

June 2020

Volume 29 Issue 11

# THE FILTER



Gardneri "Misaje"  
*Fundulopanchax gardneri*

Photo Mike Jacobs . . . 2015

## TBAS Killifish Issue

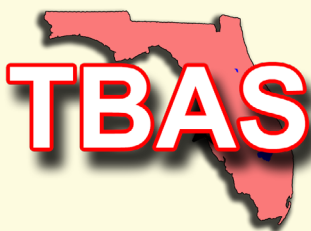
TBAS . . . Since 1992



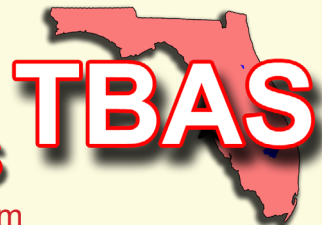
# TAMPA BAY AQUARIUM SOCIETY

## “THE FILTER”

Tampa/St. Pete, Florida



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**Killifish, Killifish, Killifish** . . . they have been a passion of mine since about 1969. Bill Dyer, in Lafayette, Indiana showed me his basement full of killifish tanks and I was off and running!!!

I was amazed at the beauty of them and **SUPER AMAZED** why I had **NEVER** seen them in a fish store EVER!!! I had been keeping and buying tropical fish since about 1951 and I had never seen a killifish. I then began hearing about the killifish and all of the rumors and stories of them and one-by-one, when I finally got into them, all of them were only about 10% true. No better or no worse than any of the other tropical fish I had. Every fish has it's quirks . . . you just have to learn aout them and then either accept them or move on to another type of fish . . . like all fish.

Killifish are beautiful, smallish and very nifty to work with . . . anything from a 2-gallon tank to a 20 gallon tank will work. Take some time and talk with some killifish keepers in the club . . . **Bill Shields, Brian Skidmore, Bruce Lilya, Charles Nunziata, Hank Darin, Mike Jacobs, Mike LoBello.**



*Mike*

Mike Jacobs, Editor TBAS Filter

*Lucania goodei*  
Blue Fin Killifish

Photo by Mike Jacobs 2001

**A FLORIDA  
KILLIFISH**

# A FLORIDA KILLIFISH

## *Floridichthys carpio*



Photo by Tony Terceira

Article by Charles Nunziata



*Floridichthys carpio* is one of two species in the genus, and is characterized by a single, spineless dorsal fin, abdominal pelvic fins, squared or rounded caudal fin and a scaly head (Robins & Ray 1986). The common name is Goldspotted Killifish and it is closely related to the pupfishes of the genus *Cyprinodon*, and the single species *Jordanella*.



*Floridichthys carpio*, Tampa Bay, Fl. male Photo by Bill Shields

*Floridichthys carpio* occurs in fresh, brackish and marine water in swamps and estuaries from southern Georgia throughout Florida and west to Louisiana. Typical habitats include seagrass beds, mangroves and salt marshes. This species aggregates into large schools in full strength and hypersaline sea water (Goldstein), and is occasionally found in freshwater, although this may be for short periods of time. Temperature

tolerance is wide, from 42 to over 100°F (Bennett).

The slowly flowing marsh and mangrove habitats of *F. carpio* periodically undergo periods of hypoxia. Sensitive to low oxygen levels (Kaill), this fish probably moves to open water during low oxygen events. *F. carpio* schools in large aquaria with many individuals. It is most hardy in marine water, but brackish water may be sufficient.

The largest male in a school may attain 3-4 inches, but all females and other males in that school will be smaller. The body of *F. carpio* is deep, short and chubby, with a convex profile (Robins & Ray 1986). The head is small. There are gray bars on the silver-blue flanks that break into spots in the rear. The lack of a dark spot at the base of the first dorsal fin ray differentiates this killifish from the similar species, *Cyprinodon variegatus*, with which it is often confused. See further comments on identifying this species later in this article.

Dominant and breeding males are more brightly colored, with yellow spots between the bars and concentrated on the back. The jaws are blue, the chin and lower mandible yellow. The operculum is also marked with yellow and blue, and there are orange-gold spots on the cheeks.

The unpaired fins are light blue, the dorsal spotted, and dorsal and caudal

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may be edged in blue or orange. The pelvic fins are cream to yellow, sometimes clear.

