Tampa Bay Aquarium Society
25 Years
St. Pete/Tampa Florida

Gold variety of an old favorite killifish: *Nothobranchius guntheri*

THE FILTER

November 2018
Volume 28 Issue 4

Photo Mike Jacobs . . . 2018

TBAS . . . Since 1992

TAMPA BAY AQUARIUM SOCIETY

"THE FILTER"

Tampa/St. Pete, Florida

TBAS TABLE of CONTENTS TBAS

Click on Title to go Directly to Item

Finally Fall is upon us!!!

November is here and we finally got a break from the heat. It is very welcomed.

I made a trip to Aquatic Experience last month in New Jersey and it was again a great show. Not as heavily attended as last year's show but still a great show.

Now that I am back in town it is time to finish up our preparations for the annual auction on November 17th in Plant City. We are going to be using a new system this year for the auction and it is online. Everyone will need to create an account at Mygroupauctions.com to sell and buy items at the auction. If you are planing to sell it is a great way to list your items ahead of time. We will have multiple stations setup at the auction but you can save time by getting registered before you show up. I will have a small presentation about the system and bagging fish at this months meeting. I am looking forward to having another huge auction!!!

Dre

Dre Alvarado, Pesident TBAS

Dre at Waterscapes!

To Table of Contents

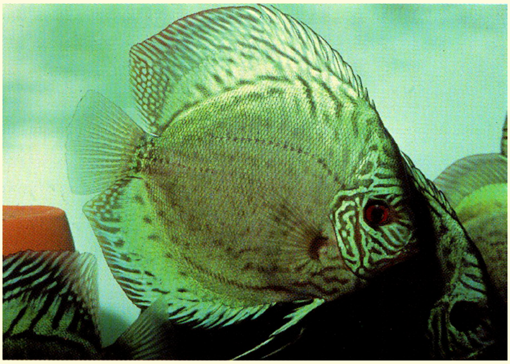
RO & CICHLIDS

Discus Photos by Joe Gargas

by Joe Gargas

www.aquaresearchcenter.com

Within the past few years, the technique of reverse osmosis has spread rapidly among breeders of fish species which require water of low ionic strength for successful fertilization and egg hatching. Among these species are killifishes, dwarf cichlids (genus ***Apistogramma***), and the species of Symphysodon, the well known discus fishes. Breeders of African Rift Lake cichlids can also use salt-free water produced by reverse osmosis to make up for evaporative losses. Additionally the aquarist who maintains Rift Lake cichlids can sometimes use the brine reject water from the reverse osmosis unit (which is very high in dissolved salts) to initially fill his tanks, as long as the water has not been treated with a water softener. I have kept these species in the brine reject water of 280 ppm hardness, and they did quite well in it. As long as the tapwater source does not contain nitrates and the right salts are present, then this will work. This article will attempt to clear up current misconceptions about this process as well as to introduce the reader to the design and operation of reverse osmosis. Chemists use certain terms to designate important characteristics of water. The most significant of these, for our purposes, are pH, total hardness, ionic strength, and alkalinity. An understanding of these terms is essential to the fish culturist.



Proper water management practices are essential for maintaining quality discus fishes of the genus Symphysodon (Gargas strain 3B is shown here).

pH is a measure of the acidity of water. Since it is the hydrogen ion, H^+, which causes acidity, pH is a measure of the concentration of the hydrogen ion, expressed as the negative value of the logarithm of the hydrogen ion concentration. Since pH is a function of the decimal logarithm, every unit change in pH reflects a tenfold change in the hydrogen ion concentration. Knowledge of this is essential to understand the effect pH has on levels of the percent of toxic molecular ammonia (NH_3), which increases tenfold for every unit increase in pH, as

To Table of Contents

non-toxic, ionic ammonia (NH^+_4) is converted to its toxic molecular form, NH_3 (Spotte, 1979).

Total hardness is the sum of the concentrations of bivalent cations, expressed as ppm of calcium carbonate, $CaCO_3$. The calcium ion (Ca^{+2}) and magnesium ion (Mg^{+2}) are the only common bivalent cations. Hardness is important since spawnings will not often occur in "hard" water; even when they do, the hatching of eggs will rarely be successful. Furthermore a high hardness is usually (but not always) accompanied by high alkalinity which acts to buffer pH at a constant level and makes it difficult to maintain pH at low levels preferred by many cichlid species.

