8 inches in diameter and are on stems up to 2 meters long. In nature it grows in shallow muddy water.

It is widely sold for the water garden trade but has become a weed plant in Florida. It is excellent for container gardens and small ponds. It likes full sun or partial shade. The small, beautiful flowers only last about one day, but several flower stems grow from underneath each leaf base. The young leaves, stems, flower buds, and fruits can be cooked, boiled, or curried and are edible.

I purchased a plant of the Water Snowflake last fall at a SWAMAS auction. Since I don't have an outdoor pond, it was decided to pot it in a 70 gallon planted tank. There is a 2-bulb shoplight over the tank which is on about 12 hours per day. About 1/4 inch of potting soil with aquarium gravel over it in a pint container was all that was used. After 5 or 6 months, it began to bloom.

***Nymphoides indica* is a delightful plant to cultivate and get to bloom, although it would be much easier in an outdoor pond!**

Nymphoides ezannoi

Nymphoides peltata

Nymphoides krishnakesara

Minifins

-

The Bulldog Tetra

-

Rachoviscus graciliceps

-

By Mike Hellweg, CFN
(Certifiable Fish Nut)


Rachoviscus graciliceps LEMON Form

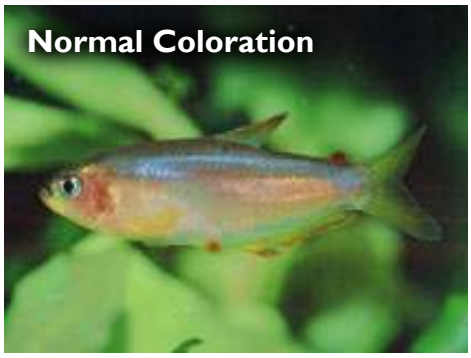
We're all familiar with many of the so-called "bread and butter" tetras that are usually found in fish stores and even big box stores around the world.

Tetras like neons, serpaes, black neons, Colombian redfin blues, bloodfins, glowlights, bleeding hearts and a few others are almost always in stock. Some of the less common, but still popular tetras like cardinals, rummynoses, ember, emperor, blue emperor and blind cave tetras are also pretty well known. They're such a big part of the hobby that they've had the moniker "bread and butter" associated with them, meaning that they are literally sure sellers and put bread and butter on the shop owner's table.

But there are so many more tetras out there, and many of them are rarely seen in the hobby, but definitely deserve our attention. The bulldog tetra is one that you shouldn't let pass by if you happen to see it.

They are one of the "chunky" bodied tetras, similar in size and shape to the more familiar Emperor tetra. They have a blunt, rounded snout with a toothy under bite that gives them their common name of bulldog tetra. While they look tough, they are actually great community tank fish, though they look their absolute best in a group of 8 or so in a planted tank.

In full color, males are a dark bluish purple below the lateral line and a dark purple-black above it. The adipose fin is bright red. The anal fin is bright yellow outlined in red. The caudal and dorsal are lemon yellow. Females are a dull pinkish-purple overall. Males top out at about 2 inches, with females reaching about a quarter-inch less.


Normal Coloration

One of the most unusual things about them is that males "flash" for one another when displaying, and for the girls when they are courting. They flash two oblong oval shaped gold spots along the lateral line that just appear as if out of nowhere and

disappear just as quickly. The first time I saw it, I was surprised and had to sit and watch them for a half hour or so just to be sure I really saw it.

Bulldog tetras have only been known in the hobby for about 20 years or so, and have only been known to science since 1981. They come from small coastal rivers in southern Brazil. They are exclusively found north of Rio de Janeiro in the southern part of the state of Bahia near the popular resort town of Cumuruxatiba.

They are found in clear water streams with slow flow, and water that is just slightly acidic with a total hardness of around 200 ppm. Due to their proximity to the coast (sometimes less than a couple football fields away from the Atlantic), they can tolerate, though they do not require, a bit of salt in their water. Temperatures fluctuate between 70 and 78 degrees Fahrenheit year round.

Unfortunately, due to their limited distribution, they are considered endangered in the wild as any major climatic event could irreparably harm the wild population.

Fortunately, care in our aquaria is fairly easy, and our St. Louis area tap water is ideal. They thrive at a pH around neutral, with water about 125 ppm total hardness, with low to moderate carbonate hardness - exactly what we get from the Missouri River over much of the year.

A twenty gallon long type tank is perfect for a group of 8 - 10 adults. Add a mature sponge filter or waterfall type power filter is perfect to maintain water quality and provide a bit of current. They don't even need a heater in their tank. As long as you are comfortable in the room, they will be, too. They seem to prefer fluctuations in temperature, and spawned readily for me in a tank that often saw temperatures in the low 70s Fahrenheit.


Rachoviscus crassiceps
CARES

In the wild they seem to be mostly insectivores, so replicating this diet in our aquaria is optimal. They will eat commercial flakes and pellets; frozen meaty foods of all kinds, especially brine shrimp, Mysis shrimp, and bloodworms; live foods like daphnia, flour beetles, mini mealworms (Tenebrio obscurus), adult brine shrimp, Gammarus, young cherry shrimp, Grindal worms, white and blackworms, and even chopped earthworms. Famed breeder Rosario La Corte also recommends feeding tetras finely chopped market shrimp (I use canned "mini shrimp" found with tuna in the grocery store) and rehydrated freeze dried krill, also chopped into bite sized pieces after it has been soaked for 20 minutes or so.

A regular diet of these meaty frozen and live foods will quickly bring them into spawning condition. Breeding takes a bit of work, but it's not too difficult. Clean water, good food and a place to lay eggs and for the fry to get a good start is all that is needed. They are most easily bred in the manner similar to other tetras like Emperor tetras.

Set a couple of pairs up in a 10 gallon tank with a mature sponge filter bubbling heartily so that it creates a slight current, add a large pile of Java moss or similar plant like Susswassertang, and clean water. Give them a lot of live and frozen meaty foods at least twice a day, and change at least 50 percent of the water every 5 to 7 days, but don't gravel vac the bottom.

After about two to three weeks, start looking under the pile of moss every day. From this point there are two options. The first is once you start seeing youngsters, remove the parents and start feeding the tank live baby brine, microworms, and similar small live foods twice or three times a day. Soon the youngsters will start coming out when food is added, and before long they will be swimming above the plants instead of in and under them.

The second is to remove the larger juveniles as you see them under the plants, and leave the smaller fry in the tank with the parents. The adults pretty much ignore the youngsters, but if you let a few of the older siblings remain, they will consume their younger brothers and sisters, and you won't see many fry until these older fish get large enough to join the adults.

***Rachoviscus graciliceps* is a CARES species**, as is its cousin *Rachoviscus crassiceps*, which has been very rare in the hobby. Care for both is very similar, so if you are lucky enough to find *Rachoviscus crassiceps*, grab them! Both are listed by the MMA (Brazilian government authority) as Endangered due to limited habitat and even with the loosening of Brazilian fish export laws, it is unlikely that we will see either of them coming any time soon.

They are long lived (my original fish lived for nearly 10 years), and I occasionally see them at aquarium club auctions around the country, so they are occasionally available through hobbyist channels, if not occasionally through the trade.

If you see either of them, be sure to grab a group of 8 - 10, put them in a planted tank, and enjoy! And don't forget to sit in front of the tank and spend time just watching your fish!

***Rachoviscus graciliceps* and cousin *Rachoviscus crassiceps*, are both CARES species. If lucky enough to find either, grab them! Both are Endangered and you're unlikely to see either again soon.**

Spawning *Polycentrus schomburgkii*

The Dwarf South American Leaf Fish

-

By Patrick A. Tosie, Sr.

Polycentrus schomburgkii is a small leaf fish from Northern South America that reaches up to four-inches in total length. They are in the Polycentridae (Leaffishes) family and these guys can live in freshwater and brackish water. They are a mottled brown color that are high-bodied and oblong in shape.

Mine were set up in soft freshwater at 78F and the water was older with water changes of 10% once every month. They are not aggressive toward fish larger than themselves but if they can get smaller fish in their mouth they will eat them. However, they do not do well with aggressive fish larger than they are.

They prefer soft water, up to a pH of 7.0 with temperatures of 75F - 80F with a lot of cover and hiding places. I set several 1-year old *Polycentrus schomburgkii* up in an eighteen-gallon breeder that was completely full of floating hornwort, some java ferns, a few cryptocoryne plants and some duckweed.

They prefer to eat live foods but will take frozen brine shrimp. I kept a group of common guppies with them and in addition fed frozen brine shrimp. When the guppies started getting low they were replenished.

I started with six juveniles and kept them all in the eighteen-gallon breeder. After a couple of months and some growing, they started to die off. For about four weeks, they slowly died off at a pace of one a week.

When the tank was down to two, they were okay together and one could start seeing differences as one was getting heavier bodied. The fins were also a little longer on the thinner bodied one. The heavier one grew to three and a half inches and the thinner one to three and three-quarter inches.

By May, it was obvious they were a pair as they laid eggs on the java fern and the side of a flower pot. I would guess the eggs numbered well over one hundred, they were very small, maybe one-twentieth of an inch and oval in shape, opaque colored eggs.

The male took care of the eggs and on day two the male killed the female, ate all the guppies and stood watch over the eggs for another day and a half till they hatched. Nearly all the eggs hatched and the newborn fry clung to the leaves and flower pot while the male kept a careful eye on them.

For me the key to breeding was starting with a group and letting them pick their own mates, then have a tank with a lot of plants and hiding spots. I would also suggest to keep a lot of small docile fish (common guppies) with them as they are growing and choosing a mate.

The fry grew fast and they were very cannibalistic, eating each other! I moved the male when the fry started swimming around, I caught him and moved him to a ten-gallon tank. The ones that grew the fastest were eating their little brothers and sisters. I was feeding them newly hatched brine shrimp every day and I was trying to separate the different sizes. I only saved about a third of the fry and raised them to three-quarters of an inch at sixty-days old.

***Polycentrus schomburgkii* was an enjoyable fish to watch and raise.** I particularly like watching their hunting style as they hid in the hornwort and ambushed the guppies. They would glide through the plants and pounce with lightning speed to capture their prey.

ORANGE LYRETAIL KILLIEFISH *Aphyosemion australe*

by Chase Klinesteker

Reprinted from the SouthWest Michigan Aquarium Society (SWMAS) Newsletter: SWAM
September 2017

THE ORANGE LYRETAIL Killiefish, *Aphyosemion australe*, is one of the most stunningly colorful fish I have ever kept.

DESCRIPTION: It is a color variant of the more common Chocolate Australe. It is not often seen in fish shops likely because it is a jumper, shy in nature, and requires close attention to water quality.

It is easily bred and lays eggs in nylon mops, although hatching and rearing the fry can be a challenge. It was one of the first killifish to become popular in the aquarium hobby and comes from shallow slow-flowing streams in costal West Africa where there is heavy aquatic vegetation.

They will eat a variety of foods including frozen, live, and flake. Soft, acid water seems to work best, and I bred and began raising the fry in rainwater with good results. Once the fry reach a month or so in age, they can be transferred to tap water to grow larger.

They are susceptible to velvet disease, so frequent water changes are necessary, as well as the addition of a teaspoon of salt per gallon to their water as a preventative. If you see clamped fins, they are not healthy, and a salt treatment of 2-3 teaspoon per gallon or a peat moss filter is recommended.

Maximum size is about 2 ½ inches. Sexing is easy---males are much more brilliantly colored and slightly larger than females. Their lifespan is longer than many killiefish, about 3 years. Rainwater or a peat moss box filter should keep them healthy and happy.

BREEDING: A pair can be bred in a small 2 or 3 gallon tank with light aeration or a sponge filter in a low light area. Males do not seem to be overly aggressive, so the female will be fine if there is some cover available.

A dark colored nylon mop is used for them to lay their eggs in, although their eggs are not very adhesive, and I have collected more eggs by siphoning out the debris on the bottom and checking it.

Their eggs could be put in moist peat moss for 3-6 weeks to hatch, but I prefer to pick the eggs from the mop and hatch them in water and a drop of methylene blue. Light aeration will keep them viable, and they hatch in around 2 weeks. Feed the fry infusoria for the first couple of days, then newly hatched baby brine shrimp.

It is thought that the temperature that these fish are kept and raised could be a factor in their health. Ideally, 70-75 degrees is recommended and they may be susceptible to higher temperatures, which could cause stunting, weakness, or poor color development.

Finding and Spawning *Chortiheros (Theraps) wesseli*

-

By Patrick A. Tosie, Sr.

Back in the mid 1990's I was fortunate to tag along with Rusty Wessel and Charlie Pyles to Honduras in search of a new and rare cichlid which was in the process of being described by Dr. Robert "Rush" Miller, the name was to be *Theraps wesseli* in honor of Rusty Wessel, the person who first found it.

The collecting trips I went on with Rusty and Charlie were the best, most fun and most rewarding trips I have ever been on and will remain as treasured memories for my lifetime.

In recent years, *Theraps wesseli* has had their Genus name changed to *Chortiheros* and it is the only species in the genus so from here on I'll refer to them as *C. wesseli*.

***C. wesseli* is from fast flowing rivers in in eastern Honduras**, the Rio Danto and Rio Jutiapa were a couple of rivers where we caught them. They may be from a few other rivers in the area but do seem to have a limited range.

We did not catch any during the day as they stayed in the fastest flowing areas of the river and hid in the rocks when we approached. At night as they came to the waters edge and were inactive we were able to catch some of them. We were able to get a permit from Honduras to take them out of country and I was able to bring 6-10 fish home as juveniles and young adults. Using Kordon breather bags with one fish per bag they seemed to travel well.