The female is silvery with gray bars and spots, and the unpaired fins clear to gray. *F. carpio* prefers surface feeding, but will feed at all levels on live, freeze-dried, frozen, and flake foods including spirulina (Terceira).

A 20-gallon marine aquarium equipped with killifish spawning mops for both cover and media best houses a small group (Terceira). Wildekamp recommends the use of a spawning mop that is longer than the tank is deep so that a significant portion of it lays on the bottom. (Wildekamp, 1996) Preconditioning consists of copious feedings of live foods. Eggs are deposited in the mops in the typical killifish fashion, and hatch in 14 days at 74°F. (Terceira).

The fry immediately take small newly hatched brine shrimp. A clump of plant matter may provide supplement microorganisms for these small fry. Growth is slow, maturity requires 7 months. The fry remain quietly on the bottom for weeks, so care must be taken not to remove them when changing water or removing debris (Terceira).

*F. carpio* is probably a spring breeder stimulated by temperature or photoperiod. Males tend to be territorial during breeding. (Wildekamp, 1996).

Especially young specimens of *F. carpio* can be misidentified as the sheepshead minnow, *Cyprinodon variegatus*, and vice-versa. These species are similar in shape and coloration, and may be found inhabiting the same habitats. There are differences in adults that are easily identified, but these differences are less obvious in juveniles.

The dorsal surface of *C. variegatus* is less concave, and irregular, less formed dark bands extend over most of the flanks (Robins & Ray 1986). A dark spot is present at the base of the first dorsal fin ray, which is especially prominent in young individuals and is a key to identifying *C. variegatus* from *F. carpio*. Some young males and all adults exhibit a dark edge on the caudal fin.

*C. variegatus* in breeding colors are easily identified with their intense colors; a blue nape and orange on the cheeks and throat, extending toward the abdomen. The irregular dark bands are also absent in breeding males. Adult *F. carpio* in breeding colors appear as primarily a yellow fish.

Females have an ocellus, or eyespot, on the rear of the dorsal fin. At a maximum length of 7.5 cm, sheepshead minnows also grow slightly larger than *F. carpio*, and appear somewhat more robust.

Some months ago, Dr. Glen Collier, a well-known professor at Tulsa University and a founding member of the A.K.A., asked whether the SKS could provide specimens of *Floridichthys carpio* for his ongoing DNA analysis of killifish.

Bill Shields and I, on a particularly beautiful day, seined the sea grass beds south of the Sunshine Skyway Bridge southern fishing pier. The water was calm



Approximate collecting site location, south pier rest area, Sunshine Skyway Bridge [A Google map]

and quite warm. At low tide, one can fish well away from the beach and remain in knee high water.

Only juveniles were caught initially, but as we walked south along the beach where it gives way to mangroves, the *F. carpio* became much more numerous, consisting of mostly full sized adults. Several males were in breeding color, putting on a wonderful display in the warm Florida sun.

I might add that as we walked, many blue claw crabs, with their pincers amusingly held high, scattered away from our path. It was an altogether pleasant and productive half hour or so, about the time it took to load our bucket with many more specimens than Dr. Collier needed.

Dr. Collier writes "The *Floridichthys* were very much appreciated. Tony Echelle wanted to know what their karyotype might be. Some of their relatives, (*Garmanella* and *Megupsilon*) have unusual sex-chromosomes. After he asked me about doing it, he came across a monograph by Ghedotti that, buried in an appendix, listed their chromosome

number as  $2n=48$ . I went ahead and did the karyotype and it is indeed  $2n=48$  (both sexes) - very similar to what most pupfish look like.

What may be interesting in the long run is that molecular data suggests a set of relationships that would suggest the two odd sex-chromosome situations may have arisen independently. I find that a little hard to buy. So, I don't think the story is done - other than the *Floridichthys* karyotype is verified."

Salt water killies are not as difficult as coral fishes to maintain. Typically, water changes are all that is necessary to breed and keep these fish in top shape.

Try this atypical killie, it will be an interesting and rewarding experience.

Bennett, W. and T.L. Beitinger. 1997. Temperature tolerance of the sheepshead minnow *Cyprinodon variegatus*. *Copeia* 1997(1):77-87

Goldstein, R.H., R.W. Harper. and R. Edwards 2000. *American Aquarium Fishes*. Texas A & M University Press, College Station. 235 pp.