Alkalinity is an expression related to the sum of anion concentrations capable of neutralizing acid (H^+). For aquaculture, this means carbonate ($C0_3$-2-) and bicarbonate ($HC0^-_3$). Carbonate ions exist only above a pH of 9; at lower pH values, bicarbonate ions are present. At pH levels above 9, as acid is added, hydrogen ions bond to carbonate to form bicarbonate. If pH is much less than 9, acid bonds to bicarbonate to form carbon dioxide (CO_2) and water. At a pH under 6.3, bicarbonate begins conversion to CO_2 (Jenkins and Snoeyink, 1980). Based on my experiences, fishes have difficulties eliminating CO_2 from their blood if levels in their tank water exceed 30 ppm. For this reason, it follows that pH should never be dropped quickly to 6.3 (or lower) unless alkalinity is less than 45 ppm. For alkalinities above 45 ppm, multiplying the observed value (expressed in ppm) by a factor of 0.66 yields a maximum value of free CO_2 produced. If total alkalinity is high, pH must be decreased slowly with heavy aeration so that free $C0_2$ does not exceed 30 ppm (Note: "hard" water will usually be high in bicarbonates).

Ionic strength, an expression of the total salt content of the water, equals one half the sum of the product of each ion multiplied by the square of its charge (Lewis and Randall, 1921). Since it is difficult and expensive to determine, a crude approximation of ionic strength can be gained from the total dissolved solids (TDS; see equation 1) or from the conductivity (equation 2; Jenkins and Snoeyink, 1980).

Equation 1 Ionic Strength = (0.000025) X TDS

Equation 2 Ionic Strength = (0.000016) x conductivity

A TDS-meter, though actually measuring conductivity, is calibrated with a sodium chloride (NaCl) solution, so that measurements are expressed in ppm NaCl. On the other hand, conductivity is calibrated with potassium chloride (KCl), but is expressed in micro mho/cm or micro Siemens. For interconversions between the two systems of approximation, conductivity = 1.56 x TDS (conversely, TDS = 0.64 x conductivity). Thus, a measurement of TDS or conductivity can give a crude approximation of ionic strength. Reverse osmosis lowers the ionic strength of feed water by flushing out ions of the dissolved salts present, as well as organic molecules beginning at molecular weight 30. As a result, hardness is also reduced.

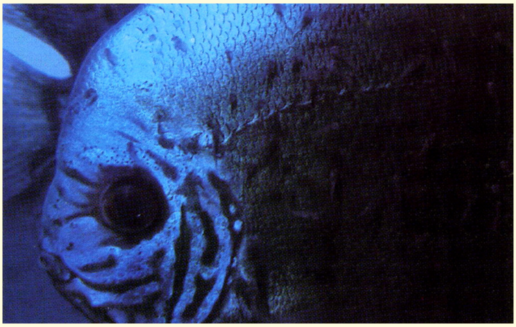
Reverse osmosis is a process whereby water is forced under pressure through a semi-permeable membrane thereby flushing out dissolved salts and most organic substances. Low molecular-weight organic compounds and dissolved gases freely pass through the membrane, but dissolved gases will not remain present long enough to create a problem, and organic compounds will not normally be present in tap water from a city water utility. In any case, a carbon filter will always be placed ahead of the membrane to protect it from chlorine and absorb organic compounds which are not highly water-soluble. The membrane will also flush out pathogenic organisms such as viruses and bacteria. As materials which cannot pass through the membrane must not be allowed to accumulate on its surface, it is necessary to continually wash the upstream side of the membrane with a flow of fresh feed water two to five times the volume of desalinated water produced (this ratio is set at the factory and will never need to be adjusted by the user). Water flushed off the high pressure side of the membrane is designated as "brine reject" since it has a relatively high dissolved-salts content.

Filtration is defined as retention of particulate matter within a solution. Contrary to popular belief, reverse osmosis is not a filtering process, but a flushing process which should never be used as a component of a filtration system. Use as a filter would require that aquarium water be fed to the unit, passed through the membrane, and then returned back to the tank in a recycle loop. A portion of the water would be eliminated as brine reject, thus continually reducing the volume of water in the aquarium as well as its ionic strength. A point would soon be reached where either fish would die of osmoregulatory stress or the tank would run out of water altogether. Also, the membrane would quickly foul without significant pre-filtering. A second common misconception is that reverse osmosis is a process similar to common household water-softening. Reverse osmosis

Many dwarf Neotropicals, such as ***Apistogramma cacatuoides***, thrive in waters of low pH and low ionic content. Photo by J. O'Malley.

