Tampa Bay Aquarium Society

25 Years

St. Pete/Tampa Florida

THE FILTER

TBAS . . . Since 1992

Xiphophorus helleri
Assorted Swordtails

JANUARY MEETING:
No Speaker!!
PLANT Auction

January 2018
Volume 27 Issue 6

Photo Mike Jacobs . . . 2017

TAMPA BAY AQUARIUM SOCIETY

"THE FILTER"

Tampa/St. Pete, Florida

TBAS

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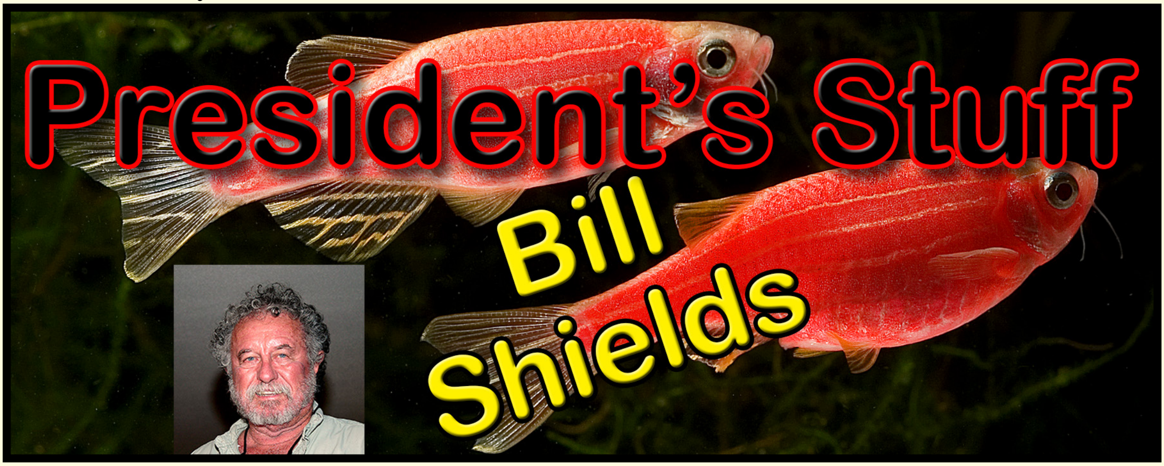

Hope you had a great holiday season with your family and friends. Thanks again for making it another wonderful Christmas party. As always Mike Jacob's picture quiz was a fun time for all.

We had an exceptional Christmas with my family coming for Christmas day. Thanks to Charlie Nunziata for the 125 gal tank set up that had to be removed from his former work place as they were remodeling. My son Andrew brought along his pet mini pig Rudy and my great niece and nephew were thrilled.

Do not forget to get your entries in for the Florida State Fair Aquarium Beautiful Competition. Go to http://www.floridastatefair.com/p/about/435. The deadline is January 5, 2018. The TBAS pays for all youth entries so if you have any youth entries we will pay the $3 entry fee.

This month is our annual all plant auctions; remember no dry goods or fish this month. Get your surplus plants ready and make up your wish list. The club will have plenty of great plants for the auction as well as the plants the members will be bringing in for auction.

Also we will be partnering with the Florida Betta Club in May to do a betta show and presentation. We will post more information as we work out the final details. This will give those of us that have never been to a judged bench show a chance to participate or just observe.

Bill

Bill Shields, President, TBAS

Xiphophorus variatus
Hli-fin Variatus
Photo by Mike Jacobs 2017

TBAS Had a CHRISTMAS Party

Photos by Ludo & Mike

There was FOOD everywhere . . .

There was FUN everywhere!!!

Everyone had a GREAT time . . . and look at what TBAS brought for the local kids . . . I am so PROUD of TBAS!!!