At home I set the *C. wesseli* up in a 135-gallon, six-foot long tank with two Marineland Emperor power filters plus a couple sponge filters, two-inches of small Meramec gravel, and piles of larger rocks scattered about, with the water temperature of 78F-80F and lights usually left on 24 hours a day. Included in the tank were a group of 20 or so *Poecilia mexicana* used as dither fish so the *C. wesseli* might feel a little more comfortable.

My *C. wesseli* were active in the tank but shy whenever approached as they would hide in the rocks. If I would stay still for a while, they would come out in the open and stake out territory.

I fed my fish flake foods, frozen brine and earthworms. They did not grow very fast and it took 18-20 months before I saw any pairing off or pre-spawning behavior. Four of my fish paired off into 2 pairs and started protecting a territory, one at the left end of the tank and one right in the middle. The other *C. wesseli* were chased out of the areas whenever they got near either of the pairs territory.

After pairing off and establishing their territories for a month or two the tanked seemed to settle down. The pair on the left side of the tank were the first to start acting like they were getting ready to breed as they kept closer to their pile of rocks and started changing colors. During breeding *Chortiheros wesseli* changes color– the lower half of their body to black and the color of the upper body to a whitish color during the spawning.

The female guards the eggs and fry while the male keeps the other fish out of their territory. Once the fry start swimming, they were fed microworms and baby brine shrimp. They had 100+ fry and were fairly good parents. I siphoned thirty fry from the tank and raised them in a 10-gallon tank.

There is no better feeling than catching wild fish, raising them to breeding size and spawning them.

C. wesseli habitat.

Feeding Fish Bloodworms (*Chironomidae/ Chironomus*): Possible Health Risks to Hobbyists

-

By Thomas M. Keevin

IN A TIME, long, long ago in the pre-COVID-19 world when we actually had MASI meetings, a question was raised at one of those meeting by Pat Tosie. "*Had anyone had an allergic reaction as a result of feeding their fish bloodworms?*"

I was surprised by the number of hands that immediately shot up in response. So, the question and the overwhelming positive response prompted me do a quick literature review. I was curious if bloodworms could possibly be a health hazard to aquarium hobbyists.

I first scanned some aquarium hobbyist blogs to see what folks had to say. Here are some posts from MonsterFishKeepers.com that will help you gauge the potential severity of an allergic reaction to bloodworms. (Note that in the first description, the hobbyist was apparently even allergic to aquarium water in which the fish had been fed bloodworms. This has health implications for you even if you are not feeding your fish bloodworms.)

"I fed them for years and developed a very bad allergy. I started having severe allergic reactions, took me three of them to realize it was the bloodworms. My eyes swell completely shut, I break out all over in red splotches and can't breathe. It feels like my chest is caving in. I now carry around an epipen and an inhaler. I tried just letting my husband feed them, but that didn't work out either. I can't clean our aquarium if they've been fed at all, my hand and arm breaks all out in welts. Also, if my husband gets near me without having washed his hands after feeding, I start to react."

The reactions increased in severity. The first reaction was bad, but the third just plain terrified me. I've always had very bad allergies but I've never experienced anything as scary as my reactions to these things. On the third reaction it took 3 days for the swelling to go away in my eyes. They were swollen basically completely shut for 24 hours, even after steroid injections. If you do react and experience swelling in your eyes, whatever you do, DON'T touch your eyes! It will make it a lot worse."

Another hobbyist described a very similar response to blood worms in their post.

"I can't feed them at all, which sucks because fish love them and they offer great nutritional value. Even if I wear gloves and only use utensils to feed, my face swells, airway constricts, and I get a wonderful red itchy rash which lasts for a couple of days. I fed them for years without issues until one day I found myself in a rather unattractive mess requiring an Epipen and some heavy doses of Benadryl for a few days. I have tried it a few times

Types of allergic reactions to Chironomids:

- Conjunctivitis
- Angioedema
- Rhinitis
- Hives
- Localized rash
- Asthma
- Anaphylaxis!

since and even in their frozen state with gloves, I have a reaction."

To my surprise, a number of the bloggers commented that the they had just discovered that they too had an allergy to bloodworms based on the descriptions of allergic reactions provided by their fellow hobbyists. The posts had solved the mysterious symptoms they were having. For example:

"Just figured out I am allergic to BW. What happens is my eyes start to get a burning itch and worsen if I scratch. Back of my hands get itchy. Just pinned it to it only happens right after I feed fish BW's!!! Sure enough, its all over the net."

After reviewing what the bloggers had to say, I then conducted a search of the scientific/medical literature and found that there was a considerable body of literature which both supports and parrots the descriptions of allergic reactions provided by the bloggers. There are so many scientific papers and clinical case reports that I could write a lengthy scientific review paper on the topic, and by the way - allergic reactions are not restricted to hobbyists. They have also been reported in fishermen that use chironomids for bait, in people that work in aquaculture, people that work in public aquariums, people that produce, package, or sell fish food, and people that live in areas with high concentrations of flies. For hobbyists, allergic reactions can be caused by exposure to live, frozen, freeze dried and processed (fish foods that contain bloodworms as well as other components) chironomids.

The medical literature suggests that allergic reactions to chironomids (bloodworms) can present themselves as conjunctivitis (inflammation or infection of the transparent membrane (conjunctiva) that lines your eyelid and covers the white part of your eyeball), angioedema (area of swelling of the lower layer of skin and tissue just under the skin or mucous membranes), rhinitis (inflammation of the inner lining of the nose), contact urticaria (hives), contact dermatitis (localized rash or irritation of the skin caused by contact with a foreign substance, asthma (condition in which your airways narrow and swell and may produce extra mucus), and anaphylaxis

Tetra Warning Label:

BloodWorms

FREEZE DRIED FOOD

FOR ADULT USE ONLY– KEEP AWAY FROM CHILDREN

WARNING: ALLERGY ALERT - THIS PRODUCE CONTAINS INSECT LARVAE WHICH MAY CAUSE AN ALLERGIC REACTION IN SOME INDIVIDUALS. IF SYMPTOMS OF AN ALLERGIC REACTION OCCUR (SUCH AS HIVES, ASTHMA, WHEEZING, RED OR IRRITATED EYES OR SKIN, RUNNY NOSE OR SNEEZING), DISCONTINUE USE IMMEDIATELY AND CONSULT YOUR PHYSICIAN. AVOID ALL USE IF SYMPTOMS RE-OCCUR. DO NOT USE THIS PRODUCT IF YOU SUFFER FROM ASTHMA, HAY FEVER, OR ARE KNOWN TO BE ALLERGIC TO INSECT LARVAE. HOBBYIST AND HEAVY USERS SHOULD USE SPECIAL PRECAUTIONS NOT TO TOUCH OR BREATHE DUST OF PRODUCT. CALL 1-800-526-0650 FOR ADDITIONAL INFORMATION. HEAVY USERS CAN POTENTIALLY BECOME SENSITIZED TO THIS PRODUCT.

DISPOSAL: DO NOT RE-USE CONTAINER AND SECURELY DISPOSE OF CONTAINER.

(Anaphylaxis causes your immune system to release a flood of chemicals that can cause you to go into shock - your blood pressure drops suddenly and your airways narrow, blocking breathing. Signs and symptoms include a rapid, weak pulse; a skin rash; and nausea and vomiting. Anaphylaxis requires an injection of epinephrine and a follow-up trip to an emergency room.).

Approximately 20% of people exposed to blood worms have some level of allergic reactions. The allergen has been identified as chironomid hemoglobin (Chi t l). As you probably know, hemoglobin is an iron containing protein that carries oxygen. It is responsible for the red color of human blood cells and of bloodworms.

Different organisms have different molecular hemoglobin structures; hence, bloodworm hemoglobin, which is different from human hemoglobin, can be an allergen to humans. Adults (flies) can also cause allergic reactions in humans (although aquarists are not exposed to adult flies), but the allergen is apparently tropomyosin.

The description of allergic reactions in the medical case study literature is very similar to what we saw in the fish hobbyist's blogs.

"A person who worked in an office setting in our hospital was referred to me after three admissions to our emergency department for marked angioedema and inflammation of the right side of the face, chemosis of the right eye, and blurred vision with onset in the morning at work. She had no atopic history and had eaten no food on the day of one of the reactions. Only after persistent questioning regarding what she may have transferred from her hand to her face (she was right-handed) did she divulge that she fed the fish in her aquarium in the office. She did not know the source of the fish food, and I requested that she place a tiny amount on her forearm the following day. This produced a swelling of the entire forearm. The fish food was freeze-dried bloodworms." (From Schellenberg 2005)

Schellenberg (2005) also describe an incident of accidental ingestion of bloodworms.

"..... Dr. J. Roberts presented the case of a girl who had developed

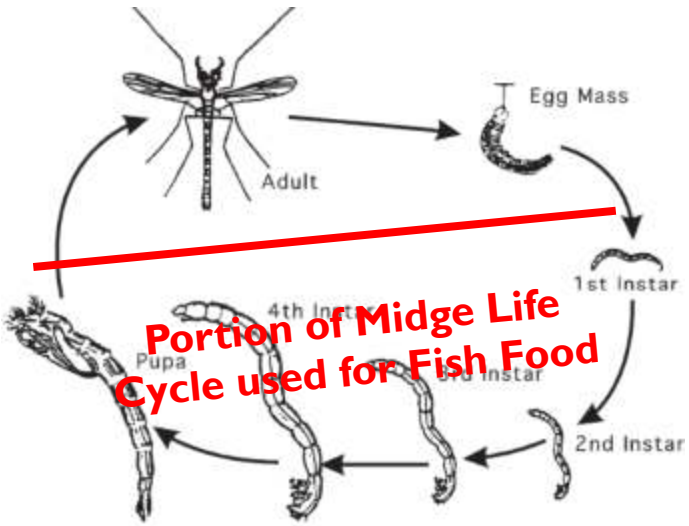


Figure 1. Chironomid life cycle (adapted from Walker 1987).

anaphylaxis after accidental ingestion of residual fish food that was on her hands when she was eating dinner. This individual had a striking reaction to a dilute preparation of the bloodworm fish food on skin testing and did not react to other fish food preparations."

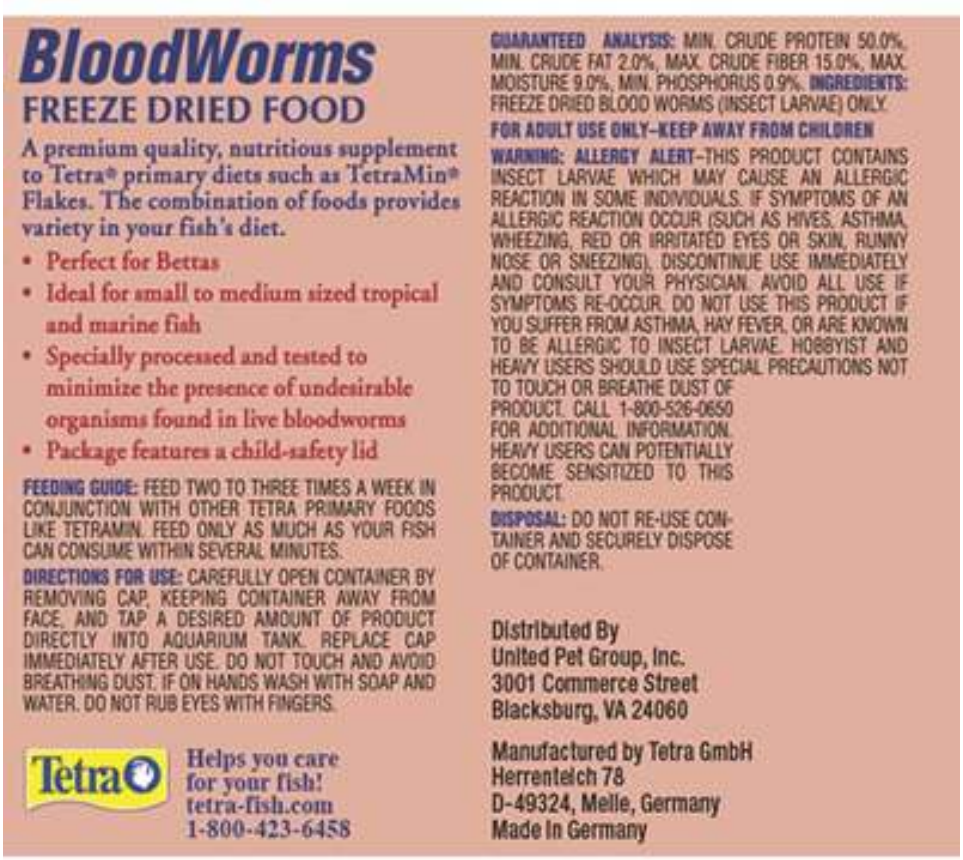
A simple skin-prick test with a dilute solution of bloodworms can be used to determine if you have an allergy to chironomids. However, be careful! A medical publication (Nguyen et al. 2007), by a group of allergists, was prepared to inform the medical community that the skin prick-tests for bloodworm allergies could actually cause severe allergic reactions, including anaphylaxis. The paper described three severe allergic reactions and made the following recommendations.

> "Performance of prick-prick test with Chironomus should be done with extreme caution. Undiluted red grubs should be avoided. Prick tests have to be started with a highly diluted solution and progressively increased to obtain the lowest effective concentration.
>
> ... In conclusion we report three cases of patients who developed adverse systemic reactions to skin prick testing with red grubs. Chironomus larvae have proven to be a potent allergen. As demonstrated, skin testing with red grubs can result in severe reactions and should therefore be performed only in controlled hospitalized settings."