Kaill, WM. 1967. Ecology and behavior of the cyprinodontid fishes *Jordanella floridae* (Goode & Bean), *Floridichthys carpio* (Günther) and *Cyprinodon variegatus* (Lacépède). Ph D Dissertation. Cornell University. Ithaca, NY. USA. .

Terceira, Anthony. *Floridichthys carpio*, Species Profile. *Journal of the American Killifish Association* 39 (3-4): 100-102.

Wildekamp, R. H. 1996. *A World of Killies. Atlas of the Oviparous Cyprinodontiform Fishes of the World. Vol. III.* American Killifish Association, Inc., Mishawaka, Indiana.

Robins, C.R. and G.C. Ray, 1986. *A field guide to Atlantic coast fishes of North America.* Houghton Mifflin Company, Boston, U.S.A. 354 p

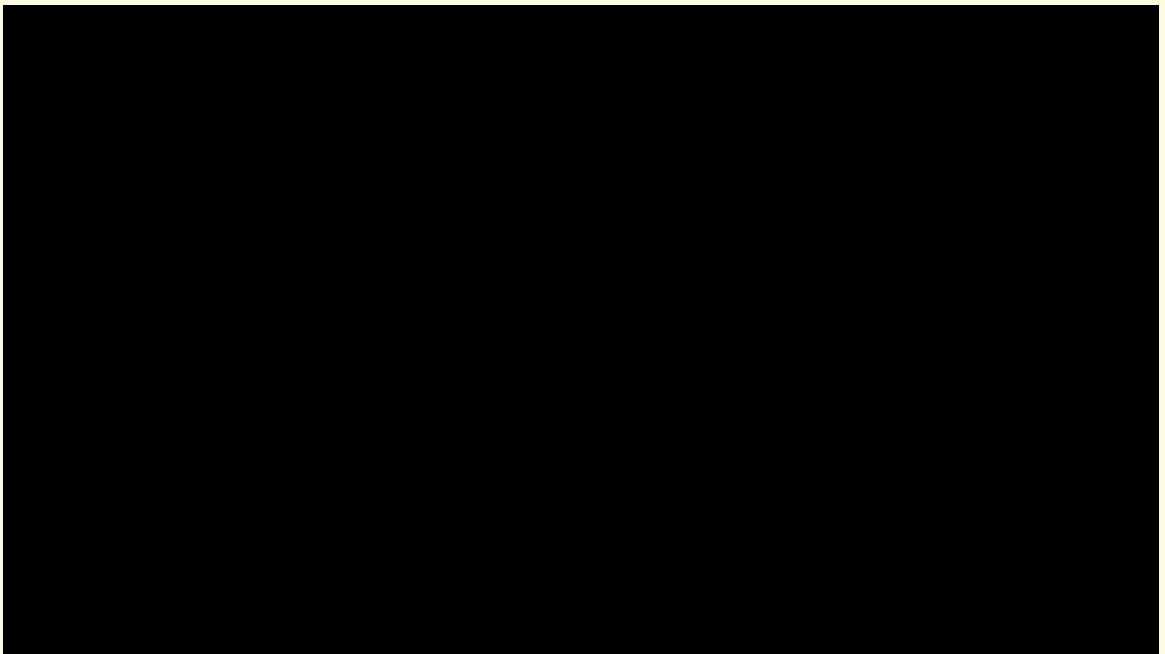
# Killifish . . . *Nothobranchius kilomberoensis* VIDEO:



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[to See Video](#)



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# KILLIFISH PHOTOS

11 photos of the  
HUNDREDS of TYPES  
of Killifish

photos by  
Mike Jacobs

## Aphyseomien:



## Epiplatys:



## Fundulopanchax:



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**Nothobranchius:**



**South American:**



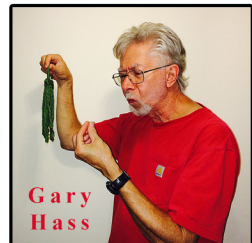
**American Killifish Association Logo Killifish:**



# THE BLUE GULARIS

## *Fundulopanchax sjoestedti*

by Gary Hass - member of the American Killifish Association



### “Too Many Blue Gularis”

by Gary Haas (Photos by the author)