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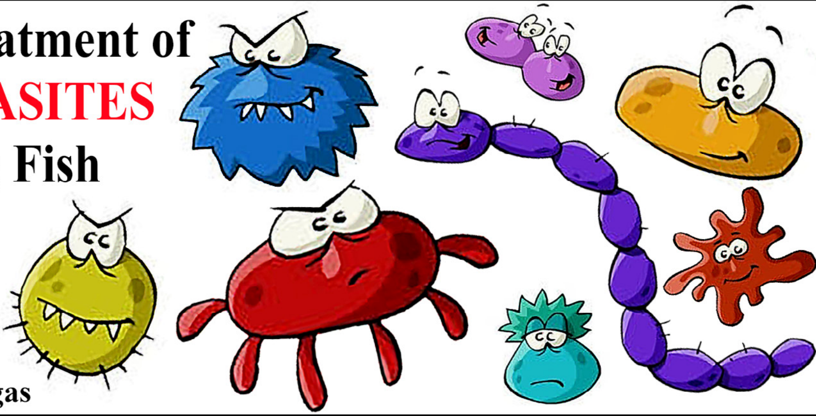
Chemical Treatment of ECTOPARASITES Afflicting Fish

by Joe Gargas



Introduction

The inorganic chemicals commonly employed in the aquaculture industry for the control of fish pathogens and parasites include: salt, copper, formaldehyde, dyes such as Malachite Green and methylene blue, and oxidants such as permanganate and chlorite. These chemicals are inexpensive and remarkably effective against bacteria, fungi, protozoans, and ectoparasites.

Fish afflicted with gill parasites will display a higher rate of respiration. This is the first symptom indicating treatment is necessary. The normal respiration rate for discus at 28° C., 82° F. , is 60 gill flaps per minute. If the parasites are not controlled, the deteriorating health of the fish will be indicated by a darkening in coloration, lack of appetite, and scraping against objects if skin parasites are present.

Water Quality

Cultured fish often suffer more from poor water quality than they do from diseases. What is even more important is that poor water quality is what causes outbreaks of pathological forms of the bacterial diseases such as Columnaris or Aeromonas. Since these bacteria are part of the natural flora of all aquatic systems , they are always present; therefore, all that is required for their rapid propagation is an excess of uneaten food particles or metabolic waste products which serve as nutrients for these bacteria. Moreover, a large reduction in water quality will act to depress the immune response of the fish so that it is more easily attacked by pathogenic forms of these fast multiplying gram negative pathogens.

Whenever the fish do not appear to be healthy, the first thing to do is to perform the complete range of water tests to include ammonia, nitrites, and pH.

Whenever diseases are being treated it is advisable to •make large daily water changes to maintain a high degree of water quality. This is especially important in the case of bacterial diseases due to their very high rates of propagation. Fresh-

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water also ensures a very low concentration of metabolic waste products in the water thus increasing the efficacy of chemicals to control these diseases.

pH

pH is the most important variable in water quality because it controls so many other chemical equilibria:

(1) Equilibria between non toxic ionic ammonia, $NH4^+$, and toxic molecular ammonia, NH_3.

(2) Equilibrium between nitrite ion, $N0_2^-$, and nitrous acid, $HN0_2$.

(3) Equilibrium between bicarbonate ion $HC0_3^-$, and carbon dioxide, $C0_2$.

Ionic/Molecular Equilibria of Ammonia and Nitrite

The higher the pH, the higher the fraction of ammonia in the toxic molecular form. The lower the pH, the higher the concentration of nitrites in the form of nitrous acid. Nitrite ion (nitrites) will not be very toxic at high ionic strength (high concentration of dissolved salts). Chlorides are particularly effective in offsetting nitrite ion toxicity, but if the pH is less than 6.0, then most of the nitrites are in the form of molecular nitrous acid, which is toxic regardless of ionic strength. As a general rule, it is best to keep the pH above 6.0 to prevent cessation of nitrification (Collins, Gratzek, Shotts, 1975).