To Table of Contents

results in removal of dissolved salts and molecular compounds present, producing a "softer" water as a byproduct. Water softening *per se* is accomplished by the exchange of sodium for other cations present. However, for tap water sources with hardness levels above 200 ppm, a water softener unit must be added to a reverse osmosis system to avoid clogging the pores of the membrane by high calcium concentrations. Using a sodium exchanger or water softener ahead of the reverse osmosis system will triple if not quadruple the life expectancy of the membrane. A third misconception is that fish can live in totally desalinated water produced by a reverse osmosis unit or a deionizer. The fact is that without some dissolved salts in the water, fish would not be able to retain salts in the blood and would soon die from osmotic stress as salt-free water enters the fish through the gills and skin.



Successful fertilization and egg hatching in discus require water of low ionic strength and low hardness; a male with fry of Gargas strain 3A is illustrated.

In conclusion, reverse osmosis can contribute significantly to the maintenance and breeding of a number of cichlid species. Many dwarf species of the genus ***Apistogramma*** require water of 10-30 ppm total hardness with an ionic strength of 30-100 micro Siemens and a pH of 5.5-6.5. Discus fishes (***Symphysodon)*** require water very low in ionic strength (100-300 micro Siemens), a hardness of 40-60 ppm, and a pH of 5.0-6.5 for breeding. It has been my experience that a sufficient percentage of fertilized eggs is obtainable in hard alkaline water, but the eggs do not survive to hatching as they are susceptible to attack by bacteria and fungi. It is possible that the egg membranes are weakened due to the high osmotic gradient in the presence of dissolved salts in the water. The membrane, thus weakened, is then more susceptible to bacterial attack.

Due to heavy industry and waste treatment problems, water quality around the world has decreased significantly over the past 15 years. Since the introduction of reverse osmosis to the aquarium trade, it is now possible to breed species of fishes, including cichlids, which were once considered hard to keep alive.

References Cited:

Jenkins, D., and V. Snoeyink. 1980. Water Chemistry. John Wiley & Sons, New York.

Lewis, G. N., and M. J. Randall. 1921. J. Amer. Chern. Soc., 43:1111.

Spotte, S. 1979. Fish and Invertebrate Culture. John Wiley & Sons, New York.

To Table of Contents

I talk to fish. I can't help it. I just have to talk to them. The other day a friend of mine laughed at me and said, "Where are there ears?" "Fish don't have ears," I told her. But it got my curiosity up and I looked in my books. Well, I was wrong, fish do have ears . . . inner ears to be exact. The inner ear is usually located right behind the brain and picks up high frequency sound, up to 8000 hertz (cycles per second). Some fish, like Characins, have a keen sense of hearing because the inner ear is highly developed. The swim bladder acts as a receiver and amplifier for sounds that are passed to the inner ear by means or a series of connecting bones called the **Weberian ossicles**. This allows them to sense danger quickly and to form schools.

The inner ear in fish also works much like the human inner ear in helping with balance. The fluid within the three semicircular canals triggers receptors that register turning, tilting and acceleration. This enables the fish to orientate themselves in the three dimensions within the aquatic environment.

Fish actually rely heavily on their sense of sound, which in water become pressure waves. They use the inner ear for high frequency sounds and they use their lateral line system for low frequency sounds, as low as 1/10 to 200 hertz. The lateral line consists of rows of mucous-filled sensory buds along a certain line which is located in a narrow channel beneath the skin and the scales. Some fish have more than one lateral line or an irregular lateral line. The lateral line also informs the fish on the strength and direction of currents, helps schooling fish after dark or in muddy waters and aids in migrating.

Until next month, keeping talking to your fish, they might hear you (understanding you is a different matter).