I think this has answered Pat Tosie's question: *"Had anyone had an allergic reaction as a result of feeding their fish bloodworms?"*

Approximately 20% of people that have contact with bloodworms (mostly fish hobbyists) develop allergies to them, which can be severe in some people. This number corresponds well to the number of hands that were raised when Pat asked his question.

A runny nose, sneezing, coughing, hives, itching skin, and swollen eyes can all be a considerable inconvenience, but asthma or anaphylaxis can be fatal if not quickly treated. So, it was worth my time sitting down and doing a short literature review if you now know why your hands itch after feeding your fish or if I have potentially saved somebody's life. The one thing I couldn't understand while reading the hobbyist's blogs was why they continued to feed their fish bloodworms when they actually had associated the fish food with their symptoms.



A doctor's recommendation in one of the case studies was simple - Stop feeding your fish bloodworms and feed them something else! Remember, the more you expose yourself to bloodworms the greater the chance that you will eventually have a severe allergic reaction.

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Dr. Paul's Fish of the Month:

Danio feegradei Hora 1937 and *Danio meghalayensis* Sen and Dey 1985

By Dr. Paul Loiselle

Reprinted from the Jersey Shore Aquarium Society's June, 2017 issue of THE SHORELINE

A male *Danio feegradei*. Yoma Danios are easily sexed - the vertral and anal fins of females are edged in iridescent white.

I AM EXTREMELY PARTIAL to danios. Like many other hobbyists, I can cite the ebra fish, *Danio rerio*, as a resident in my first aquarium.

I later grew to esteem the smaller representatives of the genus as superb dither fish for dwarf cichlids and with the further passage of time have now come to appreciate these colorful, hardy, and active Asian minnows as desirable aquarium fish in their own right.

The subjects of this month's essay are two of the more robust representatives of the genus *Danio*. One hails from India, the other from just across the frontier in Burma. Both have a rather complicated taxonomic history, having been conflated with *Danio dangila* (Hamilton 1822), type species of the genus and both are relative newcomers to the aquarium scene.

The first species of this pair, *Danio feegradei* Hora 1937 was described from material collected at Sandoway in Burma's Rakhine State. Like *D. dangila*, this species ports an impressive set of oral barbels and has a color pattern made up of broken pattern of light and dark lateral blotches.

Preserved specimens apparently resembled one another sufficiently for *D. feegradei* to have been treated as a junior synonym of *D. dangila* in recent catalogs of Indian freshwater fishes (Talwar and Jhingran, 1992; Menon, 1999). One strongly suspects that Drs. Talwar, Jingram and Menon had never seen living *D. feegradei*, for as can be seen from the accompanying illustrations, these two danios are very different fish!

As contemporary authors (Fang et al., 2009; Kottelat, 2013) recognize *D. feegradei* as a valid species, its taxonomic status is no longer a matter of dispute, This is a robust danio, growing to 2.75" (7.0 cm) SL. This colorful species, which has been marketed as Danio sp. Yoma, or the Yoma Danio, made its aquaristic debut in 2005.

The second species is of the pair, *Danio meghalayensis* Sen and Dey 1985 was described from the Khasi Hills in the Meghalaya region of India, which is situated between the northern border of Bangladesh and the Indian state of Assam.

Kottelat (2013) places this species in the synonymy of *D. dangila*. As is evident from the accompanying photo, while *D. meghalayensis* may sport impressive oral barbels, its color pattern is quite unlike that of *D. dangila*. Indeed, this extremely colorful danio could justifiably be described as a tarted-up *D. rerio* on steroids! Rainbow Zebra Danio would be an appropriate common name for this striking species. It certainly falls more trippingly off the tongue than Meghalaya Danio, which has also been proposed as a vernacular name for this species.

Growing to 2.5" (6.4 cm) SL, this is the largest of the laterally striped danios. Although it made its aquaristic debut in 2005, *D. meghalayensis* remains only episodically available. Its rather high asking price suggests a continued dependence on wild-caught fish. As the type locality of this species lies 4000 feet above sea level, could it be that intolerance of elevated water temperatures has also hindered efforts to produce this species on a commercial scale in either Florida or Southeast Asia.

Like the generality of danios, this twosome are easily maintained. They will prosper over a pH range of 6.5 to 7.8 and tolerate carbonate and general hardness values up to 20. DH. They are much less forgiving of elevated levels of nitrogen cycle by-products. An efficient biological filter and a program of regular partial water changes are essential elements of a successful maintenance strategy.

These danios find temperatures in excess of 79. F. [26. C.] very

stressful. If exposure to higher temperatures is unavoidable, providing their tank with supplementary aeration is highly advisable. These large danios are extremely active fish that require plenty of swimming room to prosper. Housing them in tanks less than 36" [c. 1. m] in length is strongly contraindicated. When disturbed, these danios do a very credible imitation of a cruise missile. Keep them in a well-covered aquarium and always lower its water level by at least 50% before trying to net them.

Danios are highly social fish. Housing them in groups of fewer than six individuals can result in bullying and lead to the death of the group's smaller members. Unlike their distant cousins of the genera Barilius and Luciosoma, Danio species are not actively piscivorous. That said, they will prey opportunisitcally on smaller fish. Therefore housing either of these species with *Boraras* or *Microdevario* species could be expected to end badly.

Mid-sized barbs, the larger rasboras and livebearers as well as Australasian rainbowfishes are appropriate tankmates. So are most mid-sized cichlids.

Both *D. feegradei* and *D. meghalayensis* are too large and boisterous to be satisfactory dither fish for dwarf cichlids. Their robust appetites makes them easy to feed - flake, frozen and live foods are devoured with equal gusto. However their enthusiasm at feeding time - which calls to mind a shark feeding frenzy - puts most dwarf cichlids at a serious disadvantage when the time comes to put on the feedbag.

Danios are easily bred egg-scatterers. If well-fed and housed in a mixed-sex group, these fish will spawn more or less continuously, females ripening small batches of eggs every few days. However, mid-sized and large danios such as *D. feegradei* and *D. meghalayensis* are avid egg-eaters Breeding these fish successfully entails setting up the breeding tank in a manner that denies the adults access to their spawn.

The traditional approach of setting the breeders up in a shallow tank over a layer or marbles works quite well. So does the use of a spawning grate in the breeding tank.

A male *Danio dangila*. Apart from its long oral barbels, this native of the Ganges River has nothing else in common with either *D. feegradei* or *D. meghalayensis*.

A male *Danio meghalayensis*. This species is not characterized by marked sexual dimorphism. Female Rainbow Zebra Danios are fuller bodied than males and less intensely but otherwise similarly colored.

Danio fry require infusoria for their first few days, after which they can be offered microworms and Artemia nauplii. Under a regime of frequent partial water changes, the fry are easily raised. Growth is fairly rapid, the young showing traces of their adult color pattern between four and six weeks post-hatching.

Danio feegradei is being bred on a commercial scale in Florida, the Czech Republic and the Far East. It thus appears on wholesalers' price lists with a reasonable degree of regularity and specimens find their way episodically into retail establishments.

As previously indicated, while *D. meghalayensis* has been bred by hobbyists, it does not appear to have yet entered into commercial production. It is thus harder to find and specimens, once located, are likely to be rather expensive. Both species are frequently available from on-line suppliers.

While their active life style would suggest that large danios would not ship well, my personal experience suggests the contrary. So if the opportunity to purchase either of these colorful danios from an on-line source, go for it.

You won't be sorry!

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FISHES AS DISHES

PATRICK A. TOSIE, SR.

We all love our fish! This column is dedicated to using fish for something tasty to enjoy. Try it, you may like it. If you have leftovers, bring them to a monthly meeting for others to enjoy!

CRISPY BACON WRAPPED STUFFED TILAPIA

Ingredients:

- 4 tilapia fillets
- 4 slices bacon
- 1 tablespoon olive oil
- 1/4 cup chopped red onion
- 1/4 cup chopped red pepper
- 3 tablespoons plain crushed breadcrumbs
- 1 tablespoon lemon juice
- 1 tablespoon light brown sugar
- 1 tablespoon minced garlic
- 1 teaspoon dried parsley flakes
- 1/4 teaspoon black pepper
- 1 pinch salt
- 1 pound fresh green beans
- 1/4 cup parmesan cheese

Directions:

Preheat oven to 350 degrees.

In a small sauce pan heat the oil. When heated add the onions and fry for 2-3 minutes or until translucent.

Add the red peppers, lemon juice, brown sugar, garlic, parsley, black pepper and salt. Bring the mixture to a boil, then reduce to a simmer and cook 5 minutes, or until the peppers are tender.

While the pepper mixture cooks prepare a baking dish. I use a disposable aluminum 8x8 inch square cake pan because I don't like bacon grease on my good pans. Cut about 6 strips of aluminum wrap the size or your baking dish. Crinkle the strips of foil and place them securely in the bottom of the dish to make racks.

Remove the pepper mixture from the heat and process in a food processor or blender until smooth.

Return the mixture to the pan and stir in the bread crumbs until combined.

Spread the mixture evenly among the 4 Tilapia filets and roll them up. Wrap in bacon using one strip of bacon per filet. If needed secure in place with toothpicks.

Place the filet rolls over the racks to let the grease drain. Cover with aluminum wrap foil and bake in the preheated oven for 20 minutes.

In another baking dish spread the green beans evenly and sprinkle the top with parmesan cheese.

After the 20 minutes remove the filets and turn on the broiler. Remove the foil cover from the filets. Put the green beans and filets under the broiler and broil until the top of the bacon is crispy. Turn the filets to crisp the bottom side. If the cheese begins to burn too badly, take out the beans. When both sides of the bacon are crispy, take it out as well.

Serve the tilapia with a big side of green beans and enjoy.

Total Time:

About 30 minutes – Yields 4 servings.

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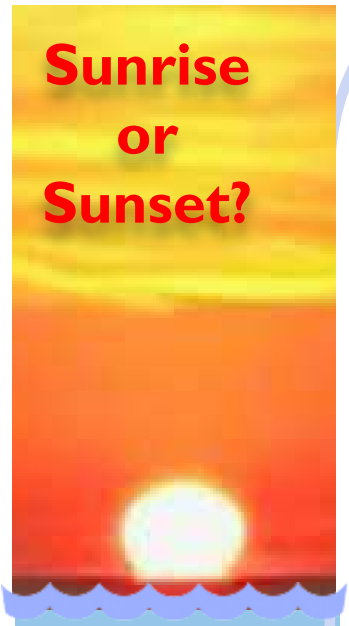

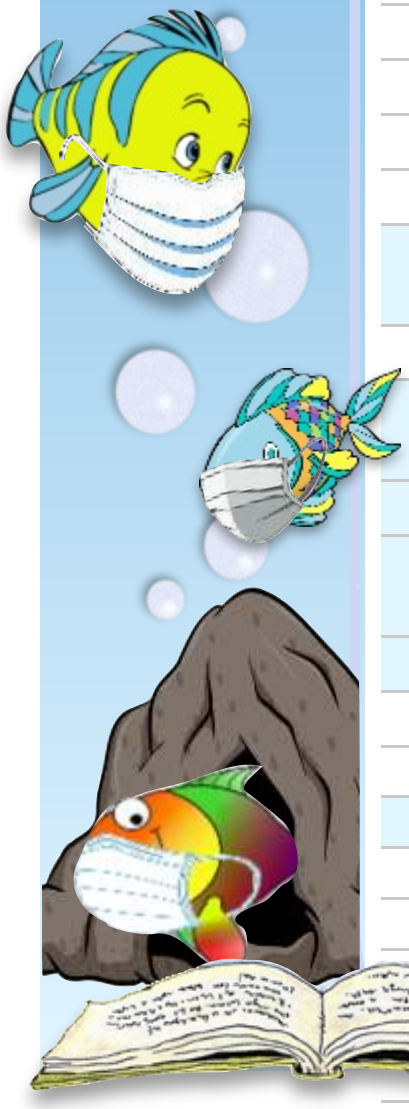

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The Fish Tank

Things I Wish I had Thought of:

LOCATION, LOCATION, LOCATION

By Kathy Deutsch

THE WORLD MAY be different than it was this time last year. But some things never change, and my ability to mess up is sadly, unchanged.

I was thinking the other day that I dearly wished my common sense kicked in more often. My over 50 years in the fishkeeping hobby has allowed me to screw up in many different and ingenious ways.

People keep fish for many reasons. Some of us just love fish. They fascinate me. They were an excellent baby-entertainer when my kids were small. They drew our blended family together; the fish were something we could all talk about in a friendly manner.

Other folks like the plants, the aquascaping aspect- for some especially landscaped tanks, the fish are a secondary consideration to the overall look. Species tanks for observation, biotope tanks that mimic the wild, there are many reasons to keep a big box of water in the house. What all the justifications, reasons, explanations have in common is success. We want success with the hobby.

Placing the fish tank in the right spot is the foremost consideration. Before tank size, before tank residents, the ability to place the tank correctly is THE measure of potential success. Like it or not, we are the caretakers of the fish and we largely determine their fate. And it is up to us to keep the fish comfortable. They need clean water at a temperature and condition they can tolerate.

The easiest way to meet the fish (and plants') needs is through water changes. Water goes in & water goes out. Think about how water is going in: via hose or bucket. For a 10 gallon tank, doing a weekly 2 gallon water change means towels, a bucket, a siphon and patience. That tank could go anywhere.

As the tank size goes up, the potential for disaster goes up accordingly. Some of us place our big tanks near a patio door, so we can run the hose out the door. This requires skill, so the fish don't get into the hose. A piece of netting rubber-banded to the hose end that is in the tank, cuts down on the suction. It will make the hose run slower. But, trust me, you do not want to have a corydoras stuck in a hose. Ever!

Siphoning the dirty water in a bucket, first, is a bit tedious. But the disaster of a fish going out with the water is lessened. And then the bucket has to be dumped.