Bacterial Toxins

Bacteria secrete toxic proteins and various enzymes including hemolytic enzymes (which break down red blood cells) and protease enzymes (which break down proteins), but most of the toxic effect comes from the hemolytic enzymes (Roberts, 1982, p. 139).

Exotoxins

An exotoxin is any extracellular protein formed by bacteria, they are neurotoxic, they appear to be proteins, and they are denatured by heat and destroyed by protelytic enzymes with the exception of botulism toxin. Treatment with formaldehyde destroys their toxic qualities but not their antigenic properties (International Dictionary of Medicine, 1986).

Endotoxins

This lipoploysaccharide, also called bacterial pyrogen, occurs in the outer membrane of the cell wall of Gram negative bacteria; unlike the specific exotoxins, endotoxins from various organisms have similar pathogenic effects (International Dictionary of Medicine, 1986).

Chemical Treatment of Toxins

Bacterial toxins can be removed from the water with activated carbon, but in the case where the bacteria are growing in or on the fish, the toxins rapidly diffuse into the fish tissue before they are removed from the water.

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Many aquaculture chemicals rapidly alkylate, oxidize or otherwise denature bacterial toxins. Permanganate is the fastest acting and will rapidly oxidize bacterial toxins down to non-toxic, and readily biodegradable products.

Bacterial Resistance to Antibiotics

New antibiotics are initially very successful but after repetitive use, they lose their effectiveness as the bacterial populations develop tolerance towards them.

Aeromonas hydrophila, and *Flexibacter columnaris* were sensitive to oxytetracycline at less than 4 ppb (parts per billion), but not to erythromycin at less than 16 ppb. *Pseudomonas jluorescens* was found to be susceptible to oxytetracycline at 4 ppb, but not to erythromycin or chloramphenicol at less than 16 ppb (parts per billion) (Nusbaum, 1981).

In another study it was demonstrated that *Aeromonas hydrophila* could develop resistance to Nifurpirinol (Furanace) in vitro culture. *A. hydrophila* which grew at 0 .25 ppm were capable of growing at 2 ppm; and colonies taken from plates containing 0.5 ppm Furanace grew well on plates containing 5 ppm (Mitchell & Plumb, 1980).

Experiments such as these demonstrate the potential for bacteria to quickly develop resistance to new antibiotics. The fish culturist can prevent the spread of antibiotic resistant bacteria into the environment by adding a small quantity of bleach to water which has been treated with antibiotics before disposing of the water. The bleach will quickly kill any resistant microorganisms remaining in the water.

Effects of Aquacultural Chemicals and Antibiotics on Nitrification

Treatment of freshwater recirculating systems with formalin at 25 ppm , copper at 0.4 ppm, potassium permanganate at 4 ppm, and sodium chloride at 5,000 ppm, had no effect on nitrification (Collins, et. al., 1975). In seawater some inhibition of nitrite oxidation was observed at 0.3 ppm copper, but nitrite oxidation resumed after a water change to remove copper (Bower and Turner, 1982).

Chloramphenicol

In freshwater, Chloramphenicol did not inhibit ammonia oxidation at 50 ppm (Collins et. a!., 1976). In seawater Chloramphenicol at 13 ppm had no effect upon nitrite oxidation , but it caused a slight inhibition of ammonia oxidation; normal nitrification resumed after it was removed from the water (Bower and Turner, 1982).

Erythromycin

Nitrification stopped for 14 days after addition of a single dose of Erythromycin at 50 ppm (Collins et. al., 1976).

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Gentamycin Sulfate
Nitrification was not affected in seawater at 5.3 ppm Gentamycin Sulfate (Bower and Turner, 1982).

Malachite Green
Malachite Green either alone or in combination with 25 ppm formalin did not inhibit nitrification at a concentration of 0.1 ppm of the dye (Collins, et. al., 1975).

Methylene Blue
A single dose of Methylene Blue at 5 ppm resulted in a complete cessation of nitrification for 16 days (Collins, et. a!., 1975).