To Table of Contents

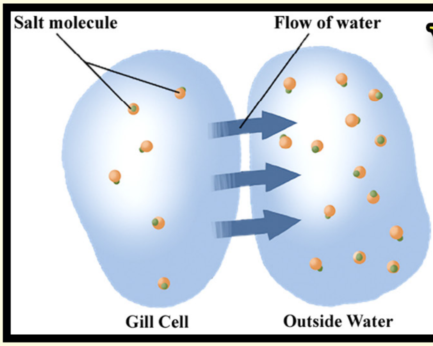
Angels Plus
www.angelsplus.com

Click on the

to See Video

THE BEST KOI ANGELFISH IN THE UNIVERSE

To Table of Contents



Wives' Tale: pH Shock!!!

by Mike Jacobs

Remember guys . . . I have been keeping tropical fish since I was about 5years old (1950)! My mom introduced me to the hobby and boy was she ever sorry about that . . . inside of 1-2 years I had 6-8 tanks in my bedroom and spawning fish and I was only 6-7 years old!!!!

Anyway . . . in all of the years of keeping fish I have heard about 10000000 wives' tales. Most people don't intentionally tell "lies" . . . they just repeat what they have been told and accept it as fact . . . they REALLY think they are helping people, really!!!!!

Well, one of the old "Wives' Tales" I had heard since about the late 1950's was that when you put "new" fish into your aquarium and within 1-12 days they die, then it's "pH Shock"!!!! I bought the story. I mean at that time I was 8-9-10 years old and who was I gonna argue with?

Well folks . . . that "wives' tale" is not true. I don't think I have ever seen a TRUE case of "pH shock". It's not generally pH shock and let's rule that out!!! Generally, maybe 98% of the time, it has to do with OSMOREGULATION! Generally the fish are coming from a conductivity problem (hardness . . . we'll talk about that and Joe Gargas is now really mad at me for saying the 2 are the same . . . ☺☺!!). Generally the fish that died is coming from a higher conductivity than your water and that presents a problem . . . sometimes a DEADLY one!!!

Let me try to explain what is going on with fish when that situation presents itself to the fish you just got somewhere.

A fish's body does so many things it's amazing . . . but let's just talk about this problem and the fish's reaction to THIS problem. A fish's body needs to be in "equilibrium" with the surrounding water . . . that's just NATURE . . . the amount of "salts" in the water has to be equal to the amount of "salts" in the fish's body. If it is not, then the fish has a problem and begins to self-correct its body, since it cannot correct the outside water and the salt on the outside. To do this the fish can either take water in or release water from its body to make the proper compensation. That's the problem!!! (salts & minerals: I use them as the same)

Ok . . . remember, the fish cannot change the "salts" in water outside of

To Table of Contents

it's body!! So let's assume you are given (buy) a fish and just plop it into your tank. Let's assume the water the fish was in had a MUCH higher "salts" content that your water. What's going to happen? The fish is going to try to REGULATE it's fluids to match the outside water . . . that's all it can do!!! Well, remember, the outside water contains MORE "salts" that the body contains so water from the fish's fluids must exit the fish's body. WHERE DOES THAT HAPPEN . . . **THROUGH THE GILLS**!!!! If the "salts" on the outside are just a little bit more concentrated then that's not a problem . . . the fish will allow water to **exit** through its GILLS and everyone is happy. The problem is if the water contains a way higher concentration of "salts" . . . now the **exit** of was is happening **BIG TIME** through the gills AND THEY CAN'T TAKE IT!!!!! What happens is the gill cells will burst and burst and burst and burst until the fish can no longer breathe and that's the classic symptom of the OLD "Wives' Tale - pH Shock" . . . the fish will go to the top of the water and try breathing like a betta does and they gulp and gulp and gulp air, unsuccessfully, until they eventually die!!

The process of dying can start within minutes if the outside concentration of "salts" is **WAY** higher than what the fish was in up to 10-12-14 days in some cases and you won't even notice what the heck is going. That last case would happen if the amount of "salts" they were in is not a tremendous difference between your water.

Ok . . . trust me folks . . . this is a matter of the water from within the fish's body trying to get out of the fish's body and it happens through the gill cells and the gill cells will burst if the difference is too much . . . literally.