Back to hoses; the hose that fills the tank, has to comfortably reach the tank. Water needs to be treated, first. So, a bucket with a small pump in it? Pump the treated water into the tank? Or treat water in a bucket and just dump that in? If you consider it exercise, that's a safe way to go. In general the spills are less dramatic. But whether you use a hose system or a bucket brigade, placing the tank where the inevitable puddles won't mean permanent damage, is smart.

Temperature of the water is vital. The temperature can be somewhat regulated via heaters. But no heater can overcome a tank that is

next to a northern window in January. And, placing a tank near an air conditioner vent will mean that heater will run more.

I guarantee that a heater will go out. It will either overheat a tank, or just quit. And the tank will become uncomfortable, if not downright deadly. Tank placement MUST consider windows, vents, and an outlet with GFI (ground fault interrupter) close by.

Avoid extension cords. Doubly avoid putting any cord anywhere near where any animal could possibly go. Block the area behind the tank so no pet can get in behind it. They will accidentally jerk a cord and your heater will go flying.

Most important, the tank MUST be where it will be observed every day. Get into the habit of touching every tank twice a day, preferably when feeding the fish. Is that tank warmer than it should be? IS IT COOL?

Finally, algae. Placing a tank by any bright area, including near a floor lamp, can stimulate algae growth. We all think of windows. But a floor light that is full spectrum can turn that tank green. Having said that, your plecos will be delighted. I have ancistrus, and they adore the green.

But if you want sparkling tank walls, avoid sunlight.

And honestly, if clean tank walls are important, DO NOT get a deep tank. Reaching down to scrub every bit of a deep tank will get part of a shoulder wet, will drip down the side of the body. And (this is weird) you can poison a delicate tank with the deodorant from your arm that gets into the tank.

This is my reminder that all sucker-mouthed fish need wood. Good sunken wood with algae growing on it is a good food. In my observation, every fish likes to pick on soft wood with algae. From cichlids to killies. But for digestion, the suckermouths need it.

Placing a tank well means considering temperature, ability to access it, and the algae that will form. It also means being sure it can be cleaned easily, and can be observed, as well as touched, daily.

If you are in fishkeeping for the long haul, you know you want success. Good tank placement sets up for potential success- and moving a poorly placed tank, is no fun.

Avoid the problems I have encountered; think about where the tank goes before the bag of fish come through the door.

Minifins

-

The Three Spot Gourami

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Trichopodus trichopteris

-

By Mike Hellweg, CFN
(Certifiable Fish Nut)

EVERYONE HAS LIKELY seen the three spot gourami, *Trichopodus trichopteris*. Wait! What?! Everyone knows it's *Trichogaster trichopteris*, right?

We'll if you've been paying attention recently, you'll see that the five (or six) species in *Trichogaster* have been moved to *Trichopodus*, and the four species of *Colisa* have been moved back to *Trichogaster*. Why? Well, scientists like to torment hobbyists who think they know everything! But seriously, without getting too deep in the name game, it has to do with primacy of the generic name's first use and the fact that no one bothered to designate a type species for either the genus *Trichogaster* or the genus *Trichopodus* until nearly a century and a half after they were created!

As there are at least 10 different species synonyms and at least four different generic names that have all referred to the three spot gourami in the literature over the past two and a half centuries, I will avoid going any deeper into the name game at this point.

The scientific name refers to the very fine, thread-like pelvic fins, and literally translates to "hair belly, hair fin". If you watch them in an aquarium, you will notice that the three spot gouramis are very tactile, using these "feelers" to touch everything in the tank as they go through their day. They will literally rub their fins over plants, other fish, the tank and equipment itself, decorations, and anything else they encounter.

In their natural habitat the water is often murky, so these sensitive fins allow them to feel their way through their world. In addition, these "hair-fins" are covered with taste buds, so while not as sensitive as the famous "whiskers" of catfish, the fish can also find food with them.

It is very likely they also can be used to sense pheromones released by conspecifics as pairs also spend a lot of time touching each other during mating, and newly introduced fish will spend time touching each other as they get to know one another.

Aggression can sometimes be a problem with newly introduced adults as they establish a pecking order, but once established they are fairly peaceful outside of spawning. Occasional squabbles are usually settled by a bit of fin flaring and circling, with an occasional nip if the two fish are well matched otherwise.

To avoid serious problems, it is best to keep them in mixed sex groups of 5 to 7. Some authors have reported that males will chew up the caudal fin of females that are not quite ready to spawn, but if you use a large enough tank with some cover for the female and don't introduce her until she is ready to spawn, this is rarely a problem. More on this in a bit.

In the wild they are found in Southeast Asia from Vietnam westward to Thailand and Malaysia, through several islands from Sumatra back eastward to Borneo and are even reported in the Philippines, though this last location is likely influenced by man.

In fact, they are a popular food fish and are often cultured along with rice, where they can be harvested at the same time. Due to their culinary popularity they have been widely distributed by man, so in truth we have no real idea what their original natural range was.

Today they can be found on the menu in fine restaurants throughout their range, where they are displayed in tanks or jars and patrons can chose the fish they want for dinner while they are still swimming, just as we choose lobster. With the head and viscera removed, they are eaten pickled, smoked, dried or fried as well. I have seen jars of them for sale in Asian markets even here in St. Louis.

There are several color variants of the three spot gourami that are popular in the trade. The most popular ones to this day are the blue which is bright blue with two dark spots on the flanks (plus the eye makes up the "three spots" of their moniker) and the Cosby (or Opaline), which is a dark blue mottled or marbled color. But other colors are available including gold, which is bright yellow; gold marble, which is deep yellow with greenish or brownish marbling on the flanks; silver, which is a pale slightly bluish silver with no spots; and lavender, which is silver with a darkish, purplish marbling on the body.

The three spot gourami can grow to five inches, though four inches is a much more common size. Males and females are similar in size and color pattern, with males sometimes having more colorful orange or red eyes, though this is not always a reliable indicator. Males generally have a much longer, taller and pointed dorsal fin, and in some variants the males have a bright yellowish to orangish color pattern on their bellies. Females in all variants have a much stouter appearance, and once sexually mature, they seem to always be nearly ready to burst with eggs.

Feeding couldn't be easier. In the wild they are omnivores, eating anything organic that fits in their mouths. In spite of their large size, they do not have large mouths, so they will not eat larger food items. They will just eat a LOT of smaller fare. Flakes, pellets, and frozen foods can make up the bulk of their diet, with occasional live foods added maybe once or twice weekly.

They will also eat duckweed. I've had some specimens that will literally clear a tank of duckweed in a week, and others which never once touched it, so take this with a grain of salt and make sure your particular specimens will eat duckweed before you start adding it to their tank. Oddly, in my experience specimens of the gold morphs seem to be more inclined to consume duckweed while those of the wild color three spot variants seem to be least likely to touch it.

Three spot gouramis are bubblenesters. The male will build a large, foamy nest of bubbles at the surface under or near some structure like a large leaf, piece of Styrofoam or something similar. The male blows each bubble individually. They are coated with sticky mucus from a gland in the roof of the male's mouth. This mucus makes the bubbles last for several days, and a really well-built nest will still be in the tank when the fry become free swimming.

Most males build a large nest, though I have seen spawning reports of males barely building any nest at all. In general, it is thought that in the wild females choose their mates by the size of their nest, as this indicates a more vigorous mate who will be better able to defend the spawn.

In addition, the nests are built where they are exposed to the sun, so it is believed that taller and larger nests are more successful for hatching and raising fry. It seems the more layers of bubbles the better protection the eggs and fry have from extreme heat.

In aquaria, some males have built huge nests that cover half or more of the surface of the tank, even lifting the cover glass! While they don't form pair bonds, most males will spawn with a single female during a spawning session, but some males have been reported to spawn with multiple females if more ripe females are ready and available at the same time.

As they are large fish, I would suggest a minimum of a thirty gallon tank for spawning. Fill it about three quarters full, add a few floating plants, a large clump of Java moss or something similar, and a few flower pots turned on their sides to provide the female a place to get out of the male's line of sight in case he gets aggressive and she's not quite ready. Add a heater set to about 80 degrees Fahrenheit, and a small, slowly bubbling sponge filter. You don't want a filter going to strongly as it will make nest construction difficult for the male.

As you might surmise from their wide distribution, they are not at all demanding as to water parameters. They are found in swampy, acidic, low hardness water and in basic, alkaline water flowing over limestone. Some populations are even exposed to brackish water for at least part of the time. So as long as the water is clean, they should be good to go.

Condition both breeders with meaty foods like frozen brine shrimp, Mysis and bloodworms and live foods like blackworms, daphnia, and similar

fare. Add the male to the tank a few days before you anticipate a spawning attempt. Once the male builds a nest, add the ripe female. You'll know she is ready to go if she looks full of eggs and her egg tube is showing. This is a small white nub that protrudes slightly from the vent area.

Within an hour or so after you add her to the tank, if she is ready to go and

she finds the nest and male acceptable, she will initiate spawning by approaching the nest. The male will show he is ready by intensifying his colors, and rolling over on his side to form a "U" shape with his body. The female will enter the "U" and the two fish will line up their vents and begin to embrace and roll a bit. After a few false starts, the female will begin to lay eggs in bursts of about 20 to 40 at a time.

Each egg contains a small oil droplet and floats to the surface. After each of these egg-laying events, the male will move up to the nest and blow a few bubbles around the eggs, then return and mate again with the female until from several hundred to 4000 or so eggs are laid, depending on the size and age of the breeders. Then the female will move off and the male will start guarding and tending the nest.

At this point, carefully remove the female so you don't mess up the nest. The male will carry on guard duty for a couple days, or you can remove him as soon as spawning is done. If you leave him in the tank, only let him tend the nest and fry for two days, then remove him.

Once the fry hatch and start to make their first escaping attempts, he will catch them in his mouth and spit them back into the nest. At a certain point, he will still catch them in his mouth, but he will no longer spit them back into the nest, but rather eat them instead. Once this happens, he can consume most of a spawn in a few hours.

Once they are free swimming, the fry will be ready to be fed. They are very tiny and need microscopic food for a few days. Infusoria is ideal, and is the reason for leaving the water level down a bit from the top. That way you can just pour in the infusoria culture into the tank each day for several days, slowly bringing the water level up to the top. When it gets to the top, it's time to start doing water changes.

If you don't want to use infusoria, fortunately, they will eat powdered commercial foods for egg layers. Usually I recommend mixing these dry commercial fry foods with water and pouring the slurry into the tank, but young three spot gouramis are surface feeders and will eat the floating powdered food greedily. They are pigs and will eat continually if you let them. This translates into rapid growth, and by the third or fourth day after becoming free swimming, many will be large enough to take newly hatched brine shrimp, microworms, vinegar eels, and even finely ground flake foods.

This rapid growth is natural, and some siblings will seem to grow as you watch them while others don't grow at all. This, too, is normal. In the wild, the faster growing siblings will consume their slower growing siblings. To head off this behavior, about every week or so, grade the fry by size while you're doing a water change. Don't attempt to raise every young gourami, as there will just be too many of them. 100 or so would be a good group to raise up to saleable size. When deciding which to cull, don't keep all of one size, as often these wind up being all of one sex when they reach maturity.

In fact, attempting to raise too many three spot gourami fry led to the genesis of the popular myth that Anabantoid fry need to have warm, moist air over the tank or they will get pneumonia and die. This was the speculation of a German breeder published back in the 1950s as to a POSSIBLE reason why his fry were dying, but if you read the entire article, you'll see that this was only one of several theories that he had, and that in truth he was actually not feeding enough food to the fry, which oddly was NOT even one of his potential theories!

Be that as it may, a well-known American publisher came upon this article and seized on this speculation as a fact, and it became the "truth" in every Anabantoid related article and book he published, even though it is not. In fact, Anabantoid fry develop just as healthy under cooler conditions without cover over the tank as they do with cover.

I have even had paradise fish successfully spawn and rear fry in a tub on our balcony right before Thanksgiving! And many scientists over the years have debunked this myth as well including renowned Betta expert Dr. Gene Lucas, who raised thousands of spawns of *Betta splendens* in his lab with cool, dry air over the spawning tanks. Proper feeding is key to raising healthy Anabantoids- not keeping warm air over the water.

The various morphs of the three spot gourami are well worth keeping. Given room and plenty of food, they will be big, colorful, outgoing and generally peaceful members of a medium to large community or planted tank. In addition, they are long lived, often providing their keepers with six or seven years of companionship. Finally, if you're looking for a breeding project, the three spot gourami is a fun challenge that offers something a bit different than the more often encountered livebearers and cichlids.

And don't forget to sit in front of the tank and spend time just watching your fish!

Spawning the Mega Clown Pleco

-

Hypancistrus sp. L340

-

By Caleb Pittman

THE *HYPANCISTRUS* SP. L340 pleco is commonly referred to as the "Mega Clown Pleco" in the aquarium trade. This dwarf species of pleco is found throughout the Orinoco river and the Amazon Basin in South America. The Orinoco river is one of the longest rivers in South America and home to many other species we keep in our aquariums, including many species of Corydoras and many other Loricariidae.

So many of these related species are found in South America that a system was created to organize them all. This organizational system was created in the 1980's by a German aquarium magazine DATZ and is used to quickly describe species until a true scientific classification can be made. However, so many Loricariidae have been found in recent years that as many as 600 L- number plecos have been documented, many of which are still awaiting scientific classification.

The L340 pleco is a *Hypancistrus* which is a genus of the Loricariidae family. Hypancistrus plecos are omnivorous but tend to prefer a meatier diet. Being from the Amazon Basin the "Mega Clown Plecos" enjoy slightly acidic quick flowing warm water, at or above 80 degrees Fahrenheit.