Neomycin Sulfate
In seawater, ammonia oxidation was inhibited at 66 ppm Neomycin Sulfate; moreover, nitrite oxidation was severely inhibited and did not recover even after a water change to remove Neomycin Sulfate. It took six to seven weeks for nitrite oxidation to recover, indicating that Neomycin Sulfate is lethal to nitrite oxidizing bacteria in seawater (Bower and Turner, 1982).

Nifurpirinol (Furanace)
Nitrification was not affected by Nifurpirinol in freshwater at 1 ppm (Collins, et. al., 1976) nor in seawater at 0.1 ppm (Bower and Turner, 1982) .

Oxytetracycline
Nitrification was not affected by Oxytetracycline in freshwater at50 ppm (Collins, et. al., 1976).

Quinacrine Hydrochloride
Nitrification was not affected in seawater at 12 ppm Quinacrine Hydrochloride (Bower and Turner, 1982).

Sulfamerazine
Nitrification was not affected by Sulfamerazine in freshwater at 50 ppm (Collins , et. al., 1976).

SALT

Sodium Chloride, NaCl
Sodium Chloride, or common salt, is the simplest treatment for ectoparasites. The cheapest salt suitable for aquacultural uses is the common rock salt which can be purchased from builder’ s supply outlets.

Salt is chemically inert, meaning that it does not react with other compounds present in the water. This means that it can be used freely in the presence of other chemicals such as copper, formaldehyde, or permanganate. It is even advisable to use some salt along with strong oxidants which cause loss of slime such as permanganate. It is also advisable to use salt in cases where nitrites are high , but the pH must be higher than 6.0, since chlorides cannot offset nitrous acid toxicity.

Osmotic Mode of Action of Salt

Water diffuses in the direction of increasing ionic strength (increasing salinity), so that a semi-permeable membrane which has freshwater on one side and saltwater on the other side will experience a pressure (osmotic pressure) difference across the membrane. The membrane will swell out towards the saltwater side as the freshwater begins diffusing in the direction of increasing ionic strength. This phenomenon is known as osmosis.

The parasiticidal effects of salt are achieved through the sudden change in ionic strength that occurs when a fish is taken from fresh water and dipped into salt water, or when a marine fish is taken from salt water and dipped into fresh water. Fish can withstand an instantaneous rise or fall in ionic strength much better than their unicellular protozoan parasites. The protozoan cannot osmoregulate quickly enough by means of its contractile vacuole to respond to such a sudden change in ionic strength. Sudden changes in ionic strength exert such large osmotic pressure differences across the cellular membrane of the protozoan, that the membrane can rupture as water suddenly tries to diffuse in or out of the unicellular protozoan depending upon whether the ionic strength increased or decreased.

Freshwater protozoan such as Trichodinids and particularly *Ichthyobodo necator* (Costia) have been found parasitizing saltwater fish. *I. necator*, in particular, is a problem, since it infects salmonids hatched in freshwater and remains with them during their gradual transition to saltwater (Cone & Wiles, 1984). Due to the ability of these protozoans to adjust to high salinities over time, salt can only be effective when used as a dip where change in ionic strength occurs instantaneously, and the protozoan does not have time to adapt.

Saturated Solutions of NaCl for Preparing Dips

The solubility of sodium chloride in water, which is only slightly temperature dependent, is 36g per 100 ml (CRC Handbook, p. 8 223). One ml of saturated saltwater per liter equals 360 ppm NaCl. Table I can be used as a guide for preparing accurate salt concentrations in the dips.

Salt dips may have to be repeated at intervals to be successful. With juvenile discus a salt concentration of 1000 ppm NaCl in the water is recommended. The fish should be at least 2 em in diameter for this concentration of salt. Larger discus can be dipped in 2500 ppm salt and should be removed when they start to turn dark or display any other signs of distress. This will usually happen within a few minutes. To avoid reinfestation with parasites, the fish should not be returned

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to the tank from which it came until that tank has been cleaned out with a strong solution of bleach to kill the remaining protozoans.