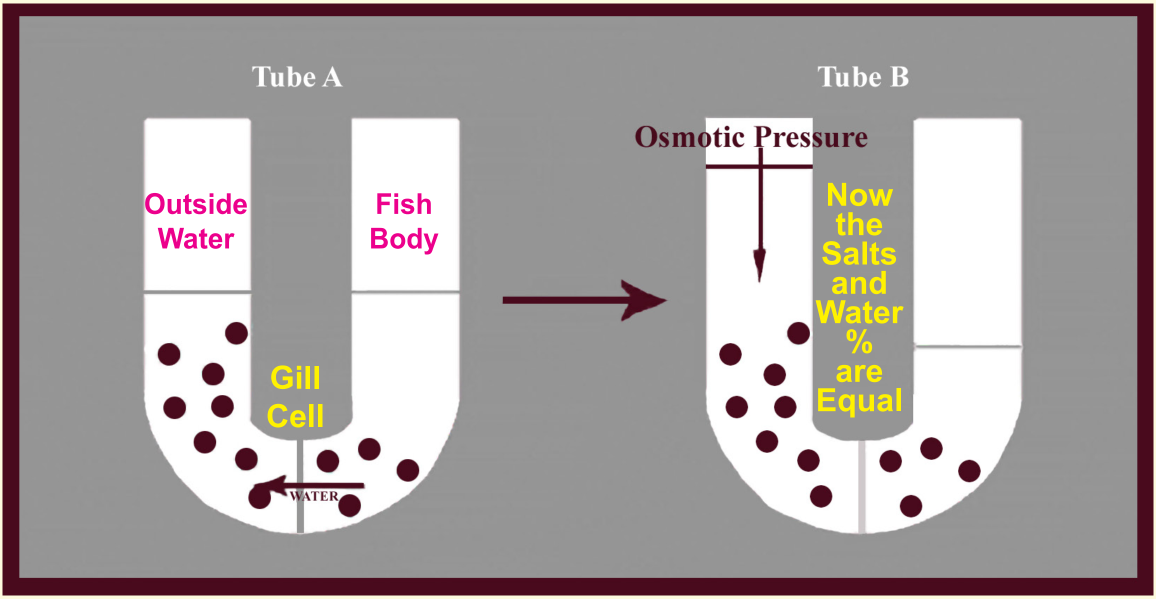
Ok . . . that's the problem . . . what are the parameters within which you can get fish from people and stores and be safe? Well, first you have to have some way to check the water. Answer: a **CONDUCTIVITY METER** (right). They are smallish (6-7 inches long and 1 inch wide by ½ inch deep . . . or so. If you don't know the conductivity of the water they are coming from then you MUST at least have a conductivity meter at home and measure the water they are in. My St. Petersburg, Florida water is about 550uS (uS – symbol for Microsiemens the units used by a conductivity meter) and that is kinda normal for West Coast Florida city water. If you get a fish from a store and the bag shows 4000+uS . . . that fish will likely be dead in 4-6-8 days or so. If you are getting the fish from a friend and they know what they are doing then you probably aren't going to have a problem. This problem is a relative problem usually with fish from a fish store. Be very careful with them . . . I am **NOT SAYING DON'T BUY FROM THEM** but if you have the fish home and your conductivity meter shows 4-5 times the conductivity reading then TAKE YOUR TIME acclimating your fish to your water.

To Table of Contents

Put them in a 1-2 gallon plastic tank and put 1/3 of the total water in every ½ - 1 hour for a day or 2 depending on the difference in the meter reading and all will be fine!

Lastly, how about going the other way with the conductivity . . . lower "salts" level to higher "salts" concentration. That's not even close to the problem of going the other way. What happens then the fish is going from higher concentrations to lower concentrations . . . **the gill cells burst from too much water trying to escape too quickly** . . . going the other way the cells just accept the INFLUX of water through the gill cells kinda normally . . . who am I to argue with Mother Nature!!

The following diagram is from Steve Rybici's website "Angles Plus" showing the water flowing from a lesser concentration (fish's body) to a higher concentration (outside water):



To Table of Contents

Nothobranchius kilomberoensis

Killifish

Killifish Video

Click on the ▶ to See Video

To Table of Contents

"Deepwater Creek" . . . *Melanotaenia splendida subsp. splendida*

photo: Mike Jacobs 2018

To Table of Contents

Supporters of TBAS

Tampa Bay Wholesalers: Tropical Fish

alphabetical order

1) 5D Tropical Fish
2) Segrest Farms

Tampa Bay Tropical Fish Farmers:

alphabetical order

1) Amazon Exotics
2) BioAquatix
3) Carter's Fish Hatchery
4) FishEye Aquatics
5) Golden Pond
6) Imperial Tropicals
7) Lile's Tropical Fish
8) V-W Tropicals

BRINE SHRIMP DIRECT

TANK TESTED PRODUCTS

YOUR DIRECT SOURCE FOR ALL OF YOUR TROPICAL FISH FEED REQUIREMENTS - FROM FROZEN FEEDS, FLAKES AND PELLETS TO ENRICHMENT PRODUCTS, FREEZE-DRIED FOODS AND, OF COURSE, BRINE SHRIMP EGGS.