After a couple of decades of not keeping fish, I decided my re-entry to the hobby last year had to include the blue gularis, my favorite fish from “back in the day”. However, Blue Gularis had become scarce, not just in local fish stores (which never stocked them, ever), but even in the monthly Fish and Egg Listing of the American Killifish Association (AKA). I, of course, rejoined the AKA and its local affiliate the Keystone Killifish Group (KKG), and at the first KKG meeting there was a trio of dwarf red Blue Gularis in the auction. And I won them at a price far lower than I was willing to pay. **YES!!!**

Nine months later, after trials and tribulations not herein described, I was ready to focus on breeding my Blue Gularis colony. I read a bunch of descriptions



A beautiful blue gularis in spectacular color



Breeders with sheltering decor

of breeding techniques, some of which are referenced at the end of this article, and talked to the breeder of my fish and KKG members with Blue Gularis experience. Blue Gularis lay eggs in mops or in a layer of peat on the tank floor. Some breeders incubate the eggs in water treated with an anti-fungal agent such as acriflavin, and fry emerge in around 3-5 weeks. Others bag the eggs with damp peat, and flood the peat around 4-6 weeks so the eggs will hatch. The merit of the peat incubation is that the fry are supposed to emerge all at once, so they are relatively uniform in size and cannibalism is minimized, and egg fungus

is supposedly easier to control due to the acidity of the peat. I chose to use peat incubation, and have to date successfully raised two distinct batches of fry consolidated from about a dozen breeding events.

### **Breeding, harvesting and incubation:**

Early attempts produced no fry and led to the death of one of the females at the hands of the male, which in turn led me to a very conservative breeding strategy that minimizes the time the pair spends together. I keep the male and female separate for conditioning, and place them in the breeding tank only when

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I want them to breed – the breeding event, or “honeymoon”. The breeders remain together for only a couple hours, or till I determine that the female is spending more time hiding than spawning. Actually, the most obvious cue to end the honeymoon is when splits begin to appear in her caudal fin, evidence that the male is no a gentleman!

The conditioning diet is several live red worms every day, supplementing the everyday diet of quality dry food. Lady gularis are worm-eating machines, converting worms to gularis eggs. The breeding tank is a 5 gallon with several spawning mops (mostly for shelter) and a mesh bottom suspended above the aquarium bottom. The eggs mostly end up on the floor of the spawning tank, not in the mops, and the mesh keeps the fish from eating the eggs.

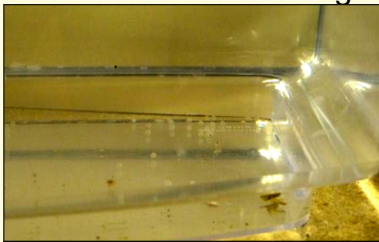
The mesh is made of 5-count plastic canvas purchased from an online needlepoint vendor. The “5 count” means 5 grid openings per inch; the more usual 7 count grid is too small for Blue Gularis eggs to pass through reliably.



Breeding set up with mesh

At the end of the honeymoon, the breeders are returned to bachelor quarters and eggs are harvested. The mesh and mops are removed and examined. Eggs are picked by hand and placed in a small plastic container of breeding tank water. The breeding tank is emptied. The last inch or so of water, which

contains most of the eggs, is poured out carefully so that the eggs remain in the last half cup of water. This half-cup is sloshed about to loosen any remaining eggs, and the eggs and water are poured into the plastic container. Eggs are then ready to be placed in peat. If I don't have time to do this right away, I



Eggs on bottom of breeding tank

add a couple drops of Maroxy anti-fungus agent (an alternative to the conventional acriflavin) to the water containing the eggs.

In the meantime, I add clean aged tap water, a cup or so, to a peat pellet, along with another couple drops of Maroxy. When the peat pellet has puffed up, I place it in a net and squeeze until it is pretty dry. (When you squeeze the peat and there are only a couple drops of water squeezed out, it is dry enough.) I place the damp peat in a jar and shake it vigorously to fluff it, and dump the fluffed peat into an open-top plastic container.



Eggs on peat

The eggs are then transferred to the surface of



Peat ready for storage

the peat, separated by 1/2" so that a fungused egg will not spread its fungus to its neighbors. I have tried using toothpicks and a test tube brush as well as my fingers to retrieve, separate, and place the sticky eggs. They stick to everything: each other, the toothpick, the peat, the finger. I'm still looking for an easy method.