TABLE 1

Sodium Chloride Concentrations based on Addition of Saturated salt Solution

ml sat. salt water	per volume of tank water	ppm NaCl	ppm Na	ppm Cl
1	I liter	360	141	218
25	10 liter	900	354	546
1	1 gallon	95	37	57
5	1 gallon	475	187	289
10	I gallon	951	374	577
15	1 gallon	1427	561	866
25	1 gallon	2377	935	1443

COPPER

Free Copper Ion, Cu^{++}

Copper for aquaculture use is most commonly employed in the form of the hydrated blue crystals of copper sulfate, $CuS0_4$-$5H_20$ containing five molecules of adsorbed water.

Chemical Mode of Action

The chemical mode of action of copper ion is to bind to the sulfhydryl group (RSH), where R is the protein molecule, S is the attached sulfur atom, and H is the hydrogen atom attached to the sulfur. The copper ion binds directly to the sulfur in the proteins of external membranes to form $RSCu^+$ which is called a metallothionein . This, of course, denatures the proteins so that they cannot assume the shape required for them to perform their normal functions. Copper ion will also attach to the RSH groups of bacterial toxins.

The efficacy of copper against a particular pathogen depends upon how much sulfur is present in the membrane proteins and how close to the outer surface of the protein molecule the RSH groups are.

Water Chemistry and Copper Ion

When using free (unchelated) copper ion , the concentration must be adjusted, depending upon the pH and hardness. The lower the pH and hardness are, the less copper that should be used . In freshwater, a concentration of 0.1 to 0.2 ppm of copper ion (Cu^{+2}) is recommended.

If the hardness is less than 50 ppm, one should stay to the lower limit of this range. Monitoring of concentration and addition of makeup copper will be necessary on a daily basis, since copper binds to organic and some inorganic matter, and is complexed (chelated) by humic acids and is taken up by living organisms (Bower and Turner, 1982). Copper ion will not inhibit nitrification at 0.4 ppm Cu^{++} in water of 30 ppm hardness (Collins, et. al., 1975).

Monitoring of Copper Ion Concentration

Free copper ion will be faster and more effective than chelated copper, however, an accurate copper test kit will be absolutely necessary to monitor the copper concentration which should be maintained at 0.1 ppm for a water hardness of 50 ppm CaC03 . In hard water copper concentrations can be doubled at most; however, caution must be observed with small fry due to possible interferences with their olfactory and visual senses limiting their ability to find food. The daily addition of small amounts of copper will be necessary to maintain the copper concentration as indicated by the test kit, since non-chelated copper rapidly comes out of solution. Also, where a parasitic infestation is already advanced, much quicker results can be obtained with free copper ion.

Toxicity of Copper to Fish

Although copper has toxic effects, fish develop a tolerance towards it, and they will eliminate accumulated copper once they are returned to copper free water (Lauren and McDonald, 1987).

Behavioral Response

Coho salmon exposed to sublethal doses of copper [1/4 and 1/2 LC_{50} (LC_{50} is the concentration lethal to 50% of the test fish)] initially lost appetite and their growth rate decreased or ceased altogether. Recovery of appetite and growth rate was faster in fish exposed to ¼ of the LC_{50} than in fish exposed to ½ of the LC_{50} (Buckley, et. al., 1982).

Site of Toxic Effects

The primary site of sublethal copper toxicity in the rainbow trout is the gills, with increasing copper concentrations inhibiting the uptake of sodium ion, Na^+, across the gill epithelium (Lauren and McDonald, 1987).