A dwarf species of pleco the adult fish only grow to about 3". Mature females have a wider midsection when viewed from above. The males have a wider head with a thicker first pectoral ray and more pronounced odontodes along the body. The yellow-orange and black body markings have nice contrast and make this quite the attractive little pleco.

When I got the L340 in 2017 I had 3 aquariums and had only kept bristlenose, *Ancistrus* sp.

Because of their small size, smaller crevices and caves are sought after by males and used for spawning. Adult males are often found guarding their cave if they are tending a clutch of eggs or not.

When I got these plecos in 2017 I had 3 aquariums and probably only had kept bristlenose, Ancistrus sp, at that time. I set them up in a 29-gallon tank with Colombian tetras and about 8 small caves but lost one within 24 hours.

About 6 months later we bought our current home and moved. I caught all the fish, put them in a bucket and moved the tank essentially setup with about 2-3" water sloshing around, hoping I would save the beneficial

bacteria in the substrate. I moved all 4-5 aquariums I had this way but wouldn't much recommend it.

Once settled in the new fish room I've kept the temperature in the tank high 80s, ranging from 84-86. I originally fed lots of frozen blood worm cubes but now feed black worms twice a week as well as mixed sinking pellets and wafers. I feed almost all my tanks fresh baby brine shrimp once a day and will often feed blanched zucchini or Repashy to all my plecos. The L340s come out of everywhere in the tank to eat micro worms.

When I change the water, I use charcoal filtered water around 75 degrees and believe this drop in

temperature is a big trigger for spawning. Soft water has not been required for me but may improve results. My tap water is around 280-300 ppm. A reverse osmosis system has recently been installed but and have not begun experimenting with it.

After a water change, when the females are plump, and the aquarium light has gone out, a male will trap a female inside his cave where they will spawn.

After a water change when the females are plump, the males are guarding their caves and the aquarium light has gone out, a male will trap a female inside his cave where they will spawn.

I have had better luck leaving the male to guard and fan the eggs inside his cave. I have been able to raise fry larger, faster inside the breeding tank as opposed to pulling the eggs or fry and raising them on their own. In the past two years they have colony bred in the same 29-gallon tank and have had a couple generations. When I see a clutch of eggs, I will add some leaf material to the tank to begin to break down, this is a perfect food for newly hatched plecos- even meat eating *Hypancistrus*.

The *Hypancistrus* L340 "Mega Clown" pleco is a quite stunning pleco, almost a yellow version of the very popular Zebra Pleco (*Hypancistrus* Zebra L046).

The "Mega Clown Pleco" was my first L number pleco and I think it would make a great L number *Hypancistrus* for any new or experienced aquarist. Mine are kept hot at 86F and are colony bred in a 29-gallon aquarium. Current tankmates are fire red *Neocaridina* shrimp which I have found also do well in warm tanks!

The L340's will eat a wide variety of prepared foods but, I believe the biggest key to spawning all fish is a varied diet including live foods. The small size and nice disposition of the *Hypancistrus* L340 makes it a good candidate for many different aquariums and tankmates.

I get the most enjoyment from my aquariums when I can create a natural environment in which the fish can reproduce and display their natural behaviors.

The Triangle Cichlid: *Uaru amphiacanthoides*

by Chase Klinesteker

www.chasesfishes.com

Special Update for MASI

MY FAVORITE FISH IS unquestionably the Triangle Cichlid, or *Uaru amphiacanthoides*. This is proven by the fact that I have 17 "3X5 Computer" cards of information collected on the species when most species have only 2 or 3.

I bred and wrote a 3-page article on this fish in 1993, but have recently bred it again and discovered some new information. Because this fish is a definite challenge to breed, I thought I should share. For those serious about breeding it, the 1993 article is on my "Breeding Tropical Fish" website www.chasesfishes.com, in the "Article" section under "Cichlids".

Uaru are native to the Rio Negro portion of the Amazon.

PERSONALITY

Uaru remind me of Discus, slow and stately. Their mouths are even similar and they both feed their fry with body slime at first. Big and bug-eyed, they seem to have a definite personality and will eat food from your hand. In October of 2017, I purchased 6 2-3 inch Urau at a SWAMAS auction. I paid about $70. for them and thought that was high, but later found out on the Internet that they retail for around $35. each, with adults going for around $100. Sometimes, this "poor mans' Discus" sells for more than discus because it is so infrequently bred.

Uaru have often been called the Poor Man's Discus and remind me of them, slow and stately.

PAIR BONDING

As the 6 fish grew, I put 3 each in two 20-gallon tanks, as no larger tanks were available. When they reached 4-5 inches, they began to sex out, mainly shown by their behavior and treatment of the third fish. Males are slightly larger and may have slightly longer fins, but that is not predictable. I didn't realize how strongly they pair-bond, as the third fish in both tanks was killed, and I ended up with 2 pairs. Then one male killed his female and I had one breeding pair. Even after the mated pair laid several batches of eggs, the male started attacking the female, but I quickly removed the female to another tank to recover for a few weeks. This aggression was likely due to not having a large enough aquarium to accommodate all 6 Uaru. Reintroduction of the female brought more attacks by the male, so I waited until nightime, threw in the female, and turned the lights out. The next morning the pair was doing fine and they soon started laying eggs again.

FEEDING

Uaru are vegetarians. In 1993, my Uaru were in a 70 gallon tank with a healthy growth of water sprite for them to access. In a smaller tank, this was not possible and I decided to feed them mostly pellets. I selected Pond Chow that leans toward more vegetarian fish. First soaking the pellets in water for 5-10 minutes helped the fish consume them.

Extra live plants from my other tanks, even if covered with algae, were eagerly devoured.

BREEDING

The pair bred in a bare 20 gallon-long with an undergravel filter. Although the fish rearranged the gravel considerably, the filter still worked well for this messy-eating fish. They did not

FISHES AS DISHES

PATRICK A. TOSIE, SR.

We all love our fish! This column is dedicated to using fish for something tasty to enjoy. Try it, you may like it. If you have leftovers, bring them to a monthly meeting for others to enjoy!

SPICY BAKED TILAPIA

Ingredients:

- 4 tilapia fillets
- 2 cups corn flakes, crushed
- 4 tablespoons shredded parmesan cheese
- 1/2 - 3/4 teaspoon cayenne pepper
- 2 tablespoons milk
- 1 egg

Directions:

- Heat oven to 400 degrees.
- Spray baking pan with nonstick cooking spray.
- Toss together cornflakes, parmesan cheese and cayenne pepper in a shallow bowl or pie plate.
- Whisk together egg and milk in a second shallow bowl or pie plate.
- Dip each fillet in egg mixture; then coat with cornflake mixture.

Salt and pepper to taste & Bake 12 to 14 minutes or until fish flakes easily with fork.

Serve fish with tarter or cocktail sauce and top with more parmesan cheese, if desired.

Total Time: 20 minutes

lay any eggs in or on the clay pot in the tank.

To help clean up, I had a 4-5 inch woodcat in with the pair. As I intended to remove the eggs for hatching, the catfish threat seemed to help strengthen the pair-bond. The mated pair would lay only about 30-40 eggs at a time, but every 5-10 days. They were laid on the glass near the undergravel lift tube in the same spot.

Uaru are vegetarians. Previously, in a large tank, I fed them water sprite. In this case, with a smaller tank, I choose to feed them Pond Chow pellets.

I would remove the eggs with a siphon-on-a-stick, which was savagely attacked by the pair. I strongly recommend that you do NOT put your hand in the tank at this time! Eggs left in with the parents did not result in any free-swimming fry, whether from the catfish or hard tapwater.

HATCHING AND RAISING

This seems to be the biggest challenge in breeding this fish. This pair has probably spawned 20 times for me in the last several months, but the hatch rate has been poor or none. I now have around 30 fry from those spawnings. Most times I use fresh rainwater to hatch them in, but from our area it is slightly alkaline, and Uaru come from extremely soft and acid water. Lately I have been acidifying the rainwater and keeping it warmer (80+ degrees), and that may help.

It seems that the eggs are very sensitive to any bacteria, so I now use both a sponge filter and bubbler for water circulation in the hatching container, which is about one gallon. Do water changes with clean rainwater. Once the eggs have hatched, the water must be kept very clean until they become free-swimming. Then I add snails and a few pieces of oak leaf. I believe the oak leaf may produce some slime that the fry can feed on for a couple of days before they take baby brine shrimp.


Uaru Juvenile

The fry are kept in the hatching container and fed for 2-3 weeks before they are adjusted to tapwater and moved to a larger tank.

HAP Temporary Rule Change

For the duration of the COVID 19 outbreak, we will suspend the requirement that for vegetative reproduction credit one must donate plantlets, cuttings or plants for auction at a MASI General Meeting or at one of the quarterly MASI auctions.

Instead, a member can now submit by Email:

1. HAP form
2. Photo of the propagated plant -a cell phone photo is fine
3. Short, approximately 200 word, article about the plant and how the entrant propagated it.

These 3 items must be submitted for each species/variety for which HAP credit is being sought. All three items can be submitted in one email. These 200 word articles do not replace the required articles for level advancement in the program, which are more extensive.

Rules for submitting a photo of a bloom for bloom credit; and for submitting a photo of the bloom, fruit, seed and seedling for sexual reproduction credit remain unchanged as these can already be submitted electronically.

Forms, photos and articles should be submitted to me using the following email:

HAPReports@missouriaquariumsociety.com

HAP forms are available from the HAP page of the MASI Website or by clicking the HAP-form icon below my photo above. They can be filled out using the FREE Adobe Reader DC which can be found at https://acrobat.adobe.com/us/en/acrobat/pdf-reader.html or by clicking this Icon:

Documentation of Blooms and Temp Vegetative HAP rules!

Water Poppy

Hydrocleys nymphoides

This water lily type plant has put off runners all through the pond. Put out 2, found 6 more, just off of the smaller one all from vegetative reproduction.

Need to get the duckweed cleaned up but didn't want to clean it all up with this heat wave. Needed to top off the pond, so overfilled some to clear out some of duckweed. Lol

Commons / comets would probably be fine to clean up the duckweed but I put almost 2 dozen juvenile convicts in there that have started breeding. Saw 2 fry swarms when I topped it up. So far, so good, but never know what will set off a breeding convict.

(Holly Paoni)

Mud Plantain, Water Star Grass, Water Willow

Heterantheria dubia

This species is a native of the northern and central United States and is sometimes also called the Mud Plantain. I have had it flower outdoors with small yellow flowers and it grows quite robustly in an indoor fish tank with little care. Several times I have offered it for sale at club auctions and other venues. Growth habit is similar to a vallisneria but individual stems have a jointed configuration and stream across the surface. When it does this if often breaks off at the base and then becomes free floating.

It offers good fry cover for livebearers and also a place for duckweed and small bladderwort to tangle which makes it a nuisance collector and maybe not quite as enticing for those with duckweed or other floating small plants. **(Chuck Bremer)**

Fiber Optic Plant

Isolepsis (Scirpus) cernus

This grass readily available and easily grown. It is one of the standard ground covers offered by the local garden center and as such came in a small pot priced for sale in groups so was inexpensive. The plant is considered one of the reeds, most of which like wet conditions and this one is no exception coming from the coastal fresh and brackish water areas of the Pacific coast.

I dropped the pot into a ring made of Styrofoam and placed it floating into one of my outdoor ponds and it took off quickly filling the pot and hanging over the side. In little time it was ready to be split. **(Chuck Bremer)**

Corkscrew Rush

Juncus effusus spiralis

This is another of those common rushes offered by many garden centers. As with most rushes it prefers wet conditions and grows easily in a marginal or bog situation. I grew mine by creating a ring to fit the pot using styrofoam and floating it so the crown would be just above the water. By floating it the need to constantly water is eliminated.

Although unique, the extreme corkscrew of this plant is not so attractive for me and does nothing to offer fry cover in the tank as it has a tendency to curl toward the center of the pot. **(Chuck Bremer)**

***Ed's Note:** the Yellow Striped Armyworm was found feeding in member's outdoor tubs in 2020.*

Blue Mohawk Soft Rush

Juncus inflexus

Grown and acquired similarly to the corkscrew rush above. I initially thought they were varieties of the same species but found that not to be the case. Both have their own species assigned, although they are in the same genus. Most of the species of this genus, Juncus, are considered to be water or cold weather plants.

The plant is quite attractive with leaves about 18 inches long and blue green.

This one was also easy to grow by fitting it's pot with a ring of styrofoam and floating in the tub. The crown of the plant should be slightly above the water. To reproduce simply divide the developed crown. **(Chuck Bremer)**

Mosaic plant

Ludwigia sedioides

The Mosaic plant is a true aquatic and roots in the bottom of the pond or lake. Sinking a pot filled with potting soil under the water is sufficient housing. It would go right alongside water lilys in such tubs. It really doesn't like rapidly moving water and will spread across the surface.

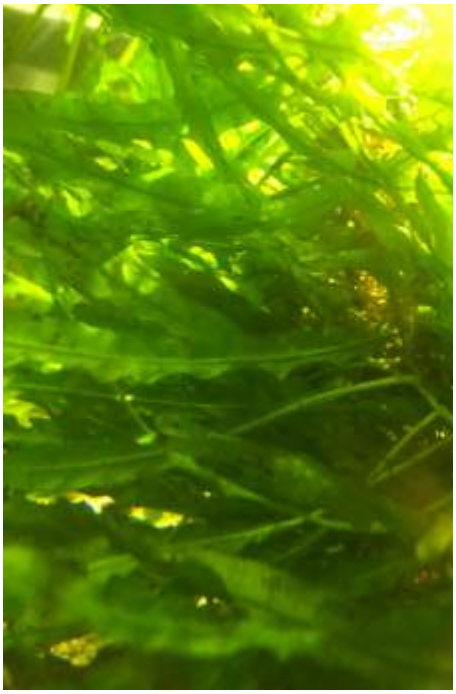
As a Ludwigia species it floats easily and will root from cuttings.