When all the eggs are located on the peat, it is dumped into a labeled (species, date, and approximate count) plastic bag and sealed. (I use quart-size Ziploc freezer bags, which are made of thicker plastic than regular sandwich bags, and have a double zipper to retain moisture. You want the peat to come out of the bag about as moist as it went in.) The bag is placed in a box on a shelf in the fish room for the incubation period.

## Hatching and Raising Fry

About 5 weeks later, it's time for the eggs to hatch. The peat containing the eggs is dumped into a clear plastic shoebox-size container and covered with about an inch of clean water. Good lighting is essential to see the fry against



Hatchlings are transferred to rearing container

the dark peat, which mostly sinks to the bottom. I use side lighting by means of a flashlight and reading glasses. (Younger eyes may need less assistance.) Fry should start to appear within a day, and may continue to hatch for several days thereafter. The hardest decision is when to declare the hatch over, especially if a lot of eggs went into the bag and only a

few fry hatched. This is not uncommon in Blue Gularis as hatch rates can vary wildly from batch to batch. If I'm not satisfied with the hatch, after about a week I re-dry the peat using the squeeze-it in-the-net method, and replace it in the bag. It can be re-hydrated in another couple weeks to hatch stragglers.

I've never gotten many hatchlings after the first hydration, but if there aren't many hatchlings at first, a second try can't hurt. New hatchlings are removed to the rearing container as they hatch. I catch the fry using a dropper and transfer them to a plastic shoebox for rearing. The rearing container contains a small bunch of sphagnum moss (not peat) for shelter.

Feeding begins immediately, as the yolk is completely absorbed during incubation and the fry are free-swimming as soon as they escape the egg. Many breeders feed live brine shrimp, but I use a slurry composed of live microworms, frozen baby brine shrimp, and a touch of dry fry food. My theory is the micro-worms agitate the inanimate components, enticing the fry to try a nibble.

Whatever the reason, I have had good success in raising hatchlings using this food. Fry grow rapidly, so if the hatch goes on for several days, I start a new rearing container for late-comers so they don't get eaten by their elder siblings.

This results in a bunch of shoeboxes containing sometimes only a few fry. These get consolidated later as the size differences sort out. Water changes in the rearing containers should be frequent - at least every few days.

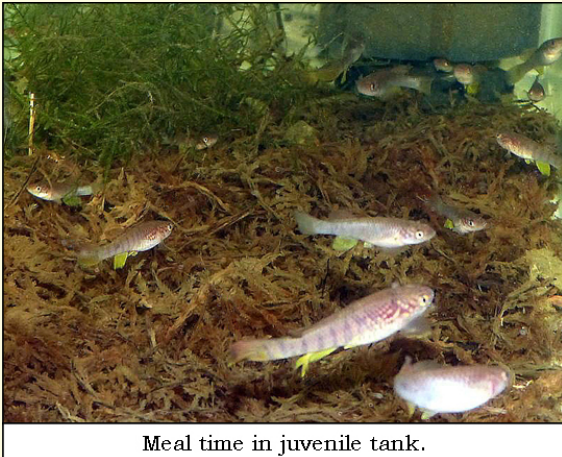
**Do as I say . . .**

On one occasion I tried to separate the eggs from the peat before rehydrating them, and succeeded in finding about 20% of the eggs that went into the bag. However, looking at the eggs told me little about whether they were ready to hatch, though it was encouraging that there were still eggs in there. I proceeded to rehydrate the eggs I had separated AND the peat they came from. I got an equal hatch from each, so I was at best half successful in locating eggs in the peat. I can't say I recommend this method, but it is possible. One problem I encountered in this experiment was that some of the eggs I had extracted from the peat didn't seem to want to hatch even after a week in water.

They were intact, not fungused, and the eyes were apparent through the egg, but the fry were apparently unable to break through the shell. I tried a couple old killifish egg-hatching tricks, bottling the eggs and carrying them in my shirt pocket for a couple hours, and adding some microworms to the egg water to agitate them.

I kept at it for about two weeks, and eggs hatched a few at a time, but some viable-looking eggs never did hatch. I think they need to be stressed somehow to weaken the egg shell, but I'm not sure how to do that.