Copper has been shown to cause corneal damage to the eyes of the larvae of Striped Bass (Marone saxatilis) at concentrations above 0.08 ppm Cu^{++} over a 24 hour exposure period. Concentrations of 0.15 ppm Cu^{++} caused severe disruption of the corneal surface, while concentrations of 0.06 ppm caused no damage. The tests were conducted at a pH of 7.0, and a temperature of 20°C, 68°F (Bodammer, 1985). No mention was made of whether the corneal damage might be permanent or whether it would heal after Cu^{++} concentrations dropped. In another study, it was reported that the olfactory organs of two species of marine fish larvae were damaged by exposure to copper. Damage to the eye or olfactory organs could impair the ability of the larvae to feed (Bodammer, 1985).

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Acclimation to Copper

Prior exposure to sublethal doses of copper ion can lead to tolerances three times higher than in fish not previously exposed to copper. Temporary loss of appetite and growth rate, followed by recovery to nearly normal growth rate has also been reported in rainbow trout and brown trout (Buckely, et. al., 1987). One study showed that growth rates approached normal within 40 days of exposure to 0.23 ppm Cu^{++} in very hard and alkaline water (Lett, et. al., 1976). In another study, growth rates began to approach normal in Coho salmon at about the time that the concentration of liver copper became constant (Buckely, et. al., 1982).

One mechanism of acclimation to copper is for the fish to increase the amount of copper binding sulfhydryl proteins so as to tie up more copper as metallothioneins, (RS-Cu-SR) where R is a protein molecule with an attached sulfur. Trout began to produce more sulfhydryl rich proteins within seven days of exposure to copper, moreover the concentration of these copper binding proteins stayed at a relatively high constant level (Lauren and McDonald, 1987).

Accumulation of Copper

Copper accumulation is highest in the liver and other tissues also accumulate copper, although the amount of copper accumulated in the kidney, spleen, gut, and brain is very low compared to that accumulated in the liver and muscle (Lauren and McDonald, 1987).

Elimination of Copper

Fish will lose copper at approximately the same rate at which they originally accumulated it once they have been returned to copper free water. Seven days after exposure to sublethal copper ion concentrations, the whole body sodium ion, Na^+ concentrations in juvenile trout had returned to normal, and by 28 days after exposure to sublethal copper ion concentrations, sodium uptake across the gills had returned to normal (Lauren and McDonald, 1987).

Chelated Copper

The copper solutions available at the aquarium shops formerly contained chelants such as EDT A, (ethylene diamine tetraacetic acid), and citric acid, but recently these have been replaced by the phosphonates.

Mechanism of Chelation

All chelants act in the same way , the functional groups of the chelant molecule: amines, carboxylates, phosphates, etc., attach to the ligating points of the metal ion. For most of the functional groups to be attached to the ligating points of the ion, the chelant molecule must wrap itself around the ion, thus shielding the ion from substances in the water which would otherwise precipitate it out of solution. This way the copper ion does not come out of the water so fast, and the copper concentration is much more stable, of course it is also much less effective this way.

EDTA contains four carboxycylic acid (carboxylate) groups, and two amino groups, hence the name ethylene diamine tetraacetic acid. The phosphonates contain phosphate groups which attach to the ligating points of the copper ion.

Water Chemistry and Chelated Copper
When using chelated copper, the pH and hardness of the water are not very important since the chelant will keep the copper ion in solution regardless of the water chemistry. Only the free (unchelated) copper ion is chemically active, and at any given instant only a very small fraction of the copper ions will be free of the chelant so that they can be effective against pathogenic organisms.

The chelant is slowly metabolized by bacteria in the tank , thereby releasing the copper ion. Generally, 2 ppm of chelated copper should be used to inhibit proliferation of pathogens. Where infestations are already established it is advisable to treat with free copper ion for quicker results.