The Mosaic Plant is easily confused with the European Water Chestnut, Trapa natans, which is considered to be invasive in many states. They can be told apart by the slightly more blocky leaves of the chestnut. Both have serrated leaf edges and similar interlocked patterns on the surface of the water.

(Chuck Bremer)

Needle Leaf Java Fern

Microsorum pteropus



A relatively newer selection of Java Fern, this variety is narrow leaved and still grows slowly under low light. It is easy to propagate, just takes some patience.

Mine is growing on a piece of drift wood deep in a 125 gallon tank and provides good fry cover for Julidochromis fry so it is also in a hard water tank. Mine started from a few leaves about 4 years ago and is just now forming a volleyball sized plant.

The plant makes excellent aquascapes because it does not have to be trimmed very often. **(Chuck Bremer)**

Floating Salvinia - Water Spangles

Salvinia minima

Several species of Salvinia have found their way into the hobby recently. Although S. minima has been around for some time. Generally Salvinia species are a string of leaves arranged alternately along a thin stem. The leaves are hairy above and have a rootlet attached to the main vein that dangles into the water. This root is good at taking up nutrients and they will also survive and reproduce over a muddy bottom.

Small specimens or poorly growing ones can easily be confused with Phyllanthus fluitans, sometimes called "Red Root Floater", which likes a higher humidity over the leaves and water a bit more soft and cleaner than necessary for Salvinia.

Many of this genus are considered invasive and prohibited from trade in the hobby. Since they are also difficult to identify and tell apart I generally avoid Salvinia species and do not trade or move to other aquarists if I should receive them as a contaminant on other floating plants. I also find amoung the hairs to be a good source for unwanted cyanobacteria (blue/green algae/bacteria). **(Chuck Bremer)**

Pink Rain Lily

Zephyranthes grandiflora

Ive had the *Zephyranthes grandiflora* since late last summer. I planted them in terra cotta pots in potting soil, and capped that with peagravel. They over wintered in the sunroom receiving indirect to full sun . I originally had the pots in my indoor pond, but as my cat has a bad habit of knocking the pots over in there, I moved the pots into a container, I filled with water from the pond, each water change, and it stayed next to the pond all winter and spring.


Double Bloom?


2nd Example - normal bloom

Its an easy to grow and bloom species given good lighting and a longer photo period. The bulbs divide, and they also reproduce by seed. Its a fun marginal to bog plant, and is quite attractive. If you can, give it a try.

My first bloom was indoors in early May, but missed seeding it. I moved them outdoor into the pond, in late may, and got outdoor blooms starting June1 & 2nd. I was able to get my first seed, naturally June 13th. I havent been using any fertilizer, or added anything to the pots since I first planted them, Last August or September.

(Holly Paoni)

Blooms & Seed

Copper Iris

Iris fulva

Seems happier in the sunroom than it ever was outside.

In a dishpan, potting soil, watered from indoor pond, and kept moist. Its went from 1 plant to a good sized cluster of plants. Waiting on weather to get nicer before turning in the vegetative propagation.

(Holly Paoni)


Zosterella dubia
(Mike Huber)


Anubias barteri
(Mike Huber)

Nymphaea gardneriana"Santarem"

This is a small dwarf lily that I picked up at the May 2019 AGA convention in Seattle. According to my new Kasselmann plant bible (English version 2020) it had entered the hobby in 2015 under the name N. "Santarem" or "Dwarf Santarem".

I abused it quite a bit and often other plants grew over the top of it but it hung on but not thriving. In early April of 2020 when it appeared that we wouldn't be going anywhere for a long time because of COVID 19 I decided to start working a little harder with some of the plants I had. I gave it more room and a few fertilizer tabs. It started rewarding me with more plants. Unlike many of the other Nymphaea this reproduces via runners.

So these little lilies started popping up all over my aquarium. Although I have it under bright lights and CO2 I don't think CO2 is necessary but it is going to need somewhat decent light.

I really like the deep fork in the leaf and the tiny red splotches. Like all Nymphaea kept in the aquarium they should be regularly trimmed to keep the leaves from reaching the surface. This plant looks quite nice trimmed at about 7 inches or less making it a nice foreground or mid-ground plant in your aquarium.

Make sure that you don't let other plants grow over the top which will force it to make leaves that shoot to the surface. I may let a few shoot up anyway and see if I can't get a flower out of it. Supposedly it has sweet smelling flowers that only open at night. If unsuccessful then maybe I'll wait until next year and try one outside. But for now it will remain a part of my plant collection.

(Gary Lange)

The DARTER

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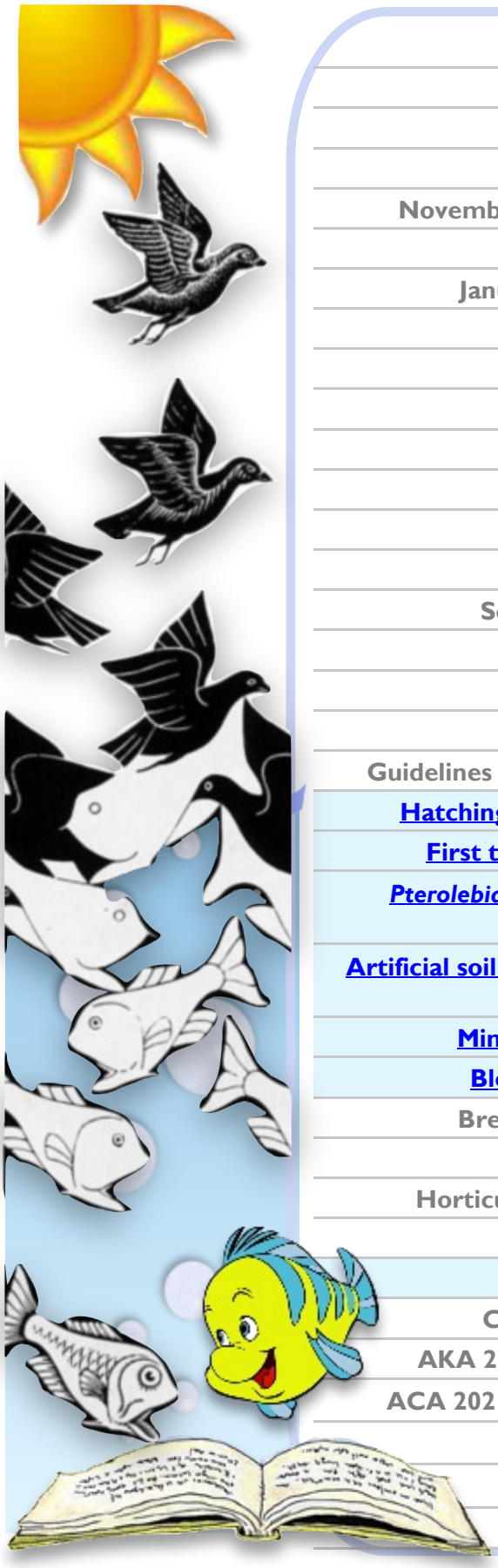
INSIDE THIS ISSUE

Cover - *Apistogramma alacrina* w Fry - Steve Coxon



Article Photos are provided by the Author unless otherwise noted.

Click/Tap this to bounce back here. Then tap/click the article you want to read next!

Hatching the Original "Ancient Mariner" - Triops!

By Rick Renfro


Triops longicaudatus

My Triops eggs were purchased from a seller on eBay, who happened to be in the Czech Republic. The purchase contained 300 - 500 Triops eggs and 500 Fairy Shrimp eggs.

Triops eggs are available many places online and can often also be found in the novelty shops at many Natural History locations or museums such as the St Louis Zoo and the St Louis Aquarium. The species most often available, *Triops longicaudatus*, is the one I received.

I used two tanks, one for hatching and another to keep the colony.

Hatching Set Up: The hatching tank is a medium Kritter Keeper with no cover. They live in fresh water, and I suppose the best water to use is boiled rain water, or spring water. I used tap water that had been treated


End on video view of 10 gallon colony tank at 7 days.

Ed Note: I saw Rick's 7 day video displayed on MASI Social Media and asked him to write this short article. Triops are ancient, one of the oldest living fossils on earth and date to before the Dinosaurs almost unchanged. Triops means 3-eyes in Greek. Although a water creature, their eggs can remain in a desiccated state for centuries, maybe millennia, and are often found even in desert locations.

Like annual killifish, Triops undergo a rapid living cycle whenever there is enough water to hatch and complete development before the next dry period. In Rick's colony they began to lay eggs at less than two weeks!!

Check out more reading in these references:

Wikipedia:
https://en.wikipedia.org/wiki/Triops

Tropical Fish Hobbist:
https://www.tfhmagazine.com/articles/freshwater/triops-ancient-wonders-full-article

with AquaScience Ultimate and then sat for 2 days.

To hatch they need warm water and a high light to mimic desert pools. The need for heat is obvious, but an interesting thing about the light is that if it is not strong enough, the eggs will remain dormant, even in water, because lower light indicates the egg is too deep in the substrate of the desert pool. Eggs can remain dormant for decades.

In the hatching tank, place 2-3 inches of water and some form of dry organic material such as coconut husk or crushed leaves. They hatched within 24 hours and were about the size of a baby Brine Shrimp. The video is from the seventh day.

The colony is now in 10 gallon tank with pool filter sand substrate, a heater, and a large box filter. The temperature is a constant 78 degrees. I turn off the lights at night, but leave them on all day to promote algae growth.

They molt a lot, maybe every day at this stage. I remove their cast shells every other day.

Newly hatched Triops will eat from the organic material the first day, then I fed powdered flake food. They eat anything, and a lot of it. They are eating an one algae or two meat eater wafer, a ½ teaspoon of my mix, and a ½ teaspoon of crushed egg shell every day. I mix growth pellets, golden pearl, larger meat and algae pellets which I feed my other tanks.

They pounce on the egg shell before the other foods and eat it all within an hour, that surprised me. I have not seen them eating much on the plants, but they get quite a lot of other foods.

The day this is written is day 9. The 10 gallon tank was a new set up, but I initially used a seasoned filter and water from another tank to start it up. I ran the larger tank for the 3 days I kept the fry in the Kritter Keeper, then added the little Triops.

Triops grow noticeably daily. The largest is now almost an inch- on only day nine of my first generation!

I will be watching for sites that eggs are laid, but anticipate drying all of the sand after they expire in a few months and collecting the eggs at that time.

As far as the hatching process, both Triops and Brine Shrimp seem to be fairly simple. However, I have failed at raising adult Brine Shrimp so far, even though I have hatched many large batches of BBS for fish food.

The process of hatching and raising Triops is definitely more interesting as a spectator, and much easier than Brine Shrimp.

My family has mixed reviews about them, the kids love to watch them and are pretty amazed by the whole process and I think the speed of the Triops' life cycle holds their interest since the creatures are different every time they see them. My wife, though, thinks they are water-roaches and makes a face and gives me an "Ugh" every time I point them out.

Wondering about the Fairy Shrimp? Me too. They either did not hatch or were eaten by the young Triops in the first days.

My First Time Spawn for MASI

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Pseudomugil mellis

-

By Gary Lange


Adult male *Pseudomugil mellis*

OVER THE YEARS I have bred a lot of different types of *Pseudomugil*. I started over thirty five years ago spawning *Pseudomugil gertrudae* obtained from the remarkable hatchery, Wet Thumb Aquatics, run by the late Delores and Dewey Schehr.

***Pseudomugil* hail from the Australian continent,** the island of New Guinea plus a few smaller islands in-between these two land masses. Out of the eight *Pseudomugil* I have bred (only 7 submitted for BAP, my bad), all have been relatively easy. However my "great white whale" *Pseudomugil* was a tiny maximum length, 1.4" (3.5 cm) fish, *Ps. mellis*.

It's a great looking fish with a beautiful bronze body and fins black lined tipped in white at the edges. Many people when they see a photo of this fish they know they want it. In the hobby though, this fish is still quite scarce and often quite pricey. So much so that a similar looking fish, the small *Pseudomugil signifer* (there are two types, the larger will eventually be renamed) has been foisted more than a few times on us at the retail level. Back in the late eighties the *Pseudomugil signifer* that Beldt's Aquarium got in as *mellis* caused some quite heated debates. Although they "kind of" look alike, when you see a photo of the real *mellis* it is obvious which is which.

The reason it's scarce is because it doesn't breed nearly as easily as its other cousins. This tiny fish is also highly territorial, so much so that I think the males would rather argue amongst themselves rather than breed with the willing females. Most *Pseudomugils*, including *mellis*, don't have a really lengthy life span and their useful breeding lifespan is only a few years. So when you get them you need to breed them right away.

I have tried breeding these fish at least four times over the last thirty years. The best I could do was to produce 8 males and one female. Not enough at the time for BAP points and certainly not enough to produce succeeding generations. The last try inside my fish room was in a two foot tank, a lot of space for three pairs of tiny fish. The fish come from very tannin stained streams that are quite acid and very low conductivity. Even


Similar, freshly caught male *Pseudomugil signifer* from Amamoor Creek.

True *Pseudomugil mellis* are only found in a small area near Brisbane, AU.

Snapper Creek - home to *Pseudomugil mellis* and *Melanotaenia duboulayi*.

Egeria najas

trying to simulate these conditions resulted in failure.