Young Blue Gularis grow rapidly and eat rapaciously - mealtime in a juvenile tank is like a feeding frenzy, even when the meal is dry food. Loads of fun to watch. Quality dry food is supplemented with size-appropriate frozen and



Meal time in juvenile tank.

live food. At slightly over an inch (6 weeks) the males begin to show color, and by 2.5" (3 months) sibling squabbles become intense. At this point I separate the males to individual tanks. Not sure this is necessary at this point, but I don't like casualties. And thus my dilemma.

As the second batch of juveniles approaches maturity, I don't have enough 5 gal. tanks in my small fish room for all the singleton males. The current batch is destined for the AKA's

Blue Gularis study group, but I just hydrated a batch of 50 eggs, and if all goes well, by fall, once again, I'll have . . . **Too Many Blue Gularis.**

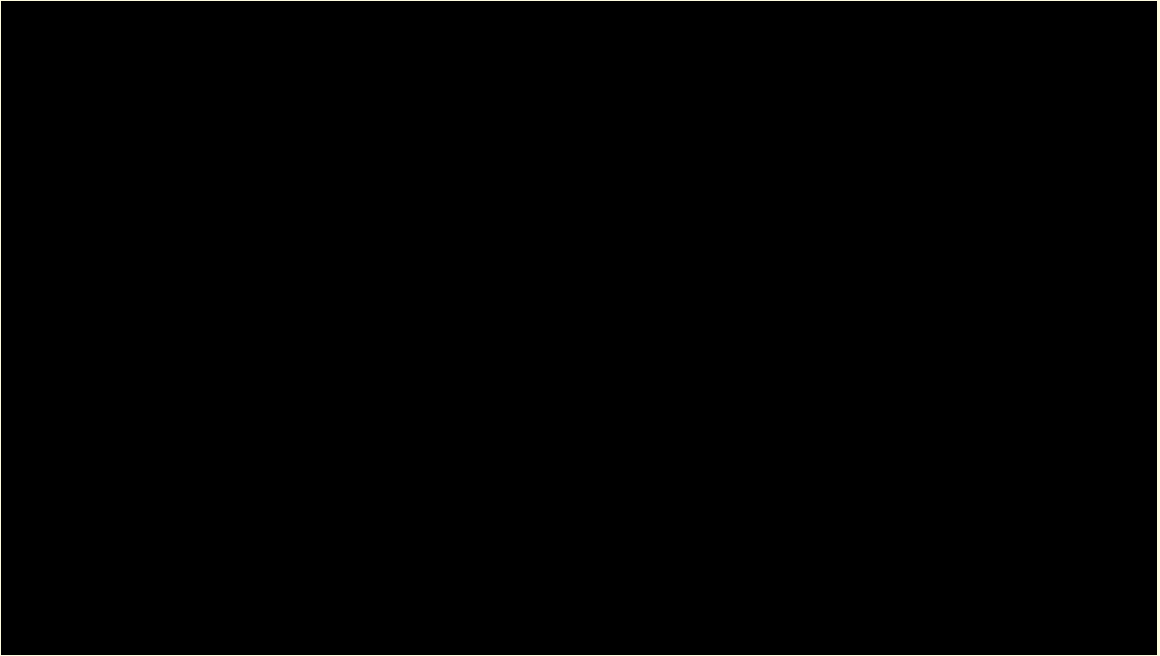
# **KILLIFISH:** **Some of THE Prettiest** **Tropical Fish**

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## Stress

Stress in life affects everything. If you put too much stress on a tree limb, it will break, opening it up to an invasion by a host of problems: birds, insects, bacteria. Stress in humans can cause

herpes, heart attacks, gray hair and many other problems. Stress in fish causes 99% of their problems. The other 1% is inherited. So the question is - what causes stress in fish?

Some types of stress we can easily see, like aggressive fish, or not enough habitat, or a tank too small. Some are a little harder to spot, like someone tapping on the tank. I was doing a water change on a tank in an office when a new employee walked in and pounded on the tank. She wanted the blue damselfish to come out for her to see. I explained that this sends shock waves through the water and is detrimental to the fish. She promptly told me this is how she calls her fish to eat and it never caused them any problems. Other stresses are difficult to see, like a powerhead or cracked heater leaking current into the water. You might feel a tingle, but it won't kill you.