SILVER

Silver ion, Ag^+
Silver ion in the form of silver nitrate is not used in commercial aquaculture, but there are some aquarium preparations which contain it. Its mode of action and effects resemble those of copper. It has been demonstrated as extremely effective against *Ichthyophthirius multifiliis* where it eradicated 100% of the free swimming tomites in 15 seconds at a silver nitrate concentration of 0.67 ppm, which corresponds to a silver ion, Ag^+, concentration of 0.42 ppm (Farley & Heckman, 1980).

Toxicity
The highest concentration of silver ion which did not affect survival or growth of the larvae of the winter flounder was 54 ppb (parts per billion) or 0.54 ppm. This study however, was conducted in seawater where the high pH and hardness would reduce the chemical activity of silver ion. In a freshwater study it was reported that 0.17 ppb caused premature hatching of the eggs and reduced the growth of larval rainbow trout (Klein-MacPhee et. al., 1984).

The chemical activity of the silver ion will be increased in low pH, low ionic strength water such as used in hatching discus so that the breeder should avoid treating eggs, larvae, or fry with silver.

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Limnotilapia dardennii **. . . Dardennii**
photo: Mike Jacobs 2017

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ON THE WILD SIDE . . . BETTAS

by Bill Little

Photo by Bill Little

As we commence the beginning of a new year I thought we would talk about Bettas for a moment and in the coming months and explore this genus in greater depth. For those of you that were at the Christmas party you may have heard Bill Shields announce the BOD decision to cancel the Bowl Shows during the coming year. At the same time we are also pleased to announce that the International Betta Congress in conjunction with the Florida Chapter (First Coast Bettas) has agreed to host a district show at our May meeting. So, the membership will have at least one opportunity to compete during the year. You will be hearing more about the details at the January or February general meeting.

A number of our members have shown increased interest in keeping and breeding bettas particularly in the last year. But still, when one mentions bettas to most people the immediately thought is, “Oh yea one of those sometimes attractive fish at the LFS displayed in those tiny cups.” While that unfortunately is one description of the betta, other folks have discovered that if bettas are acquired from a true betta breeder the fish can truly be magnificent both in terms of colors and extraordinary finnage. Up to now we have been describing one species of bettas, Betta splendens. However, within the betta genus there are numerous other species referred to as wild Bettas. At last count there are as many as 85 species and more being discovered and catalogued each year that have not been scientifically described. Over the coming year we will attempt to select a few species and introduce the species in a brief article in an attempt to encourage members to adopt one of these species and maintain them in your fishroom.

Let’s begin this month with an overview of the genus Betta. With the voluminous number of species within the genus there was a need to cluster then into smaller groups which we refer to Complexes. Currently there are 14 complexes and they are listed below:

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Akarensis Complex
Albimarginata Complex
Anabatoides Complex
Bellica Complex
Coccina Complex
Dimidiata Complex
Edithae Complex
Foerschi Complex
Picta Complex
Pugnax Complex
Rubra Complex
Splenden Complex
Unimaculata Complex
Waseri Complex

Flag Crowntail . . . photo by Mike Jacobs

You will note that one of the complexes is Splenden and B. splenden is one of 6 species included in that grouping. The five other species include:

Betta imbellis
Betta mahachaiensis
Betta siamorientalis
Betta smaragdina
Betta stiktos

Red Rose Betta
. . . photo by Mike Jacobs

Species are grouped based upon similar characteristic in terms of size, shape, finnige, water requirements, breeding modes etc. For example, some species prepare a bubble nest and after spawning the eggs are placed in the bubble nest until they hatch and are free swimming. Such is the case with the B. splendens and the other species in that complex. Other species are known as mouthbrooders. In this case during the spawning process the male collects the fertilized eggs and stores them in his mouth until such time as the eggs hatch and he releases them into the local environment as free swimming fry. In almost all cases once the eggs have been fertilized the male assumes the responsibility of caring for the eggs and young fry. Depending on the species, sometimes the female must be removed from the immediate vicinity and in other instances the female can remain but not permitted entry to the immediate area of the nest. However,she will establish a protective perimeter not allowing other fish to enter the area.