When the last try pretty much failed I decided that some *mellis* I had from the Kangaroo Creek location would go out in the pond for the 2020 breeding season along with *Rhadinocentrus ornatus* and a big rainbowfish *Chilatherina fasciata*. *Rhadinocentrus* and *mellis* occur naturally together so I figured they should get along in my 4'x7' 400 gallon pond. If the *mellis* didn't breed I was sure then that they would look much nicer when they came inside in September because something about being outside for the summer makes any fish look better.

I had always teased my Australian friends as most of their breeding of blue-eyes and rainbowfish occurs outside in their ponds. To me that's kind of cheating instead of working hard by picking eggs or moving mops to a separate hatching tank if you are raising them inside.

In 2011 I had collected at Snapper Creek, which has been another source for *mellis* in the hobby. At the time it was illegal to keep any *mellis* so we enjoyed the *Melanotaenia duboulayi* and *Rhadinocentrus* that we caught there. The water at Snapper Creek was quite dark. This is typical *Pseudomugil mellis* habitat.

***Rhadinocentrus* and *Pseudomugil mellis* are quite cold tolerant** so I put the Rhadinocentrus group and five pairs of *Ps. mellis* out in my pond at the end of April. It helps that half of my pond is in ground and benefits from solar heating. I also kept a dome of greenhouse plastic sheeting over the top for almost a month because of our fluctuating spring temperatures. I'm sure they could have taken our weather without the plastic cover but I wanted them breeding as soon as possible.

The pond had previously been seeded with Daphnia, a plentiful food source for the first month. After that I fed freeze dried mysis shrimp and FD artic copepods from Brine Shrimp Direct. Once I started seeing fry I added Krill Pacifica Powder and Arctic copepod powder also from BSD. There are always plenty of tiny critters in ponds for fry to eat but adding extra will help avoid predation among the different aged fry.

I always add *Egeria najas* to the pond which helps as a sanctuary for the fry besides the lilies that over winter there. This plant really thrives in the pond and doubles in diameter as compared to the tank raised plant. Those tiny leaves are an ideal spot for fry to flourish without the fear of being eaten by adults or larger hungry juveniles. In the photo, the tank raised material is in the upper right hand corner.

By mid-July I could finally identify the fry and know that I had some young *Pseudomugils* in the pond. After I tore down the pond and separated the *Pseudomugil* from the young *Rhadinocentrus* I realized I had way more than I had hoped- at least thirty fry. Several boxes were sent out to other people that are planning to set them up in ponds next year.

What better way to keep an endangered CARES fish going than by getting it commercially produced- so I also sent a group down to Valley Fisheries in Florida. One of the few hatcheries in Florida that have committed to not cross-breeding rainbowfish and have recently also done a great job with other blue-eyes like *Pseudomugil furcata* and *Ps. luminatus*. Hopefully this time we'll be able to keep them going.

They were locally offered as a BAP submission at a recent Parking Lot Swap.

I will enjoy them inside and will for certain put them back into the pond next year.

Photo tank of Kangaroo Creek *Ps. mellis* juveniles and fry retrieved from the outdoor pond .

Pterolebias longipinnis

A Beautiful Annual Killifish from Brazil and Paraguay.

-

By Jack Heller


Pterolebias longipinnis

ONE OF THE South American killifish that I am currently working with is *Pterolebias longipinnis*, a beautiful annual killifish from Brazil and Paraguay.

This fish has long, flowing fins and a red tint to its body and fins and is one of the larger annual killifish, growing up to four inches if given enough nourishing food and plenty of tank space. Most experienced annual killifish breeders raise a group of these fish in a 35 to 55-gallon tank and then select one pair to place in a ten-gallon tank for spawning.

I have been successful spawning *Pt. longipinnis* in a ten-gallon tank at 73 degrees and water testing 180 ppm total dissolved solids. I add oak leaves and alder cones to further soften and acidify the water, I try to wait a week after setting up the tank before introducing the breeders.

Pt. longipinnis, like other South American annual killifish, rarely live, under the best of conditions for more than a year, so I set them up for breeding as quickly as possible when they appear mature.

***Pterolebias* as well as many other species of soil spawning annual killifish readily spawn in containers of artificial soil set within the tank.** Since this species is among the larger annual killifish, I use breeding containers made out of five and a half inch tall, thirty-two-ounce deli containers with a hole cut in the lid large enough for the fish to easily swim through without scattering the medium all over the tank. he medium I use is

Substrate Spawning Killifish Basics

Annual Substrate spawning killifishes are found in both Africa and South America, and represent a group of fish with a very unique survival adaptation which allows then to live in isolated bodies of water that evaporate during the dry season.

Pterolebias as well as *Nothobranchius, Austrolebias, Simpsonichthys* and *Cyanolebias* are some of the species of annual soil spawning killifish found in temporary pools during the rainy season.

The fish in these isolated pools of water die when these bodies of water dry up after the rainy season, but the fish have already deposited their fertilized eggs in the substrate of the pool, often burying them. When the next rainy season arrives and the pool once more receives water, the eggs hatch, the fry grow rapidly, and they then, in turn, spawn and deposit their eggs in the substrate of the pool and the life cycle repeats itself.

Many years ago, talented aquarists developed a system for simulating the life cycle of these annual fishes in an aquarium. This involves filling a container with a substrate, in most cases, boiled peat moss, placing the container in the aquarium housing the annual killifish, then hoping they swim into the container and deposit their fertilized eggs in the substrate.

If the fish behave as expected, the container is removed after approximately two weeks of spawning and the substrate is dried. If eggs are found in the substrate it is stored in a poly bag or a Ziploc bag at an appropriate temperature for an incubation period unique to the particular species.

After storage the medium is then submersed in water having the same parameters as the water in the aquarium where the fish spawned. If the eggs have been incubated for the appropriate period of time at the proper temperature, the fish will hatch within hours, or, at most, a few days, and you will be rewarded with a healthy community of fast growing and interesting killifish.

coir or coconut fiber. ***See the following article on preparing spawning media.***

With both the large containers and the small ones, I harvest the coir every two weeks. I squeeze as much of the water out the coir as possible by pouring it into a canning bag and squeezing it over a larger container. I have used a canning bag for many years to squeeze water out of the spawning medium because canning bags are constructed for durability and hold up far better than fish nets during this procedure.

After I squeeze the water out of the coir, I lay it on a chamois or pigskin and rub it thoroughly to further dry the coir and to see if there are eggs. If I find eggs, I then move the coir to a one-quart Ziploc freezer bag and label it with the name of the fish and the date of harvest. I prefer freezer bags for storage because they seem to do a better job of retaining moisture during the storage period.

Two cups of this medium, which is the standard yield when these deli containers are half filled with coir, is a substantial amount of medium to rub in a chamois, so I split the yield in half and only rub half of the coir at a time. I don't do any further drying of the eggs of this species, but place them directly into the Ziploc bags for incubation. This practice has worked well with rainforest fish, but with annual killifish from the more arid regions of South America, I lay the medium on newspaper for further drying.

The bag label includes the complete name and location of the species and the date that the peat was harvested. I also note a rough approximation of the number of eggs observed. I enter this information on the label and enter it in my notebook with a sequenced control number.

I look back in the notebook to see how long I have incubated the species previously, if that information is available, and the number and quality of fish hatched. If this historical information indicates a substantial and healthy hatch. The historical incubation period is used to compute a suggested hatch date for the new bag of eggs and enter this information. I enter the control number and suggested hatch date on the label and mark the calendar in my fish room with the control number and the suggested hatch date. Then store the bags.

Through trial and error, I have found that the optimal temperature for these eggs seems to be seventy-eight degrees F. At this temperature, the *Pt. longipinnis* are usually ready to wet in four months. I check the eggs around the estimated hatch date, and if the eggs are eyed up and the embryos appear ready, I wet them.

Where I have no history with a species, I consult Dr. Roger Brousseau's book, A Hobbyists Guide to South American Annual Killifish, 1994, now out of print, which has hatching guidelines for several species. I also check Frans Vermeulen's book, The Killies of the Lost World and Frans' web site, "www.itrainsfishes.net", and other sources available on the web. These generally provide me with images of adult fish as well as approximate incubation periods so that I know when to start checking the eggs.

Once I can see a developed eye in the eggs and determine that a coir is ready to wet, I use a plastic shoe box, pour the coir in the box, stick the plastic bag that held the peat under the show box so I remember which bag is being wetted, and pour in water having the same parameters as the breeding tank from which the coir was collected. Then I wait. If I have followed the above steps, I can usually expect the first hatchlings to show up from a few hours to two days. In the case *Pt. longipinnis* fry, they are large enough to take baby brine shrimp immediately.

I set the fry up in a container with hornwort or java moss from an active tank and some small rams horn snails and feed the fry in the morning with microworms and in the evening with baby brine shrimp. I also add some daphnia to the container after the first week to filter the water and provide a constant source of food. I also do a partial water change every two days for the first two to three weeks.

Once the fry appear large enough, generally in around three weeks, I move them to ten-gallon tanks that have had the water level drawn down to half. I add a few teaspoons of non-iodized salt and a pinch of Flubendozol and plenty of hornwort, java moss and rams horn snails, and introduce grindel worms along with baby brine shrimp.

These fish grow rapidly and start to sex out in four to six weeks. Since they grow at different rates, and the males can be extremely aggressive, I try to separate them by size and sex as soon as possible. Once again, it should be emphasized that these fish should be set up to breed as soon as they appear to be large enough. It is important to match males and females by size as closely as possible, and to pick the healthiest, full bodied fish for breeding.

***Gnatholebius hoignei,* a similar species is featured on the 2021 AKA Convention logo**

The eggs of the *Pt. longipinnis* require a great deal of patience during the long incubation period and the fish require a high degree of commitment during the raising and breeding process, but these efforts are very rewarding when these beautiful and vibrant species attain maturity and start spawning the next generation.

South American annual killifish all require additional effort in order to breed them successfully, but the beauty and of these fish and their unique behavior in the aquarium more than compensate for the extra work involved in their propagation.

Artificial soil media for Substrate Spawning Killifish

-

By Jack Heller

The medium I like to use is not peat moss, the more traditional medium used with these fish, but rather boiled coir or coconut fiber. The brand I use is found in the herpetology section of the large pet stores and goes by the name "Eco-Earth".

Boil this medium in a ceramic coated kettle for about ten minutes, let it cool, and then swirl it in a bucket of water before spooning it into a net. Run the net under water to wash out the smaller particles, and then place it in another bucket with enough water to cover the medium. Swirling the medium in a bucket before spooning it out causes the sand that is mixed in with the coir to separate and sink to the bottom of the bucket. The medium that ends up in the second bucket is therefore much cleaner and easier to use.

Keeping the coir soaking in water before use assures that when it is netted out and placed in the deli container, the container will sink in the tank and sit up straight rather than floating to the top of the tank or falling over due to air pockets in the medium.

Once this medium is prepared, I fill the deli container half full with medium, finish filling it with water from the tank, snap the lid on, and hold a small lid from a margin tub over the hole in the lid so medium wont flow out of the hole into the tank when I submerse the container.

Remove the small margin tub lid very slowly and carefully from over the hole in the lid of the deli container and very little medium will flow out into the tank. Give the medium a minute to settle, partially lift the lid off the deli container gently and let the last of the air bubbles float out of the container before snapping the lid back in place.

When the spawning container has been in the tank for a day or so, one can tell if the fish have found their way into it, even if not seeing the fish in the container. The coir will no longer have a smooth level surface, but will obviously have been disturbed. It is rare that a male and female fish fail to find their way into the container, even if it initially takes a few days.

Coir has two advantages over peat moss. It is denser than peat and the spawning container does not need to be weighted down with marbles or rocks in order to prevent it from floating. The container, when half filled with coir, will stand in the aquarium on its own.

The second advantage of coir occurs when the coir is rubbed in a chamois or pigskin to further dry it and to see if eggs are present. Since coir is a courser medium than peat moss, it does not cling to the eggs as readily as peat and it is far easier to find the eggs.


Cyanolebias inspecting a jar of peat.

Coir has worked so well for me that it is currently the only medium that I use for spawning annual killifish. For the smaller species, I use a small spherical glass container that I get at the craft store for a few dollars. These little containers have a capacity of sixteen fluid ounces, and I place one cup of coir in them.

These containers do a relatively good job of containing the medium so that not too much of it ends up on the bottom of the tank.

Minifins
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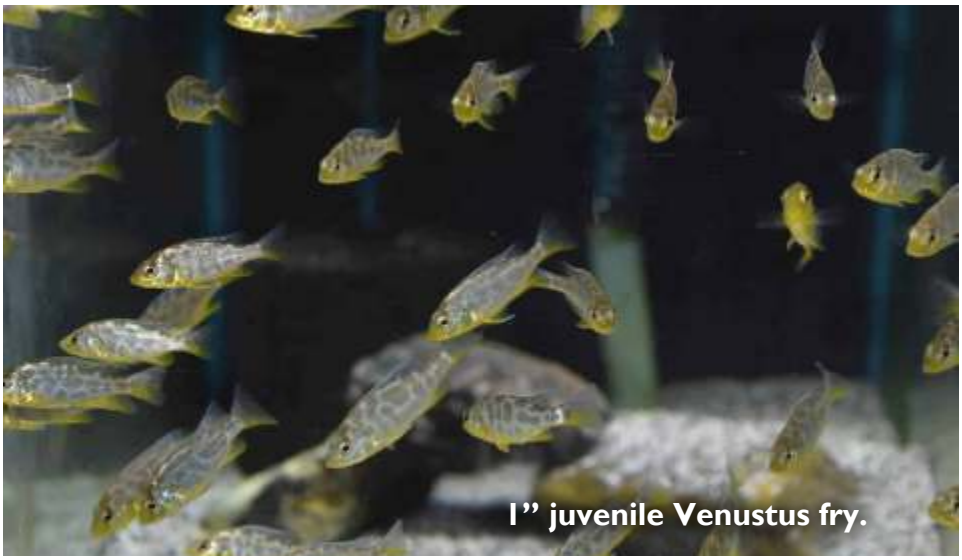
Larval Fish Development
-

By Mike Hellweg, CFN
(Certifiable Fish Nut)


1" juvenile Venustus fry.