INTRODUCING SLOW SINKING FRESHWATER PELLETS

(WITH ASTAXANTHIN FOR VIBRANT COLORS)

FOR CLUB DISCOUNT, USE THE FOLLOWING CODE AT CHECK-OUT: TBAS5

www.brineshrimpdirect.com

TOLL FREE 800-303-7914

VORTEX

Innerspace Products

To Table of Contents

JBJ
U.S.A
Website: www.jbjlighting.com

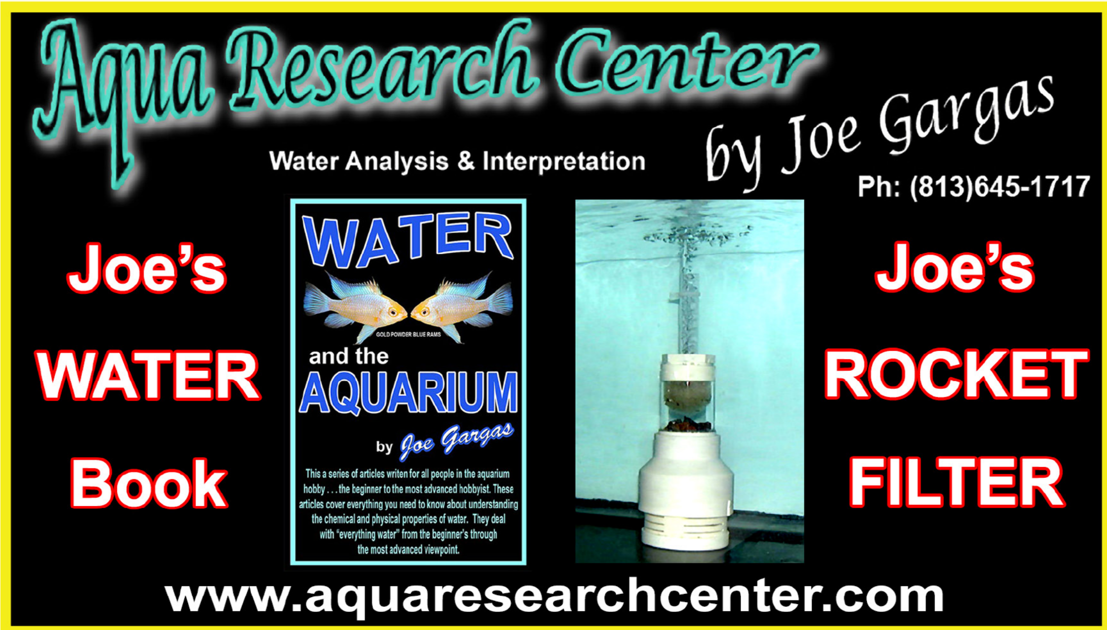
SAVE YOUR FISH
ZOO MED
AQUATIC

MARINELAND

Tetra®

COBALT™
AQUATICS

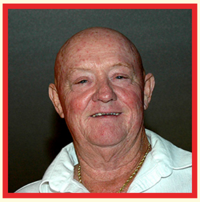
To Table of Contents



To Table of Contents

TAMPA BAY AQUARIUM SOCIETY OFFICERS

PRESIDENT
Dre Alvarado



V. PRESIDENT
Randy Hann

SECRETARY
Gary Foster

TREASURER
Patty Moncrief

BOARD OF DIRECTORS

Joe Gargas

Mollie Howell

Mike Jacobs

Bill Shields

Al Starkey

To Table of Contents

TAMPA BAY
AQUARIUM
SOCIETY
25 Years
ST. PETE/TAMPA
FLORIDA

TBAS

Tampa Bay Aquarium Society
St. Pete/Tampa, Florida

Website: www.tbas1.com

FORUM: www.tbas1.com/forum

To Table of Contents