The most common stress, poor water quality, is harder to see. You can't see bad water until it is too late. It is very important to know your fish and at the first sign of behavior change to test the water for problems. Even people who practice regular maintenance can have problems. I can't tell you how many times I have heard, "I just did a water change last week. The water is fine." A friend of mine who was just starting out in the hobby once said to me, "It seems the most dangerous time for the fish was during a water change." This can be so true. When the main pipeline in St. Petersburg broke several years ago, I lost an entire 70 gallon saltwater tank within 24 hours of a water change. Funny thing, none of my corals were affected. While I was taking a break from writing this article, I went to feed my fish and

discovered a dead fish. Water test showed high ammonia and high pH, but I just did a water change 4 days ago! This is my goldfish tank, so I might have changed too much filter material at one time. Testing water is the first thing to do, like taking your temperature when you don't feel well. But, what if your water is fine? Check your heaters: fish need a stable temperature. The larger the body of water, the more stable the temperature, thus the oceans change the least. Saltwater fish are more susceptible to problems caused by sudden temperature changes, as little as two degrees in 24 hours. Most freshwater fish are a little hardier, unless you are pushing your water quality.

Sometimes the problem is caused by poor nutrition, either from the breeder or the keeper. There are a lot of good prepared foods on the market. All you have to know is your fishes' requirements. Old food can be a problem. Even fish don't like stale food and most of the vitamins are gone by then. Spawning is stressful too, and often fish are lost during this time. This sometimes can't be helped (i.e., salmon die after spawning).

There are all kinds of stress we must be aware of and try to minimize in order to keep our fish happy. If stress is kept to a minimum, then our fish should live a full life span and even longer with no one around to eat them when they get weak. My rule of thumb (or fin) is that fish don't get sick for no reason, some sort of stress has caused the problem. Find the stress and get rid of it. Until next month, good fish keeping.

## GARGAS ANSWERS!!!



We all have a WOUNDEFUL opportunity!!! Joe Gargas has volunteered to take and answer all of your "WATER" and "DISCUS" questions!

You folks all know my opinion of Joe's "WATER" & "DISCUS" knowledge . . . so take advantage of this opportunity and have at it!!

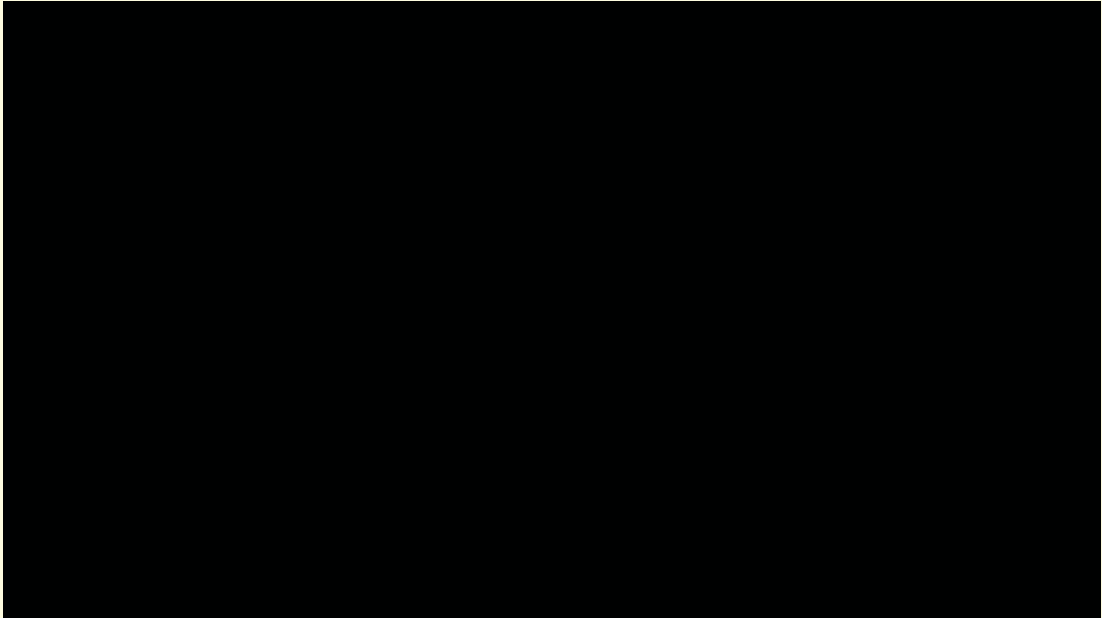
Here's Joe's email address:

[joegar@tampabay.rr.com](mailto:joegar@tampabay.rr.com) - Ask him anything

you want and let him answer. We will then publish the questions in the monthly TBAS bulletin . . . "THE FILTER" . . . **DON'T BE SHY!!**

**WHAT AN OPPORTUNITY!!!**

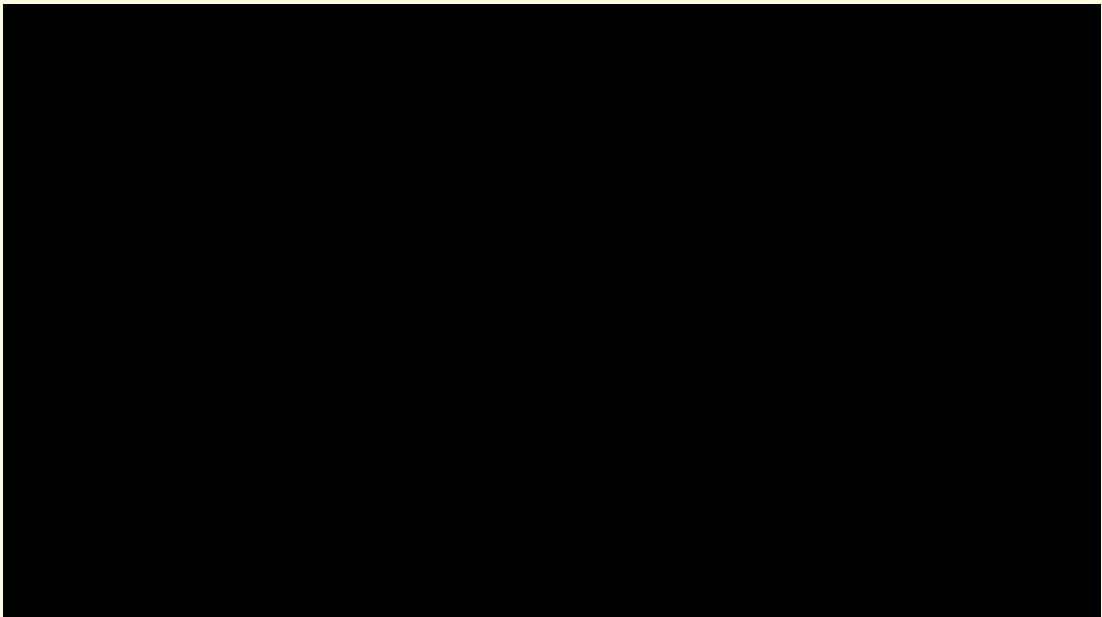
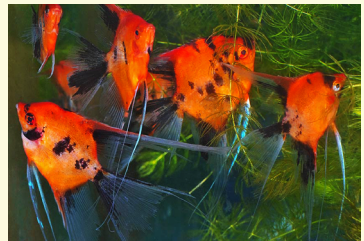




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# THE BEST KOI ANGELFISH IN THE UNIVERSE

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***Nothobranchius ravchovii* Beira 98 . . . Rachovii Killifish**

photo: Mike Jacobs 2013

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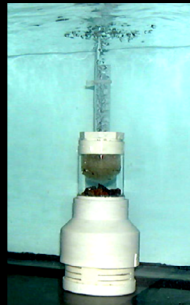
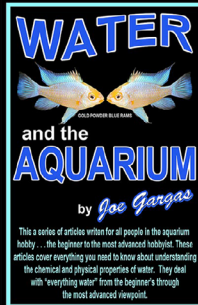
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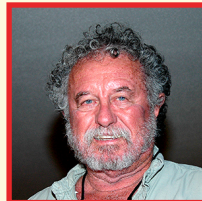
**Mollie Howell**



**Mike Jacobs**



**Dharmesh Patel**



**Bill Shields**



# TBAS

**Tampa Bay Aquarium Society  
St. Pete/Tampa, Florida**

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