NEARLY EVERY ISSUE I talk about breeding and raising fish, often assuming folks know what I'm talking about when I use terms like wrigglers, embryos, fry, larvae, juveniles, etc. I realize that might be a bit confusing to someone new to the hobby of breeding fish, and maybe I should take some time to define the terms and explain what they mean and even a bit about how fish grow. Some people use these terms almost interchangeably, but each has a specific meaning- and not really interchangeable.

Some of this may seem a bit basic or obvious, but let's start with the beginning. With but just a couple of known exceptions such as *Kryptolebias marmoratus* (the only known self-fertile hermaphroditic vertebrate), fish begin life as the separate gametes coming from each of their parents.

Spermatozoa or milt is contributed by the male, and eggs are contributed by the female. The way these products are combined internally or externally varies from species to species and is influenced by local water parameters, availability of food to the parents, temperature, daylight or moonlight, predators and countless other external influences.

Through the eons of evolution in their specific habitats these influences have led to a particular species' successful responses to these challenges. That means each species has evolved a preferred method of reproduction.

Ontogeny, or the development of the fish from fertilization to adult, varies from species to species and can be so radically different even in a single genus of fishes that one might wonder how they could possibly be related! Some species provide brood care; some carry the developing embryos internally (males or females!), while others just scatter their reproductive products in a wild chase and leave them to chance. There are even species like salmon and in a different but similar way the annual killies of South America and Africa that spawn and die, with their young hatching and growing up in subsequent seasons.

Embryos

Once the eggs are fertilized, embryos begin to develop during the period known as incubation. Incubation can last just a few hours as in the Dwarf Gourami, a few days as in most tetras, barbs, danios, minnows, cichlids, catfish, etc., or can last for two weeks or even more as in rainbowfish, killies and others.

In fact, some killies actually enter into a period called diapause where development stops sometimes for weeks or even months as the habitat dries out. They will remain in the state


Developing embryo in the egg

of diapause until conditions are just right for hatching. Once they do hatch, these larvae are ready to feed and care for themselves, and they need to be fed immediately.

Some fish eggs such as those of killies are large and clear. With a handheld magnifying glass, you can actually watch the embryo develop, see its heart beating, watch it move around in the egg, and eventually see it reacting to you.

Prelarvae

Some fish species will hatch early into what is known as a prelarva while other species will go through the prelarval stage while still in the egg. Some writers aptly describe these prelarvae as "slivers of glass". They still have their yolk sac attached and usually have an adhesive organ or cement gland on their heads or stomachs that allows them to adhere to solid objects such as the roof of a cave, the glass of the tank, plant leaves or other similar objects.

The yolk sac provides them the nourishment they need for the first several days of life as they complete their development. Their fins are often simple buds, and will take a few days to finish development. They also need to develop their digestive system, as the yolk continues to nourish the body directly. While they do have what appear to be eyes, these are often not completely developed.

Sometimes all they can see for the first week is light and dark or the specific movement of specific food items, and without this specific food item they will starve to death. Once they complete the development of their eyes, they can expand their diet and hunt.

While it seems like a lot to do, this early development is quick, often only taking 3 or 4 days after hatching. Once all of these things are complete, you will see these prelarvae make their first clumsy attempts at swimming. This is known as emergence. It usually takes them a day to get this down. Once they are free swimming, the yolk sac is absorbed and they need to be fed.

Wrigglers

With cichlids, we call the young at the prelarva stage wrigglers. They are completely dependent on the parents for protection. Parents often dig several pits in the substrate and gently move the wrigglers several times as they finish their development. If the parents are lost, some wrigglers may survive, but most will perish.

Mouthbrooding

Some cichlids, some catfish, the marine cardinalfish, and many Anabantoids, will take either the eggs as soon as they are laid, or the prelarvae after they have hatched into their mouths, where they will be protected in a special area of the throat called the buccal pouch. Usually the parent won't eat while brooding, but there are some exceptions.

Sometimes it is the male that performs this duty, sometimes the female, and with yet other species, both parents will share this duty. The mouthbrooding instinct is so strong that some species will even take on the eggs of unrelated species!

Once the wrigglers have reached the point where they have finished development and are ready to swim on their own, they are released into the world. Usually at this point parental care ceases, but with some species the young will return to the parent's mouth when danger threatens, sometimes for up to several weeks after release. It can be comical to watch these often fairly large young fish trying to cram into their parent's mouth.

Larvae (or Fry)

When the prelarvae have grown enough to reach emergence (when they become free swimming) they are called larvae, or what we hobbyists usually refer to as fry. This is the stage at which most young livebearers are born.

The fry usually have cryptic coloration that helps them to blend into their surroundings. It can be amazing to see that they blend in so well with their environment that the untrained eye might not see anything at all in the tank only to walk away and turn back to see a cloud of fry rise from the substrate!

In some cases the fry have no coloration at all! You can see the eyes and the stomach, but the rest of the body is clear. These larval color patterns help camouflage the fry so they are not obvious to predators and they can spend their first days eating and growing.

Fry are able to swim, hunt, and eat, and eat, and eat. They need to feed almost continuously. Some species will take commercial larval diets while others need specialized foods like infusoria, rotifers, or newly hatched brine shrimp.

As mentioned, some species will have a feeding response triggered by certain types of movement (such as the wriggling of a rotifer, or the jerky-darting motion of a copepod nauplius). These species can starve in a tank full of the wrong kind of food. It is important to research the species with which you are working to be able provide the right food for these first critical days.

Importance of Live Food

Some species of larval fish simply must have microscopic live foods, while others can go through larval development on a diet of just commercial powdered or liquid diets. We still don't completely understand why this is, but researchers are

discovering new information on a regular basis.

One thing that some nutrition researchers have discovered is that some larval fish need live foods to provide them with certain enzymes and bacterial gut fauna that they will need to help them digest different foods as they grow. Without these, they cannot digest food and slowly wither and die off, even though they are eating heartily. This usually happens at about two weeks of age.

If you are having fry of a particular species seem to be healthy and suddenly all dying at about this age, it is possibly due to their not having the proper live food in their diet.

Importance of Calcium

Another critical thing at this point is that the developing larvae are able to obtain enough calcium from the water for developing fins, bones, and scales. Some of limited amounts of calcium is absorbed from the food they eat, but much of it is extracted directly from the water in a process called ossification.

Larval fishes have specialized pores in their skin that help them to extract this vital mineral directly from the water. To keep calcium levels high in the grow out tank, it is important to do regular water changes to renew calcium and other minerals in the water.

Many breeders also add crushed coral, oyster shell, aragonite sand, or similar things to the fry tank to provide the needed minerals. It may be surprising, but this is important even to fish from blackwater habitats.

Bulging Bellies

A key thing to look for at this point in their lives is that the bellies of all of the young fish are bulging after feeding. If they are not, then it is likely that you are either not feeding enough, or you are feeding the wrong food. Experimentation will let you know when you get it right.

It can be almost comical to watch a tank full of fry for the first week or so after emergence. It literally looks like a tank full of eyes and bellies!

Juveniles

Finally, the larval fish will begin to take on color patterns that indicate they are now juveniles, or non-reproductive fish (also called fingerlings in larger fish). Sometimes the coloration is the same as adults, but in most species it is different, sometimes so different that juvenile fish and adult fish collected at the same time in the same location have been described as different species! This immature coloration will remain as they continue to grow until they reach adult size and sexual maturity. This varies from species to species, and can be as quick as 8 - 10 weeks after hatching, or as long as several years after hatching.

A few fish, such as some of the miniature Cyprinids like Celestial Pearl Danios, are precocious spawners and will be able to spawn successfully when they still have immature color patterns and have not reached anywhere near adult size.

Putting on growth

To get the quickest growth, feed several times a day and perform regular, large water changes on the fry grow out tanks. To get good fin growth, it is helpful to regularly feed foods with high keratin content like krill, shrimp, and similar foods. This is especially important when feeding juveniles of long finned varieties.

All of this food means a lot of waste products in the water, and waste products building up on the bottom of the tank. I recommend vacuuming the bottom of the grow out tank with a piece of airline tubing attached to a length of rigid airline tubing so you can avoid sucking up any fry. If you can, daily water changes are best for the first week to 10 days, then as you move the fry to larger quarters, cut it down to two or three water changes a week.

I always add a few snails to the grow out tank along with a handful of Java moss. The Java moss helps to filter the water a bit, but mainly it is covered by microscopic life which the fry will nibble on throughout the day between meals.

Once the juveniles have reached an inch or so in size, depending on species, they are ready to be moved to new homes. At this point you can share with fellow club members, friends, family and maybe even trade with local shops or sell them to other hobbyists.

...and that's also time to find another breeding project!

Follow-up:

Bloodworms and Potential Allergic Reactions in Your Dog or Cat

-

By Thomas M. Keevin

AFTER I HAD finished writing the article on bloodworms and your health, published in the July, 2020 Darter, I went back online to read more hobbyist discussions concerning bloodworm allergies in a number of additional aquarium fish discussion groups.

I wasn't thinking about the risk of severe allergic reaction to our pets, but it should be no surprise that I found a post indicating that our furry friends can also have allergic reactions to bloodworms that can be severe.

Remember the description of the allergic reaction of a girl that had accidentally eaten blood worms? :

> "..... Dr. J. Roberts presented the case of a girl who had developed anaphylaxis after accidental ingestion of residual fish food that was on her hands when she was eating dinner."

I found a similar post by a hobbyist whose dog had a similar reaction from "intentionally" ingesting bloodworms - or at least licking the package:

> "I would like to add here this warning pertains to dogs, cats and most other mammals. My pug puppy El Guapo was nearly killed by a severe reaction to chironomid larvae last Saturday after stealing an empty package from the trash. I don't know which is worse- seeing my little buddy struggling to breathe or the 600 USD I shilled out for a night at the doggy emergency hospital ICU. It took four days of drug therapy and many belly rubs to pull the little dude through. I had to do fecal exams on his poo to prove this was the issue. Nothing like playing with dog poop to set you straight. I now incinerate all bloodworm related packaging with a torch."

Our pets could potentially be susceptible to allergic reactions from all the same avenues of exposures that cause human reactions: aerial exposure to allergens; ie: dust from freeze dried bloodworms or bloodworm hemoglobin in the air, contact exposure, or ingestion. Remember the reactions of the woman that could not touch the aquarium water if the fish in the tank had been fed bloodworms or even be near her husband if he had not washed up after feeding bloodworms?

Both of these types of exposures, and accompanying allergic reactions in humans, were commonly discussed in hobbyist discussion groups. I could envision my cat stepping in a puddle of bloodworm contaminated aquarium water. The first thing he would do is drop, rollover, and lick his paws. Or how about your dog lapping up bloodworm tainted aquarium water or the cube of frozen bloodworms or a splat of bloodworms on the fish room floor that you accidentally dropped? Any self-respecting dog or cat would love to get a hold of a stinky bloodworm package and lick the heck out of it! Bottom line, you certainly don't want to feed your beloved catfish or dogfish bloodworms.

I looked for additional posts concerning bloodworm allergic reactions in dogs and cats on hobbyist discussion groups and searched the veterinary literature, but could find no additional information. This doesn't surprise me because our pets can't tell us what they have surreptitiously gotten into behind our backs. My cat wouldn't tell me even if he could!

Zoey Keevin contemplating eating bloodworms. "Hum, they smell bad- that's good, I think I'll have a little taste."

It often took a number of reactions in people before they even connected feeding their fish bloodworms and severe allergic reactions. El Guapo's veterinarian would probably be scratching their head wondering what was causing the breathing problems. El Guapo's "secret" would have gone to the grave. His life was undoubtedly saved because he was caught in the act of trash can diving by a knowledgeable hobbyist.

In the general population, the odds of a pet coming in contact with bloodworms are minuscule, but in our case, we are a subset of the population that might actually feed their fish bloodworms and the odds of contact become much greater.

I'm not trying to be an alarmist. I just want you to be aware of a potential danger of exposing your pet to bloodworms and to be careful. After all, your pet is part of the family!

Potamogeton lucens - Vegetative and inflorescence HAP Report -

By Gary Lange

I **OBTAINED THIS PLANT** from Vin Kutty, who is a famous pike cichlid keeper. *I don't think he wants the cichlid people to know that he is also an accomplished aquatic plant expert but now I've let the cat out of the bag!* He said it was quite easy.

Like many Potamogetons before that I have raised it this proved to be true. It grows just fine though in my 125 ppm GH and 2 degrees KH neutral water.

I really do like the veining pattern and ruffled look of it's leaves. Like all of the "pond weeds" this grew quite nicely in bright lights with CO_2 and also decent in a non-CO_2 aquarium. In the CO_2 tank it also sent up a spikey inflorescence.

I dutifully dusted it up and down hoping that it was self-fertile. I cut a hole in a thin piece of Styrofoam and pushed the spike through it. In this manner I hoped to obtain some seeds and not lose them if they fell into the water.

All of my aquariums are tightly covered so it stays fairly humid which is usually what is helpful in producing seeds. After 19 days I didn't see any seeds that had fallen from the spike.

With macro photography I'm also not sure whether there are any seeds there. Nonetheless I snipped the spike and placed it in a sand bed in a covered container to see if I could sprout anything. Maybe I'll find out next month if anything grows.

Meanwhile I'll wait for another spike and hope to get lucky with some seeds.

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