Much has been written about the betta splendens in club bulletins and on the internet so these articles will focus on the wild betta species specifically. This is just a brief overview and in future issues we will attempt to present a more detailed description of a species or two. Next article we will examine the Albimarginata Complex which contains two species – B. albimarginata and B. channoide. Until then, welcome to 2018!

Above Photo: ***Betta simplex*** by Mike Jacobs

Below Photo: Entrant in IBC Show in Clearwater, Florida by Mike Jacobs

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MEMBERSHIP DUES!!!!

Membership Dues for TBAS are due on the anniversary of your sign-up date every year. Please make sure you check the "sign-in" list on the table at every meeting to check your "Dues-Date" . . . Thanks!!!

USE PAYPAL ON THE TBAS WEBSITE . . . TBAS1.COM . . . !!!!!

ZAP!!!!!

Have you ever been zapped by an electric stingray? I WAS! I tried to force feed one when it knocked me across the room. I had mistakenly assumed that it's generated current was more like the electric Black Ghost's. I was VERY wrong.

The stingray went back to the dealer the next day. My arm "bothered" me for several months after that incident.

What do you do when a fish "get" you? If it is a venomous type sting some vinegar and HOT water and Benadryl will help. The sting will give you a burning sensation and ice or cold water will make it worse. If it is an electric zap you might consider having yourself checked by a doctor. I would not recommend one of these fish to anyone with a pacemaker.

Do your homework on new fish. I have compiled a list of potentially painful groups commonly available in the hobby and their weapons. Most are marine and some are not legal in Florida.

Black and white striped catfish, marine. The pectoral fins. Many pet shops don't know that this fish is venomous. The reaction is like that of a lionfish. Get treatment right away for a sting from this fish.

Catfish in general, freshwater and marine. If you have ever stepped on a catfish while fishing then you know how painful it can be. Some catfish have venom in their dorsal and pectoral fins. Vinegar will usually help to neutralize the poison. Always use caution when handling catfish.

Electric eel, only freshwater. This fish is not usually offered for sales and never in Florida. It can give a fatal jolt of electricity and it definitely is not for novices.

Electric stingray, marine. The name means just what is says and it can give a nasty jolt. Remember that saltwater conducts electricity better than freshwater.

Marine lionfish, all types. Venomous, usually the back fins and sometimes the side fins too. Does not hurt other fish in the tank, normally. However, the Turkey lionfish is a jumper.

Puffer fish, both freshwater and marine. These fish are poisonous if eaten. Don’t eat them unless a licensed puffer chef prepares them for you. Don’t put them with other fish that might eat them. Although this is not always fatal, it can be.

Scorpion, marine. Good name for this venomous fish. Usually top and side fins carry venom.

Marine surgeon fish and angels. Most surgeon fish, marine angels and loaches are armed with razors or spines. These razors fold down against the body or into a groove but can be pooped out in defense. These can cut a net and your hand. Surgeon fish will attack other surgeons with their spines. Freshwater loaches and botias, such as the clown loach, have spines near their eyes, so be careful when handling them.

There are other fish which you should use some caution around. As a general rule of thumb, if in doubt, ask someone you trust. Always handle fish carefully, anyway, if not for your safety, then for theirs. Until next month, good fish keeping.

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THE BEST KOI ANGELFISH IN THE UNIVERSE

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alphabetical order

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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

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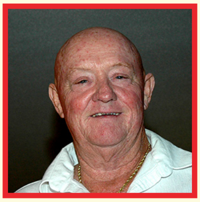
Bill Shields



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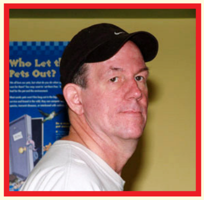

Al Starkey

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TBAS

Tampa Bay Aquarium Society
St. Pete/Tampa, Florida

Website: www.tbas1.com

FORUM: www.tbas1.com/forum

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